The clay-lined brick chimney is the most commonly used chimney, but recently other building materials have been used for reasons of economy or convenience. Investigations have established that the results shown in Figs. 4 and 5 for brick chimneys can be used, with slight error, for chimneys made of shale tile, concrete block, or cinder block.[8]

SHORT CHIMNEYS

The application of heating systems to one-story houses without basements requires special consideration because the chimneys in such houses are often made so low in height for architectural reasons that they produce insufficient draft for some kinds of heating systems. Gas-burning devices do not necessarily require a chimney for proper combustion of the gas, but the chimney must be of adequate size and height to carry the flue gases out of the building since it is undesirable and contrary to American

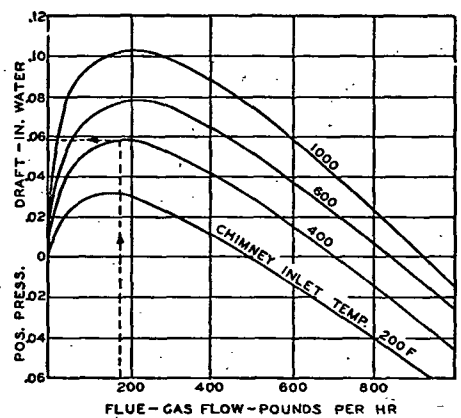

FIG. 6. AVAILABLE CHIMNEY DRAFT FOR 13 FT BRICK CHIMNEY[a, b]

[a] Square Flue Liner 6¾ x 6¾ in. inside.
[b] Barometric Pressure 29.92 in. Hg. Air Temperature 60F.

standards to have the products of combustion discharged in the living space. If a natural-draft oil-burning device is operated with insufficient draft because of a short chimney, smoky combustion usually occurs, pulsations are possible in the combustion chamber, the chimney or smokepipe may become blocked with soot, and the capacity of the heating equipment may be reduced to the point of inadequacy. Insufficient draft is not ordinarily the cause of smoky combustion in coal-burning heaters, but too short a chimney can cause slow pickup of the fire and insufficient heating capacity of the device.

Based on the amount of draft usually required for present-day heating systems at rated output, any chimney with an effective height of less than 15 ft above the center line of the thimble should be regarded as a short chimney. In short chimneys every precaution should be taken to attain the highest possible average temperature in the chimney and the lowest practicable friction loss. Short chimneys of conventional construction are likely to produce from 60 to 90 percent of the ideal draft and, therefore, the draft would only be increased from 10 to 40 percent if all friction and cooling could be eliminated.

The available draft for short chimneys can perhaps be determined most readily by using Equation 13, Fig. 8, and Table 1. Fig. 8 shows the rela-

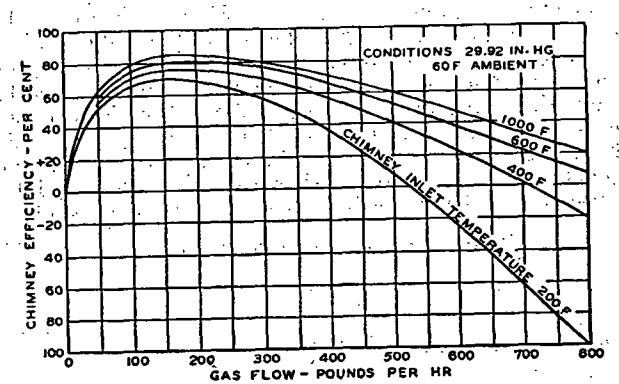

FIG. 7. EFFECT OF GAS FLOW ON CHIMNEY EFFICIENCY[a]

[a] Derived from temperature plots. Liner 8 x 8 in. outside, 6¾ x 6¾ inside. Height 13 ft.

tionship between effective chimney height, inlet flue gas temperature, and the ideal draft that would be produced for two values of outside temperature if there were neither friction nor cooling of the gases as they traversed the chimney. After obtaining the ideal draft for a given chimney height and entering flue gas temperature from Fig. 8 and selecting the appropriate efficiency value from Table 1, the available draft can be computed from Equation 13. Fig. 8 can be used in reverse in conjunction with efficiency values from Table 1 to determine what chimney height is required to produce the required draft at rated output for a given heating appliance.

Fig. 7 shows that the efficiency of a given chimney varies with the mass flow rate of gases and with the entering flue gas temperature. The efficiency also varies with the height for a given construction and depends somewhat on the method used to connect the smokepipe to the chimney

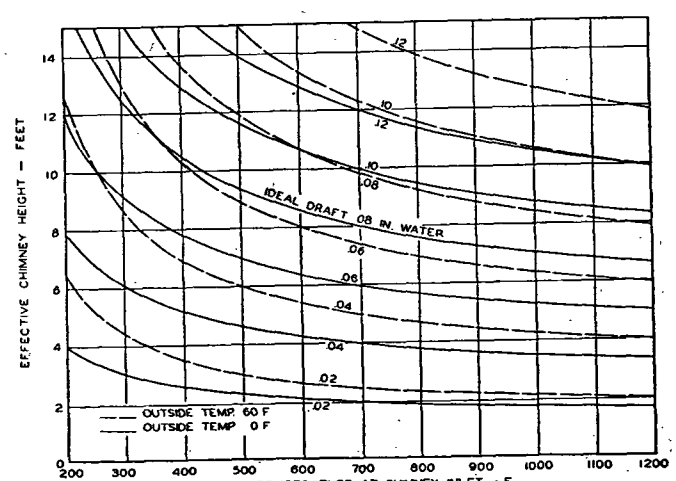

FIG. 8. IDEAL DRAFT FOR SHORT CHIMNEYS AT OUTSIDE TEMPERATURES OF 0 F AND 60 F.