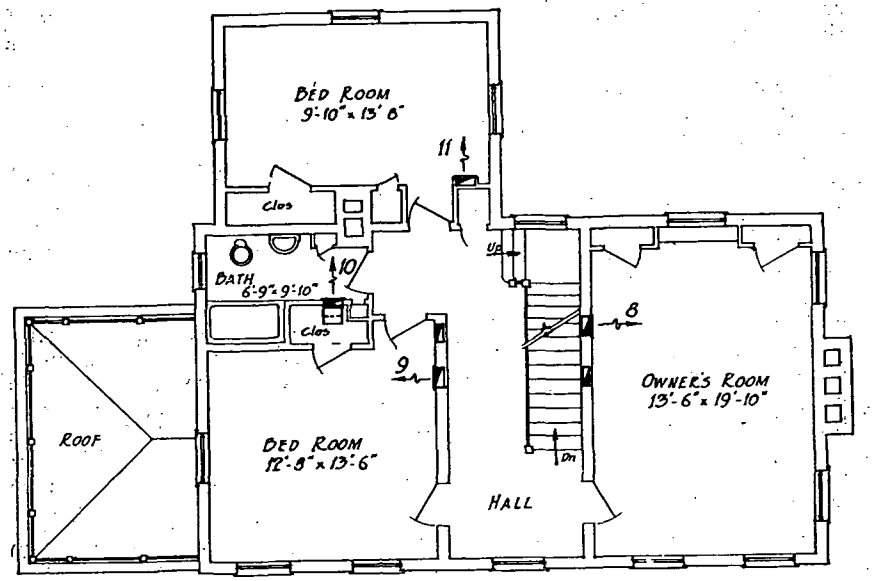

FIG. 10. SECOND-FLOOR PLAN, RESEARCH RESIDENCE

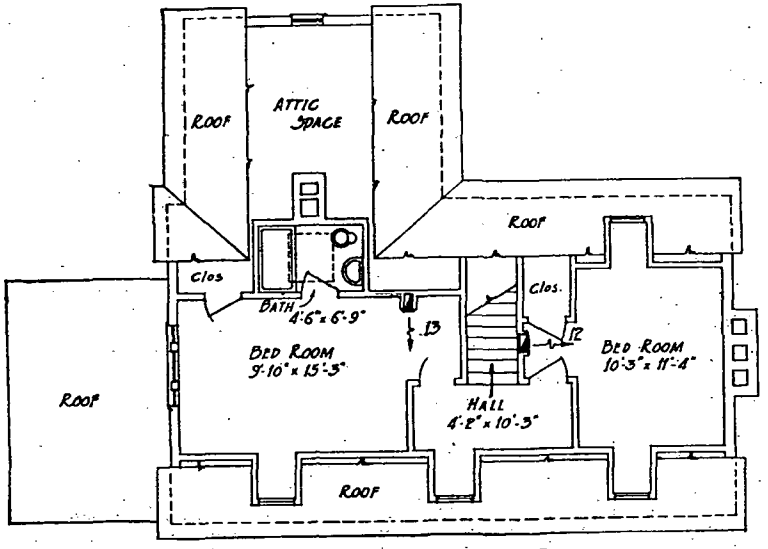

FIG. 11. THIRD-FLOOR PLAN, RESEARCH RESIDENCE

and for another furnace having 24 sq ft of heating surface for 1 sq ft of grate the expression is

$$\text{Grate area, square inches} = \frac{1.2 \times 144\,H}{0.60 \times 12{,}000 \times 6\,[1 + 0.02\,(24 - 20)]} \qquad (11)$$

The air temperatures at the registers corresponding to the conditions of equation 11 would be approximately 165 F and for 175 F and 12,000 Btu the combustion rate would be about 7.5 lb with an efficiency of 57 per cent, using the curves of Fig. 6 as a guide.

APPLICATION OF DATA

The application of the preceding data to an actual example may be of assistance to the designer. Figs. 8, 9, 10 and 11[2], represent the plans of the Warm Air Research Residence of the *National Warm Air Heating Association* erected at the University of Illinois.

Leaders, Stacks and Registers. (Direct Method)

Living Room, 1st floor:

17,250 ÷ 111 = 155 sq in. leader area. See summary, Table 1; also Example under Standard Code,[3] Art. 3, Basis of Working rules for pipes.

Leader diameter = 14 in.

Register size = 155 sq in. net area. Gross area = net area ÷ 0.7 = 14 × 16 in.

TABLE 1. SUMMARY OF DATA APPLIED TO WARM AIR RESEARCH RESIDENCE

Rooms	From Chapter 2 Estimating Heat Losses Btu Heat Losses H	Leader Area Sq In.	Stack Area Sq In. $0.7 \times LA$	Leader Diameter Inches	Stack Size Net	Register Size Gross
First Floor		$= 0.009H$				
Living	17250	155	....	14	.....	14 × 16
Dining	6810	61	....	9	.....	8 × 12
Breakfast	2300	21	....	8	.....	8 × 10
Kitchen	9210	83	....	11 or 12	.....	12 × 14
Sun	25710	230	....	Two 12	.....	Two 12 × 14
Hall and stair	12570	113	....	12	.....	12 × 14
Second Floor		$= 0.006H$				
Owners	15030	90	63	11 or 12	5 × 12	12 × 14
S. W. Bed	9800	59	41	9	3½ × 12	8 × 12
Bath	2450	15	10	8	3 × 10	8 × 10
N. Bed	14800	89	62	11 or 12	5 × 12	12 × 14
Third Floor		$= 0.005H$				
E. Bed	8220	41	29	8	3 × 10	8 × 10
W. Bed	8220	41	29	8	3 × 10	8 × 10

[2]Plans used with permission. Bath room on third floor not heated at present.

[3]Standard Code Regulating the Installation of Gravity Warm Air Heating Systems in Residences. This code has been sponsored by the *National Warm Air Heating Association*, the *National Association of Sheet Metal Contractors*, and the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. It is recommended that the installation of all gravity warm air heating systems in residences be governed by the provisions of this code, the eighth edition of which may be obtained from the *National Warm Air Heating Association*, 3440 A.I.U. Building, Columbus, Ohio.