Panel Heating and Cooling Analysis, by B. F. Raber and F. W. Hutchinson (John Wiley and Sons, New York, 1945).

Radiant Heating, by T. Napier Adlam (Industrial Press, 148 Lafayette St., New York 1947).

Radiant Heating, by R. W. Shoemaker, 1948 (McGraw-Hill Book Co., New York).

Chapter V (pages 103–115) of *Heating and Air Conditioning*, by J. R. Allen, J. H. Walker, and J. W. James (McGraw-Hill Book Co., New York—Sixth Edition, 1946).

Chapter 12 (pages 363–392) of *Heating, Ventilating and Air Conditioning Fundamentals*, by W. H. Severns and J. R. Fellows (John Wiley and Sons, New York, Second Edition, 1949).

CHAPTER 25

UNIT HEATERS AND UNIT VENTILATORS

Definitions; Unit Heaters: Classification, Application, Ratings, Location, Space Temperatures, Control, Piping, Maintenance Boiler Capacity; Unit Ventilators: Ratings, Capacity Requirements, Application, Selection, Control, Location, Exhaust Flues; Window Ventilators

DESCRIPTIONS of heating, cooling, ventilating, humidifying, and dehumidifying systems are given in other chapters. This chapter deals with unit heaters and unit ventilators. Unit air conditioners and unit coolers are discussed in Chapter 26.

Definitions

The generally accepted meaning of the word *unit* in the terms unit heaters, unit ventilators, and unit humidifiers, is that of a factory-made encased assembly of the functional elements indicated by its name. Such units can be shipped complete or in sections, so that the only field work necessary is the assembling of the sections, providing proper supports, and connecting the unit to sources of heat (or fuel), power and water supply and, if necessary, to vent pipes for combustion gases.

The term *unit heater* denotes an assembly of elements, the principal function of which is heating. The essential elements of a unit heater are a fan and motor, a heating element, a housing, and outlet vanes or diffusers. Some types are shown in Figs. 1 to 4.

The term *unit ventilator* denotes an assembly, the principal function of which is to ventilate and cool the space by the introduction of outdoor air. It may serve to heat and circulate the air within the space, or introduce air from outdoors, or may accomplish both in varying proportions. The essential elements of a unit ventilator are fans and motor, heating element, dampers, and outlet grilles or diffusers, all encased in a housing.

UNIT HEATERS

Classification

The various types of unit heaters which are at present available can usually be classified according to one of the three following methods:

1. *By type of heater.* Under this classification there are three types of heating elements to be considered: (*a*) the *steam or hot water type*, (*b*) the *electric type*, and (*c*) the *direct fired type* which may be *gas*, *oil*, or *coal fired.*

2. *By type of fan.* Under this classification there are two types of fans to be considered: (*a*) the *propeller type*[1] and (*b*) the *centrifugal type.* Either type may be arranged for horizontal or vertical delivery of air.

3. *By arrangement of elements.* Under this classification there are two types of heaters to be considered: (*a*) the *draw-through type*, in which the fan draws air through, and (*b*) the *blow-through type*, in which the fan blows air through the heater.

Unit heaters are available in any combination of the three preceding gen-