surface in the combustion chamber will absorb heat much more slowly than it would if a solid fuel were burning in the combustion chamber

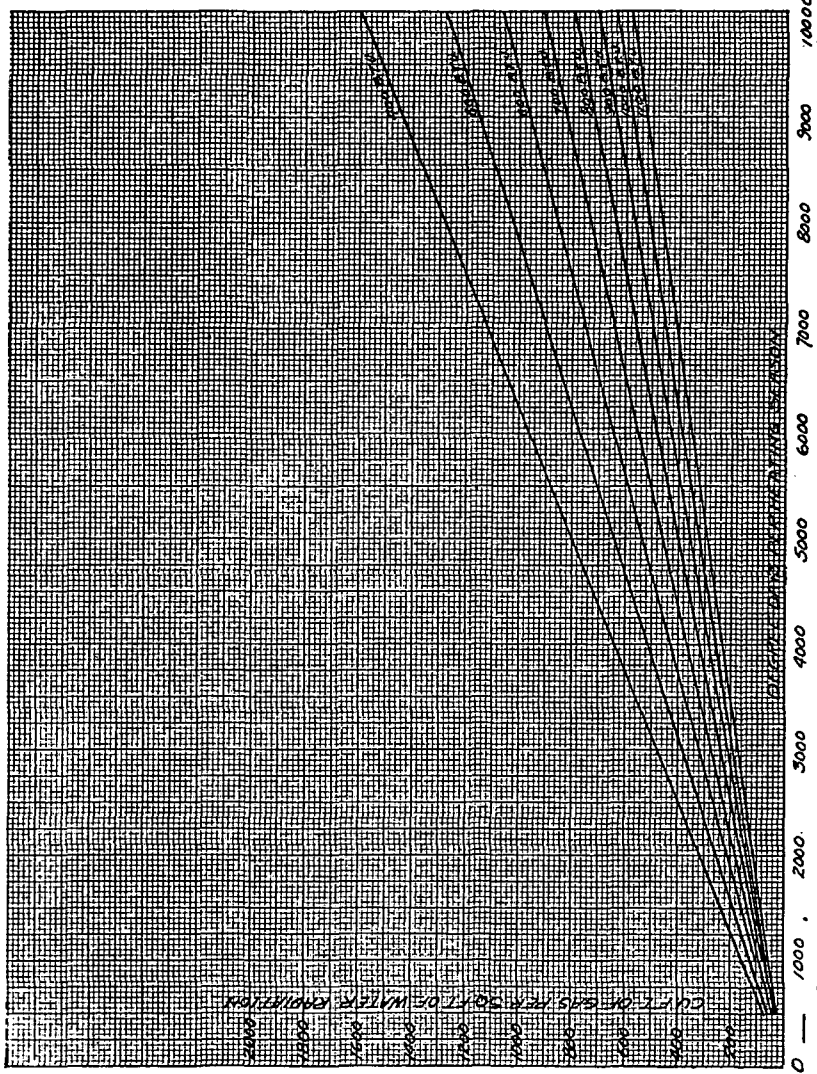

Fig. 3. Gas Consumption per Square Foot of Hot Water Radiation

with an incandescent flame and fuel bed. The heating appliance, therefore, cannot absorb enough heat to produce its rated capacity.

By burning the gas with a luminous flame, or in such a manner as to heat refractory surfaces to incandescence, the heat-absorbing surfaces





in the *combustion* chamber of the appliance designed for coal can be made to do their duty. The large flue passages, however, are not as efficient as heat-absorbing surfaces. If sufficient gas is burned to cause the appliance to deliver its rated capacity, the stack temperature will be too high for efficient results. When the rate of gas consumption is adjusted to give a low-stack temperature with consequent high efficiency, the output of the coal-burning appliance will be below its rated capacity.

### *Gas Boilers*

Gas boilers have, therefore, assumed a well-defined individuality. The usual boiler is sectional in construction with a number of independent burners placed beneath the sections. In most boilers each section has its own burner. In all cases the sections are placed very close together; much closer than would be possible when burning a soot-forming fuel. The effort of the designer is always to break the hot gas up into thin streams, so that all particles of the heat-carrying gases can come as closely as possible to the heat-absorbing surfaces. Because there is no fuel bed resistance and because the gas company supplies the motive power to draw in the air necessary for combustion (in the form of the initial gas pressure), draft losses through gas boilers are low.

### *Warm Air Furnaces*

Gas-burning, warm air furnaces are variously constructed of cast iron, sheet metal and combinations of the two materials. If sheet metal is used, it must be of such a character that it will have the maximum resistance to the corrosive effect of the products of combustion. With some varieties of manufactured gases, this effect is quite pronounced and extremely difficult to contend with. Warm air furnaces are obtainable in sizes from those sufficient to heat the largest residence down to sizes applicable to a single room. The practice of installing a number of separate furnaces to handle individual rooms is peculiar to mild climates, such as that of southern California. Small furnaces, frequently controlled by electrical valves actuated by push-buttons in the room above, are often installed to heat rooms where heat may be desired for an hour or so each day. The same fundamental principle of design that is followed in the construction of boilers; that is, breaking the hot gas up into fine streams, so that all particles are brought as close as possible to the heating surface, is equally applicable to the design of warm air furnaces. The desirablity of using an appliance designed for gas, when gas is to be the fuel, applies even more strongly to furnaces than to boilers.

Codes for the proportion of warm-air heating plants, such as that formulated by the *National Warm Air Heating Association* (see Chapter 5), are equally applicable to gas furnaces and coal furnaces. Recirculation should always be practiced with gas-fired warm-air furnaces. It not only aids in heating, but is essential to economy. Where fans are used in connection with warm-air furnaces for residence heating, it is well to have the control of the fan and of the gas so coordinated that there will be sufficient delay between the turning on of the gas and the starting of the fan, to prevent blasts of cold air being blown into the heated rooms. An additional thermostat in the air duct easily may be arranged to accomplish this.