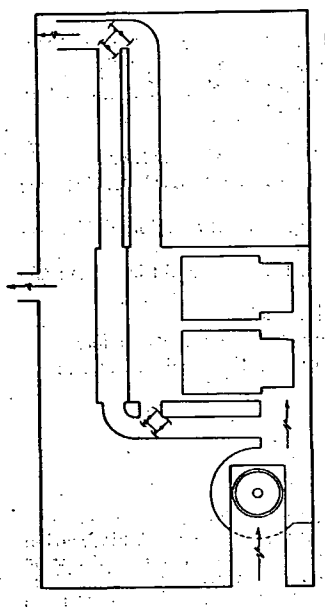

Fig. 11. Heater Arranged to Use Outside Air, with Tempered Air Chamber above Warm Air Chamber Showing Double Duct Distributing System and Mixing Dampers at Base of Risers

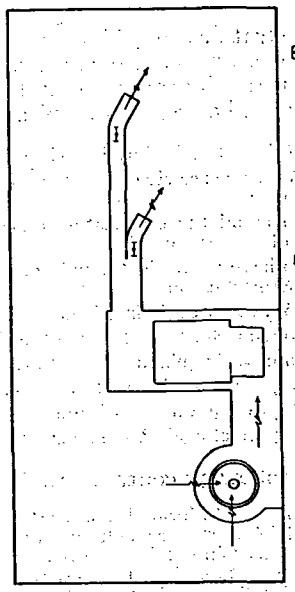

Fig. 13. Heater Arranged for Recirculation with Trunk Line Distributing System Showing Temperature Control by Air Volume at Outlet, or Direct on Heater

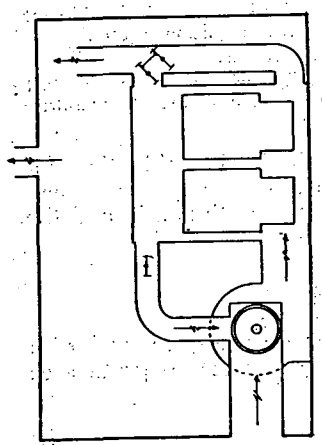

Fig. 10. Heater Arranged to Use Complete Outside Air with Tempered Air Chamber above Warm Air Chamber Showing Mixing Damper to Temper Air, Also Mixing Damper to Duct from Warm and Tempered Air Chambers

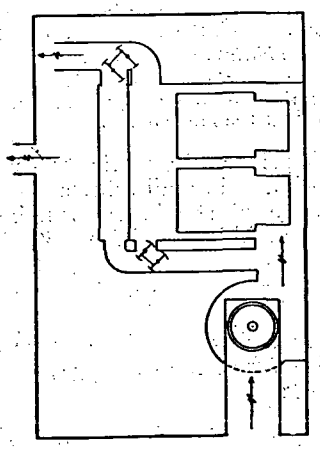

Fig. 12. Heater Arranged for Outside Air with Warm Air Connection to Fan Inlet to Temper Air, also Mixing Dampers from Warm Air and Tempered Air Chamber

where

G = required grate area, square feet.
H = total heat loss from building, Btu per hour.
F = calorific value of coal, Btu per pound.
C = combustion rate in pounds of fuel per square foot of grate per hour.
E = furnace efficiency based on heat available at register faces.

In practice it is customary to use the following constants:

F = 13,000 (For specific values, see Table 1, Chapter 27).
C = 5 to 10 lb (Use 8 lb as maximum in residence work).
E = 55 per cent to 65 per cent depending on fuel burned. Lower efficiency must be used with highly volatile solid fuel.

Where ratio of heating surface to grate area is less or greater than 20 to 1, deduct or add 2 per cent from or to rating of furnace for each unit decrease or increase in ratio, as the case may be. The foregoing procedure for determining the size of the furnace to be used applies to continuously heated buildings.

Although intermittently heated buildings usually have their heat losses computed according to the standard rules for determining such losses, these rules do not take into account the heat which will be absorbed by the cold material of the building after the air is raised in temperature. This heat absorption must be added to the normal heat loss of the building to determine the load which the heating plant must carry through the warming-up process. It is customary to increase the normal heat loss figure by from 50 to 150 per cent depending upon the heat capacity of the construction material, the higher percentage applying to materials of high heat capacity such as concrete and brick. Fan furnace systems are well adapted for heating intermittently heated buildings as these systems do not require the warming of intermediate piping, radiators, or convectors, the generation of steam, or the heating of hot water.

Follow the same methods for an oil furnace as for coal where a conversion unit is to be used, making sure that the ratio of heating surface to grate area exceeds 20 to 1. If it does not, a size larger furnace should be selected. Use the manufacturers' Btu ratings of furnaces designed for exclusive use with oil, and select a burner with liberal excess capacity.

The selection of the proper size gas furnace for a constantly heated building can be easily made by using the following *American Gas Association* formula:

$$R = \frac{H}{0.9} \qquad (2)$$

where

H = total heat loss from building in Btu per hour.
R = official *A.G.A.* output rating of the furnace in Btu per hour.

In the case of converted warm air furnaces a slightly different procedure is necessary, as the Btu input to the conversion burner must be selected rather than the furnace output. The proper sizing may be done by means of the following formula:

$$I = 1.56H \qquad (3)$$