higher temperatures of the water. The basic formula for the film coefficient of heat transfer for flow of water is as follows:

$$f_w = 1.5\,(t - 100)\,\frac{V^{0.8}}{D^{0.2}} \tag{17}$$

where

f_w = internal film coefficient of heat transfer, Btu per hour per square foot of internal tube surface per degree Fahrenheit.
V = water velocity, feet per second.
D = internal diameter of tube, inches.
t = average water temperature, degrees Fahrenheit.

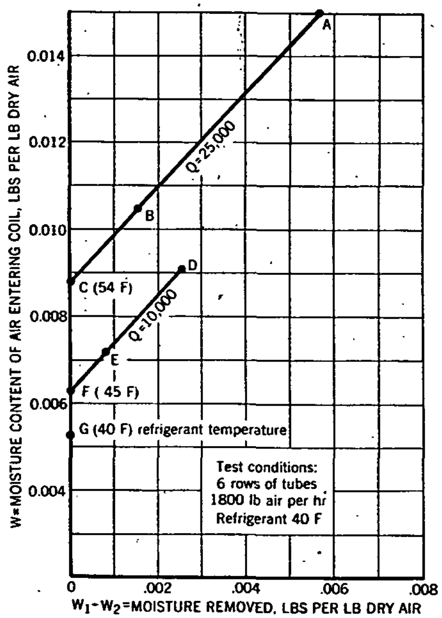

FIG. 14. DETERMINATION OF SURFACE TEMPERATURE

In the case of finned tubes, values of f_w may be lower than those obtained by use of Equation 17. Accurate results can be obtained by using Equation 15, if the logarithmic mean temperature difference between surface and water is used in place of Δt.

When saturated steam is condensed in the tubes of coils, the film coefficient f_r varies from 1000 to 2000, depending on freedom from air in the steam, and upon good drainage of the tubes. The coefficient is fairly constant for a particular coil, giving values of Δt that are directly proportional to Q.

GRAPHICAL ANALYSIS OF COIL PERFORMANCE

In testing coils, determination of surface temperatures is most important. A convenient way of determining surface temperatures is

illustrated in Fig. 14. Test points A and B are made without varying the wet-bulb temperature of entering air, the air velocity, the refrigerant temperature, and the total capacity of the coil. Only the dry-bulb and dew-point temperatures of the entering air are varied. A straight line is drawn between points A and B, and is extended to the ordinate of zero moisture removal, giving point C which represents the moisture content of saturated air that corresponds to the surface temperature. Points D and E are similarly plotted, the only difference being that another total coil capacity and entering air wet-bulb temperature are chosen.

The saturation temperatures of points C and F are then used in Equation 16, in conjunction with the test values of t_r and Q, so as to evaluate the constants m and n by solving two simultaneous equations. The

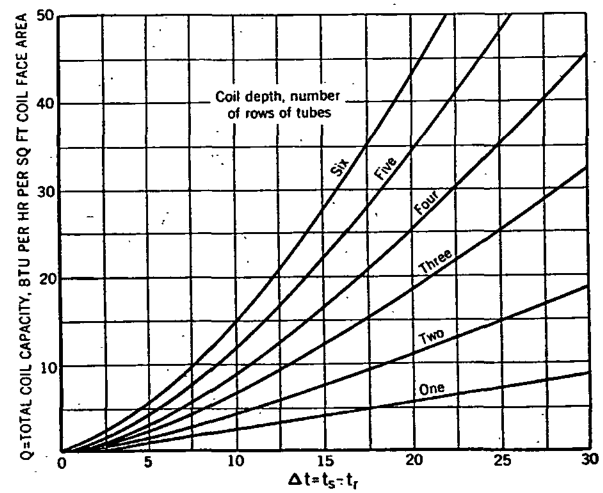

FIG. 15. TYPICAL CURVES SHOWING RELATION BETWEEN TOTAL CAPACITY AND TEMPERATURE DIFFERENCE FOR REFRIGERANTS

resulting equation is plotted as shown in Fig. 15, or can be plotted as a straight line on logarithmic paper.

Having determined the surface temperature, the test data can be used to evaluate coil efficiency, from the ratio $(t_1 - t_2) \div (t_1 - t_s)$. Then constants of Equation 11 can be evaluated and a group of curves constructed as in Fig. 12.

Use of Graphs for Predicting Performance

Coil performance under any dehumidifying condition can be predicted as shown in the following example, using Figs. 12, 13 and 15.

Example 2: Given: Total heat to be removed, 18,000 Btu per hour per square foot of coil face area; ratio of latent to total heat, 35 per cent; dry-bulb temperature of air entering coil, 83 F; dew-point temperature of air entering coil, 65 F. *Required:* Coil depth, air velocity and refrigerant temperature.

Solution. (1) Plot the entering air conditions at point C on Fig. 13. (2) Draw line C-E, parallel to the 35 per cent line N-O of the index chart, and obtain the required surface temperature, 55 F. (3) In Fig. 15, assume a coil depth of 4 rows, and obtain