capacity of the unit may be expressed in Btu per hour *at the furnace bonnet*, and this value reduced by 25 per cent should equal or exceed the entire heat load of the building due to heat loss, as well as outside air introduction, or other loads. In the case of most coal furnaces, the capacity is expressed in square inches of leader pipe area, which when

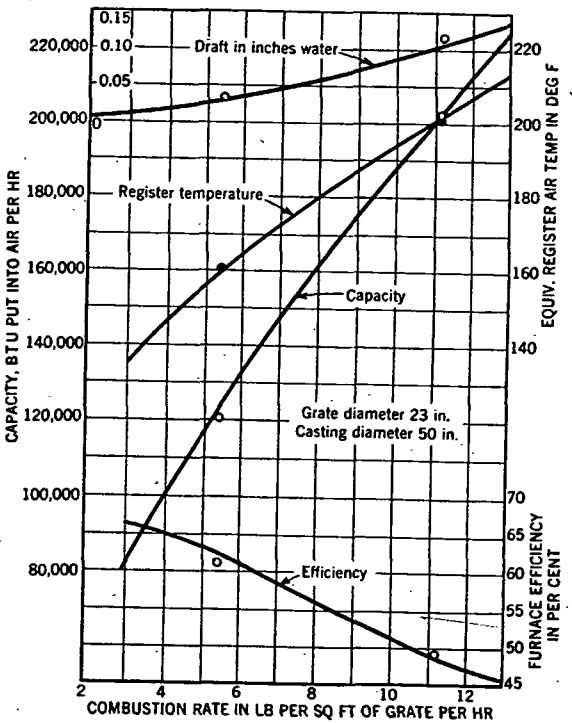

FIG. 5. TYPICAL PERFORMANCE CURVES FOR A WARM-AIR FURNACE AND INSTALLATION IN A THREE-STORY TEN LEADER PLANT, OPERATING ON RECIRCULATED AIR

multiplied by 136 Btu per square inch, indicates the heat delivery *at the register*. The latter figure should equal or exceed the heat loss figure.

The register delivery of a gravity coal-fired furnace may be established by the following equations:

$$H = \frac{G \times p \times f \times E_1 \times E_2 \times 0.866\,[1 + 0.02\,(R\text{-}20)]}{144} \qquad (1)$$

in which:

G = grate area, square inch.

p = combustion rate, pounds coal per square foot of grate per hour.

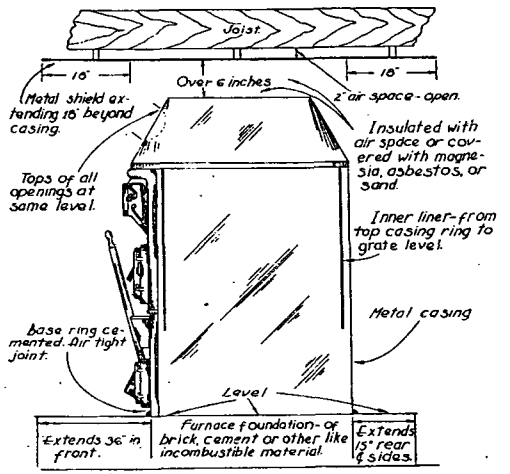

FIG. 6. DETAILS OF FURNACE BONNET, CASING, AND FOUNDATION (FROM STANDARD CODE APPLICATION MANUAL)

f = heating value of the coal, Btu per pound.

E_1 = efficiency at bonnet, ratio of heat delivered at bonnet to heat developed in furnace.

E_2 = efficiency of duct transmission, ratio of heat delivered at register to heat delivered at bonnet.

0.866 = factor of safety to allow for contingencies under service conditions such as accumulations of soot and ashes, ineffective firing methods, etc.

H = total heat loss from structure.

R = ratio of heating surface to grate area.

The preceding empirical formula provides a 2 per cent increase in furnace capacity for each unit of value whereby the ratio of actual heating surface to grate area exceeds 20. This addition is based on tests conducted at the University of Illinois on seven types of furnaces having varying ratios

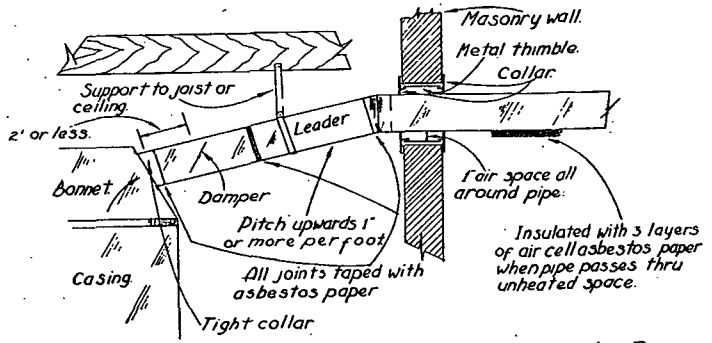

FIG. 7. DETAILS OF BONNET AND LEADER OF GRAVITY WARM-AIR FURNACE (FROM STANDARD CODE APPLICATION MANUAL)