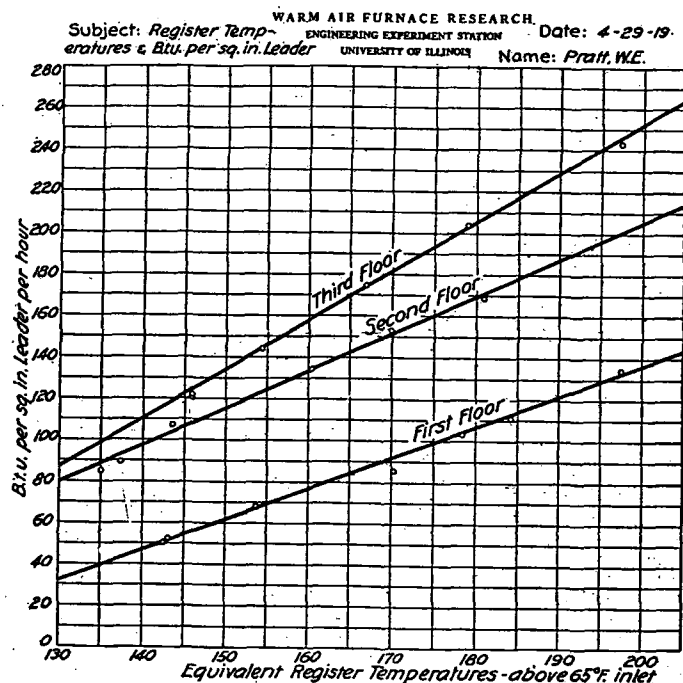




Note. Values shown above may be increased from 10 to 15 per cent for a short and well designed recirculating duct.

FIG. 43. CURVES SHOWING EFFECT OF REGISTER TEMPERATURE ON LEADER CAPACITIES

useful heating effect put into the air leaving the bonnet. A good average chimney flue will provide for a draft sufficient to burn readily 6 lb. of coal per sq. ft. of grate per hr. The grate area (G) in sq. in. may, therefore, be computed as follows:

$$G = \frac{H \times 144 \times 1.25}{6 \times 12,000 \times 0.60} = \frac{H}{240}$$

Select a furnace having a grate area as near the calculated value as possible. In general take a grate which has a larger rather than a smaller area than that calculated.

- H = heat loss in B.t.u. from all rooms to which furnace supplies heat.
 G = grate area in sq. in. (not fire-pot area).
 144 = sq. in. in a sq. ft.
 1.25 = the allowance of 25 per cent for line losses in leaders and stacks.
 6 = lb. of coal readily burned per sq. ft. of grate per hr.
 12,000 = total heat value in B.t.u. of 1 lb. of good average coal.
 0.60 = a decimal allowing for a furnace efficiency of 60 per cent.
 240 = all the above numerical values combined into one number.

Now check free area of furnace selected against the sum of all leader areas. These two values should be practically equal to each other.

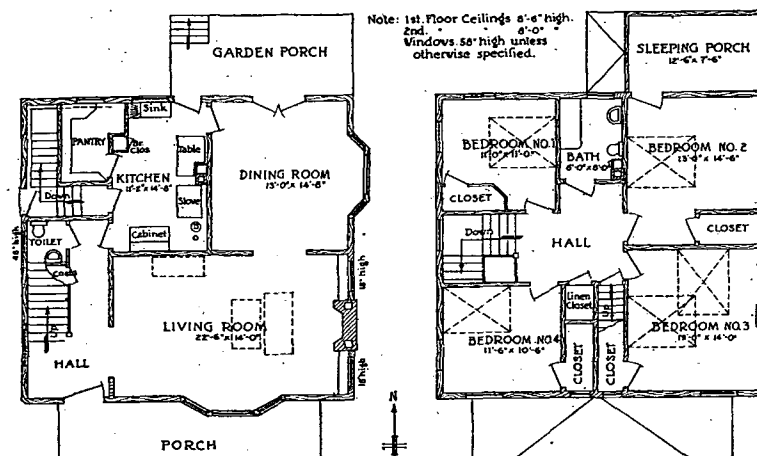


FIG. 44. FLOOR PLANS OF HOUSE USED IN TYPICAL DESIGN PROBLEM

8. The smoke connection should be not over 10 ft. in length and have not more than one 45 deg. angle, if made same size as cast-iron smoke collar on furnace. A suitable and accessible cleanout should be provided in this pipe, and both a cross damper and a check damper should be installed in the smoke connection.

9. The chimney flue should be not less than 9x12 in. clear inside and for the larger furnaces should be 12x12 in. inside. A lined flue, of the best fire clay flue lining made, is to be preferred, provided the lining is made absolutely tight at the joints and is backed up solidly with mortar so that there is no air space between lining and brick work of chimney.

10. All hot surfaces should be thoroughly covered with standard insulation not less than $\frac{1}{4}$ in. in thickness. Asbestos paper, if applied only in a single layer, materially increases the heat loss from bright tin and galvanized iron surfaces (See Bulletin No. 117 of the Engineering Experiment Station, University of Illinois.)

TYPICAL EXAMPLE IN SELECTION OF PROPER LEADER SIZES¹

It is, of course, necessary to wait until more test data are available before making final recommendations as to the proper procedure, and the most suitable values to use in designing a furnace heating system. It may not, however, be out of place to discuss a simple application of the data so far obtained to a typical furnace heating design problem using such values as are now available. In the following discussion it has been found necessary to use register temperatures as high as 185 deg. fahr. for the first floor leaders. It is undoubtedly desirable, however, to use a lower range of register temperatures, with a maximum outlet temperature of not over 175 deg. fahr., whenever possible.

Curves, Fig. 43 have been plotted from the data obtained in seven tests on the main plant, Fig. 47 showing the relation between the register

¹From Bulletin No. 112, Engineering Experiment Station, University of Illinois.