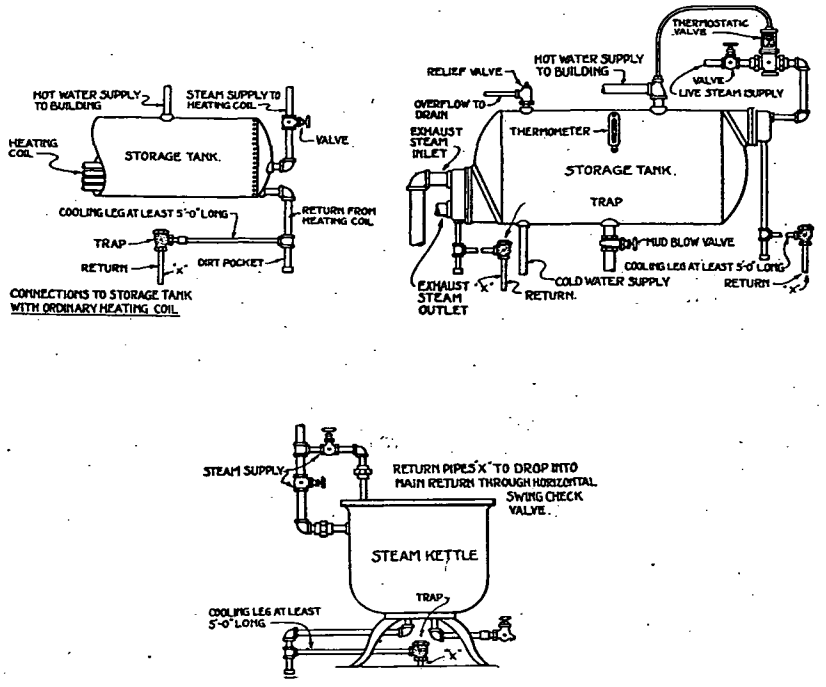


FIG. 29. CONNECTIONS TO COILS IN TANKS

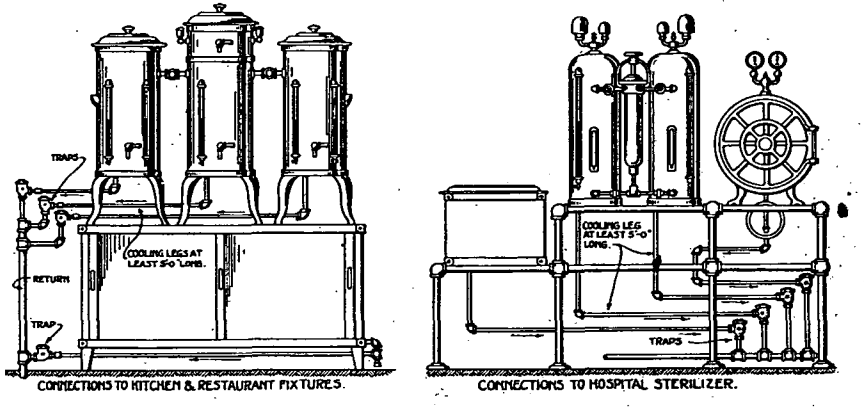


FIG. 30. TYPICAL CONNECTIONS TO KITCHEN AND HOSPITAL EQUIPMENT

CHAPTER IV

SYSTEMS AND PIPING FOR HOT WATER HEATING

A HOT WATER HEATING SYSTEM consists essentially of heaters, radiators, and a connecting system of pipe through which water circulates while conveying heat from the heater to the radiators.

The connecting pipe lines should be arranged and proportioned so that every radiator will receive its proper share of heat when the total quantity of heat required by all the radiators is being delivered to the water at the heater. There are a large number of systems or methods of arranging the pipe lines in a hot water system. A few are indicated in Fig. 31.

The force maintaining circulation is either that of gravity, which acts because the water in the return risers is heavier than the water in the supply risers, or the force supplied by a pump placed in the return main near the heater. When circulation is due to gravity, it is called a *Gravity System;* when circulation is produced by a pump, it is called a *Forced-Circulation System.*

OPEN AND CLOSED SYSTEMS

Hot water heating systems may be either open or closed. Open systems have expansion tanks vented to the atmosphere. Closed systems are operated under pressures higher than atmospheric.

In designing the pipe lines for a *Closed System* the same methods and formulas are used to determine the pressure heads and friction heads as are used in designing an *Open System.*

The principal difference between a closed system and an open system is that in a closed system, the pressure on the water in the system can be regulated by a set of valves whereas, in an open system, the pressure on the water is only that due to the atmosphere and the column of water extending from the expansion tank to the point where the pressure is measured. In general, the pressure on the water is higher in a closed system than in an open system and, consequently, the water can be heated to a higher temperature in the former without boiling. As the temperature of the water in a heating system is increased, the size of the radiation and of the pipe lines, necessary to supply a given quantity of heat, is decreased. An open system can be made the equivalent of a closed system in this respect by elevating the expansion tank to a sufficient height. For example, if, in a closed system, a pressure of

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