thermal valves act in response to the superheat at the coil outlet, this superheat should be produced with the least possible sacrifice of active evaporating surface. Sometimes a single thermal valve is used per coil. In other cases, multiple valves are used, with the coil divided across the air flow or parallel to the air flow as shown in Fig. 6. The arrangement of Fig. 7 should be avoided, since it offers the disadvantage of unequal load on the two parallel circuits.

Flow Arrangement

In all heat transfer processes, the relative directions of flow of the fluids influence the performance of the heat transfer surface. In air-heating and cooling coils, the air usually flows at right angles to the tubes. In a coil having only one row in the direction of air flow, the relative directions of

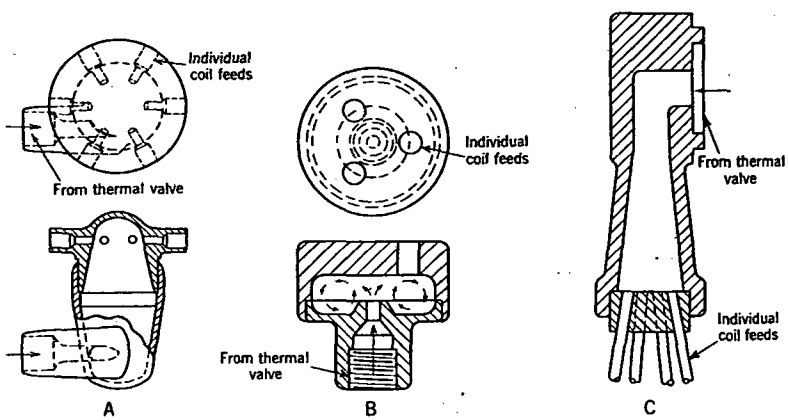

FIG. 5. TYPES OF REFRIGERANT FEED DISTRIBUTING HEADS

flow would all be at right angles. In coils having more than one row in the direction of air flow, the media in the tubes may be variously circuited as illustrated for water or steam coils in Fig. 8. It is the usual practice to designate a coil that is circuited and employed as in Fig. 8A as a *parallel flow* coil. Figs. 8B and 8C show the general arrangements that are termed *counter-flow* and *cross-flow* respectively. Cross flow is common in steam heating coils, the temperature within the tubes being substantially uniform, and the mean temperature difference the same whatever the direction of flow, relative to the air. The parallel and counter-flow arrangements as illustrated in Figs. 8A and 8B are common in brine or water coils, with the counter-flow arrangement being the preferred arrangement to secure the advantage of highest possible mean temperature difference. Most direct-expansion coils also follow the general scheme of counter flow but the circuiting requirements for proper loading sometimes result in a combination of the other flow arrangements with counter flow in the same coil. Cross flow is generally avoided in the volatile refrigerant coils because of the unequal loading of the parallel circuits.

Applications

Heating coils in field-assembled banks are used for a number of purposes as described in Chapter 30. They may be arranged with the air flow

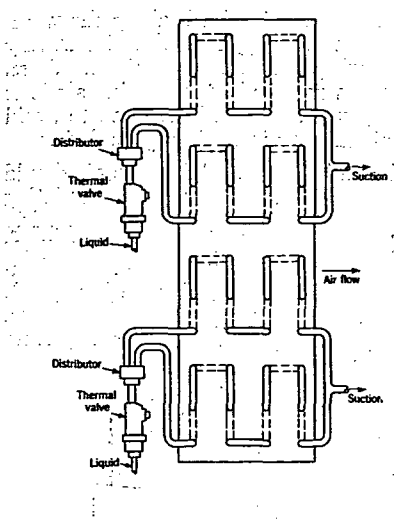

FIG. 6. ARRANGEMENT FOR FACE CONTROL

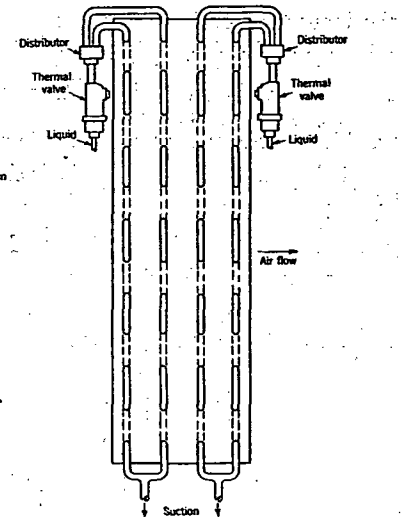

FIG. 7. ARRANGEMENT FOR DEPTH CONTROL

vertical or horizontal, although the latter is more common. For steam heating, the coils may be set with the tubes vertical or horizontal. In the latter case the coil should be sloped to provide for condensate drainage. Because of the multi-circuit feed arrangement and the necessity for avoiding air and water pockets, water heating coils are generally arranged with the tubes horizontal. Certain precautions must be taken against freezing. Where steam coils are used with entering air below freezing temperature, throttling the steam supply may cause freezing of the condensate in the bottom of the coil, if the tubes are of the variety not provided with internal distributing pipes or an equivalent arrangement.

There are coils available having inner distributing tubes, and having the supply and return headers cast in one piece. In this type of coil the condensate that forms in the outer tube has resulted from steam fed from

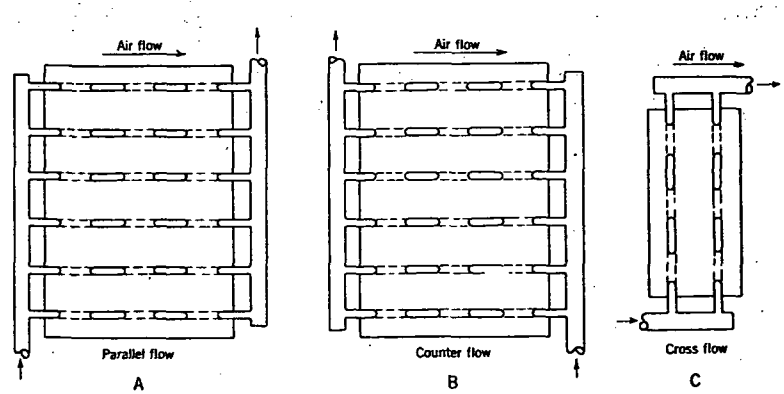

FIG. 8. FLOW OF MEDIA IN TUBES IN RELATION TO AIR FLOW