2. The performance curve of a given compressor with a definite condenser (combination usually called a *condensing unit*) is plotted as a function of suction temperature corresponding to the saturation suction pressure at the compressor suction service valve for a given inlet water temperature and quantity supplied to the condenser.

3. The performance curve of the given cooling coil is next plotted as a function of mean suction temperature within the coil, the mass air velocity over the coil and the wet-bulb temperature of air entering the coil.

4. The refrigerant pressure drop between the center of the cooling coil and the compressor suction service valve is computed and converted into the terms of temperature-difference. This temperature difference is then fitted in horizontally between the performance curves of the cooling coil and the compressor, as shown, and the total capacity of the coil-compressor combination is read along the horizontal line upon which the above mentioned *temperature-difference* segment falls.

COIL SELECTION

In the selection of a coil it is necessary to consider several factors:

1. The duty required—heating, cooling, dehumidifying.
2. Temperature of entering air—dry-bulb only if there is no dehumidification, dry- and wet-bulb if moisture is to be removed.
3. Available heating and cooling media.
4. Space and dimensional limitations.
5. Air quantity limitations.
6. Allowable resistances in air circuit and through tubes.
7. Peculiarities of individual designs of coils.
8. Individual installation requirements, such, for example, as type of automatic control to be used.

The duties required may be determined from information in Chapters 3, 4, 5 and 6. There may or may not be a choice of cooling and heating media, as well as temperatures available, depending upon whether the installation is new or is in combination with present sources of heating or cooling. Space limitations are dictated by the requirements of individual cases. The air quantity is influenced by a number of considerations. The air quantity through heating coils is often made the same as that necessary to handle the summer cooling load. The air handled may be fixed by the use of old ventilating ducts as an air distribution system for new air conditioning apparatus, or may be dictated by requirements of satisfactory air distribution or ventilation. The resistance through the air circuit influences the fan horsepower and speed. This resistance may be limited to allow the use of a given size of fan motor, or to keep the operating expense low, or it may be limited by the maximum fan peripheral velocity which requirements of quietness may permit. The friction through the water or brine circuit may be dictated by the head available from a given size of pump and pump motor. As the fan and pump motor inputs represent a refrigerating load on cooling installations, it is economical to keep them low.

Proper performance of a surface heating or cooling coil depends upon correct choice of the original equipment and upon certain other factors. The usual coil ratings are based on a uniform face velocity or air. If the air is brought in at odd angles or if the fan is located so as to block part of the air flow, the performance as given in the manufacturer's ratings cannot usually be obtained. To obtain this performance it is necessary also that the air quantity be adjusted on the job to that used in determining the coil selection, and must also be kept at this value. The most common causes for a reduction of air quantity are the fouling of the filters and collection of dirt in the coils. These difficulties can be avoided by proper design and proper servicing. There are a number of ways in which coils may be cleaned. A common method is to wash them off with water. They can sometimes be brushed and cleaned with a vacuum cleaner. In bad cases of neglect, especially on restaurant jobs where grease and dirt have accumulated, it is sometimes necessary to remove the coils and wash off the accumulation with steam, compressed air and water, or hot water. The most satisfactory solution, however, is to keep the filters serviced, and thus make the cleaning of the coils unnecessary.

The proper selection of coils requires an understanding of the necessities of each case and should be based on an economic analysis of the plant design as a whole. No general rule can, therefore, be laid down for the selection of heating or cooling coils. It is possible, however, to point out the limits of usual practice and to indicate the influence of the variables involved in the coil selection.

Heating Coils

Steam and hot water heating coils are usually rated within these limits:

Air Face Velocity—200 to 1200 fpm, sometimes up to 1500 fpm.
Steam Pressure—2 to 200 lb, sometimes up to 350 lb per square inch.
Hot Water Temperature—150 to 225 F.
Water Velocity—2 to 6 fps.

Individual cases may deviate widely, but the tabulation given herewith will serve as a guide to usual heating practice:

Air Face Velocity—500 to 800 fpm face, 500 being a common figure.
Delivered Air Temperature—varies from about 72 F for ventilation only to about 150 F for complete heating.
Steam Pressure—2 to 10 lb, 5 lb being common.
Hot Water Temperature—150 to 225 F.
Water Velocity—2 to 6 fps.
Water Quantity—Based on about 20 F temperature drop through a hot-water coil.
Air Resistance—The total resistance through heating coils is usually limited to from ⅛ to ⅝ in. of water gage for public buildings, to about 1 in. for factories.

The selection of heating coils is relatively simple as it involves dry-bulb temperatures and sensible heat only, without the complication of simultaneous latent heat loads, as in cooling coils. For a given duty, entering air temperature, and steam pressure it is possible to select several arrange-

TABLE 2. SEVERAL HEATING COIL ARRANGEMENTS

SELECTION	1	2	3
Steam pressure, lb per sq in.	5	5	5
Temperature of air entering coil, deg F.	40	40	40
Temperature of air leaving coil, deg F.	129	129	129
Air quantity, cfm.	10,000	10,000	10,000
Coil face area, sq ft.	33.3	12.5	7.50
Coil rows deep	2	3	4
Face velocity, fpm.	300	800	1330
Air friction, in. water	0.044	0.396	1.077