TABLE 4. EFFECT OF PAINTING 32-IN. THREE COLUMN, SIX-SECTION CAST-IRON RADIATOR[2]

RADIATOR NO.	FINISH	AREA SQ FT	COEFFICIENT OF HEAT TRANS. BTU	RELATIVE HEATING VALUE PER CENT
1	Bare iron, foundry finish	27	1.77	100.5
2	One coat of aluminum bronze	27	1.60	90.8
3	Gray paint dipped	27	1.78	101.1
4	One coat dull black Pecora paint	27	1.76	100.0

[2]Comparative Tests of Radiator Finishes, by W. H. Severns (A.S.H.V.E. TRANSACTIONS, Vol. 33, 1927).

The Code for Testing Radiators also accepts 215 F and 70 F, respectively, as standard steam and room temperatures. On the basis of these temperatures, the heat emission for any other than standard conditions (H_x) is equal to:

$$H_x = H_s \left[\frac{t_s - t_r}{215 - 70} \right]^{1.3} \qquad (2)$$

where

H_s = the heat emission under standard conditions.

Correcting Output for Other Than Standard Conditions

If the radiator is to be used under any other than standard conditions of room and steam temperature, this fact should be given consideration. This may be done by applying formula 2 to the standard heat output of the radiator or more conveniently by multiplying its standard heat emission by the proper factor taken from Table 3. In estimating the size of radiator required for a room under other than standard conditions divide the estimated heat loss from the room by the factor for the prevailing conditions as given in Table 3, and choose a radiator which will supply this corrected heat loss when operating under standard conditions. Thus, if a room is to be heated to 60 F with steam at 200 F and the heat loss at this room temperature is 7200 Btu per hour, divide 7200 by 0.955 (the conversion factor for these conditions), and pick a radiator which will give $\frac{7200}{0.955}$ or 7539 Btu per hour when supplied with 215 F steam in a room having a temperature of 70 F.

For hot water, the same procedure may be followed using the mean temperature of the water in the radiator for selecting the proper conversion factor. For example, if the mean temperature of the water is 170 F and the air temperature is 70 F, the conversion factor will be 0.617. If the heat emission at 215 F and 70 F is 240 Btu per square foot, the emission at 170 F and 70 F will be 0.617 x 240 or 148 Btu per hour, and $\frac{100}{0.617}$ or 162 sq ft of heating surface will be required for every 100 sq ft required for the standard conditions of 215 F and 70 F.

TABLE 5. VOLUMES (INTERNAL) FOR VARIOUS RADIATORS[3]

KIND OF RADIATOR	AVERAGE VOLUME PER SQUARE FOOT OF SURFACE, (PINTS)	KIND OF RADIATOR	AVERAGE VOLUME PER SQUARE FOOT OF SURFACE, (PINTS)
Cast-Iron column	1.5	Pipe, 1-in. diameter, steel or wrought iron.	1
Cast-Iron flue	1.75	Pressed metal.	1
Cast-Iron wall sections	1.65		

[3]*Mechanical Equipment of Buildings*, by Harding and Willard, Vol. I, second edition, 1929.

Effect of Paint

Painting a radiator changes the emissivity constant of the radiating surface, but has practically no effect upon the heat lost by convection. It is, therefore, a surface effect and it makes no appreciable difference what paints are placed on the radiator as a priming coat; the results are always dependent upon the last coat of paint. In radiators having a large proportion of radiating surface such as pipe coils or wall coils, the effect of painting will be more marked than in tubular radiators having a comparatively small radiating surface in proportion to the amount of convecting surface. Most finely ground pigments have about the same radiation constant as black cast-iron. Therefore paints having finely ground pigments will usually have little effect. Bright metals have a much lower radiation constant and therefore, bronze metallic paints will reduce the direct radiation emission from a radiator.

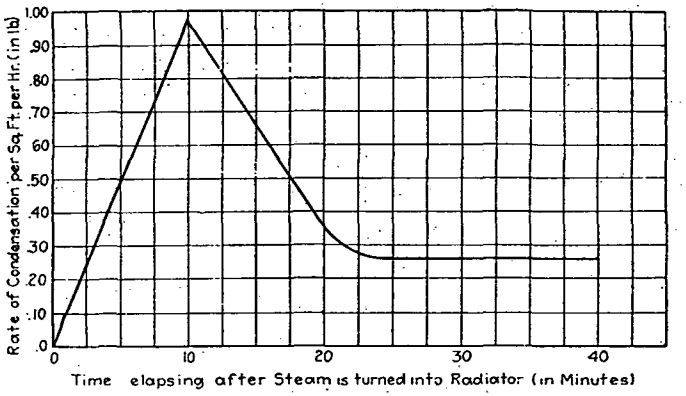

FIG. 2. CHART SHOWING THE STEAM DEMAND RATE FOR HEATING-UP A CAST-IRON RADIATOR WITH FREE AIR VENTING AND AMPLE STEAM SUPPLY

The effects of painting a six-section 32-in. three-column radiator as found in recent tests are given in Table 4.

The results of tests (Fig. 1)[4], conducted at the University of Illinois, with two types of radiators, lead to the following conclusions:

1. The heating effect of a radiator cannot be judged solely on the amount of steam condensed within the radiator.

[4]*The Effect of Two Types of Cast-Iron Steam Radiators in Room Heating*, by Prof. A. C. Willard and M. K. Fahnestock, *Heating, Piping and Air Conditioning*, March, 1930.