are usually made about 5 ft long to provide flexibility for movement in the main.

Offsets in steam and return piping should preferably be made with 90-deg ells but occasionally fittings of other angles are used, and in such cases the length of the diagonal offset will be found as shown in Fig. 31.

Dirt pockets, desirable on all systems employing thermostatic traps, should be so located as to protect the traps from scale and muck which will interfere with their operation. Dirt pockets are usually made 8 in. to 12 in. deep and serve as receivers for foreign matter which otherwise would be carried into the trap. They are constructed as shown in Fig. 32.

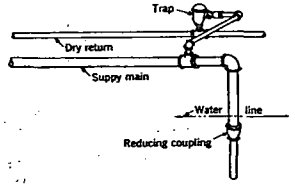

FIG. 33. DRIPPING END OF MAIN INTO WET RETURN

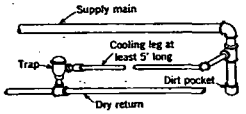

FIG. 34. DRIPPING END OF MAIN INTO DRY RETURN

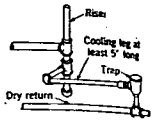

FIG. 35. DRIPPING HEEL OF RISER INTO DRY RETURN

On vapor systems where the end of the steam main is dripped down into the wet return, the air venting at the end of the main is accomplished by an air vent passing through a thermostatic trap into the dry return line as shown in Fig. 33. On vacuum systems the ends of the steam mains are dripped and vented into the return through drip traps opening into the return line. The same method may be used in atmospheric systems. A float type trap is preferable to a thermostatic trap for dripping steam mains and large risers. If thermostatic traps are used a cooling leg (Fig. 34) should always be provided. The cooling leg is for cooling the condensation sufficiently before it reaches the trap so the trap will not be held shut by too high a temperature. On down-feed systems of atmospheric, vapor, and vacuum types, the bottom of the steam risers are dripped in the manner shown in Fig. 35. On large systems it is desirable to install a gate valve in the cooling leg ahead of the trap.

PROBLEMS IN PRACTICE

1 ● What factors determine the size of steam piping and the allowable limit of capacity?

Factors which determine the size of steam piping are the desired initial pressure and the allowable drop in pressure which is permissible to maintain a pressure in the farthest radiator. The length of run in sizing piping is important and it is generally considered as the distance along the piping from the source of steam supply to the farthest radiator, with allowances for resistance of elbows and valves expressed in terms of equivalent length.

2 ● When the size of pipe is still undetermined, what arbitrary percentage is usually added to the actual length to obtain the equivalent length?

Usually 100 per cent; in other words, the actual length is doubled to allow for the added drop produced by the valves, tees, elbows, and other fittings.

3 ● What are the major factors to be considered in determining the flow of steam in pipes?

a. The initial steam pressure available and the total pressure drop allowable between the source of steam supply and the end of the return system. The pressure drop should never exceed one half of the initial pressure.

b. The *maximum* steam velocity allowable. When condensate is flowing against the steam, the velocity must not be so great as to produce water hammer, or hold up water in parts of the system until the steam flow is reduced sufficiently to permit the water to pass. The velocity at which disturbances take place depends upon:

1. Size of pipe.
2. Whether pipe is vertical or horizontal.
3. Pitch or grade of pipe.
4. Quantity of water flowing against steam.

c. The equivalent length of run from the source of steam supply to the farthest heating unit, with allowance for friction in pipe fittings and valves.

4 ● Name three fundamental considerations in designing the piping system for steam heating.

a. Provision for the distribution of suitable quantities of steam to the various heating units.

b. Provision for the return of condensate from the radiators and piping to the boiler.

c. Provision of means for expelling air from the radiators and piping.

5 ● Why is the proper reaming of the ends of pipe necessary?

The capacities of pipes depend upon the free area available for flow. In cutting the pipe this area may be restricted by a burr, which may decrease the capacity of a pipe more than 25 per cent in the smaller pipe sizes.

6 ● a. What are the major factors to be considered when selecting a pressure reducing valve?

b. How should such valve be installed?

a. The initial pressure of the steam must be considered along with the desired reduced pressure. The connected load to be supplied must be known in square feet of equivalent direct radiation or in pounds of steam per hour. For operation with a continuous load, a semi-balanced or double-seated valve operated by a diaphragm gives good results. Where the load is intermittent, as in process work or with thermostatically controlled blast heaters, a so-called dead end or single-seated valve should be used.

b. The pressure reducing valve should be installed in a horizontal line with a gate valve on each side, and with a by-pass operated by a valve. The pressure balancing pipe from the diaphragm chamber should be connected into the top or side of the low pressure main not less than 15 ft from the reducing valve.

7 ● What is the usual expansion allowance and how it is compensated for in heating system supply risers?

The expansion of low pressure steam piping is normally taken as 1¼ to 1½ in. per 100 ft of pipe. With a five story building a double swing connection between the riser and the main will suffice. In buildings between 5 and 10 stories high the riser should be anchored near its center and have double swing connections to the main. For taller buildings expansion loops or riser offsets are used which are capable of handling a length of riser reaching 5 stories in either direction from the joint. The risers are anchored at each alternate 5 stories. All radiators must have double swing connections, and those connected above where the riser is anchored must be given greater pitch to insure their having proper grade when the riser is heated.