

DEFINITIONS

Definitions of terms used in fuel heating are given in Chapter 44. The following terms apply particularly to electric heating:

Electric Resistor: A material used to produce heat by passing an electric current through it.

Electric Heating Element: A unit assembly consisting of a resistor, insulated supports, and terminals for connecting the resistor to electric power.

Electric Heater: A complete assembly of heating elements with their enclosure, ready for installation in service.

RESISTORS

Solids, liquids, and gases may be used as resistors, but most commercial electric heating elements have solid resistors, such as metal alloys, and non-metallic compounds containing carbon. In some types of electric boilers, water forms the resistor which is heated by an alternating current of electricity passing through it. One of the more common resistors is nickel-chromium wire or ribbon which, in order to avoid oxidation, contains practically no iron.

HEATING ELEMENTS

Commercial electric heating elements are divided into open type elements, enclosed type elements, and cloth fabrics. *Open type elements* have resistors exposed to view. The resistors may be coils of wire or metal ribbon, supported by refractory insulation, or they may be non-metallic rods, mounted on insulators. Open type elements are used extensively for operation at high temperatures when radiant heat is desired. They are also frequently used at low temperatures for convection and fan circulation heating, especially in large installations.

Enclosed type elements have metallic resistors embedded in a refractory insulating material, and encased in a protective sheath of metal. Fins or extended surfaces may be used to add heat-dissipating area. Enclosed elements are made in many forms, such as strips, rings, plates, and tubes. Strip elements are used for clamping to surfaces requiring heat by conduction, and in convection and fan circulation air heaters. Ring and plate elements are used in electric ranges, waffle irons, and in many small air heaters. Tubular elements may be immersed in liquids, cast into metal, and, when formed into coils, used in electric ranges and air heaters. *Cloth fabrics* woven from flexible resistor wires and asbestos thread, are used for many low temperature purposes.

ELECTRIC HEATERS

Electric heaters may be divided into three groups, conduction, radiant and convection.

Conduction electric heaters, which deliver most of their heat by actual contact with the object to be heated, are used in such applications as aviators' clothing, hot pads, foot warmers, soil heaters, ice melters, and pipe heaters. Conduction heaters are useful in conserving and localizing heat delivery at definite points. They are not suitable for general air heating.

Radiant electric heaters, which deliver most of their heat by radiation, have high temperature incandescent heating elements and reflectors to concentrate the heat rays in the desired directions. The immediate and pleasant sensation of warmth which is caused by radiant heat makes this type desirable for temporary use where the heat rays can fall directly

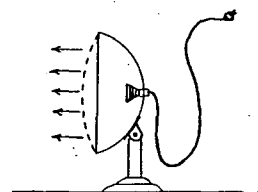


FIG. 1. PORTABLE RADIANT ELECTRIC HEATER

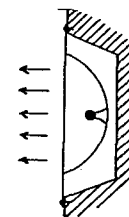


FIG. 2. RADIANT ELECTRIC HEATER RECESSED IN WALL

upon the body. They are not satisfactory for general heating, as radiant heat rays do not warm the air through which they pass. They must first be absorbed by walls; furniture, or other solid objects which then give up the heat to the air. The location of radiant heaters is important. They should never face a window because some rays would pass through the glass and be lost. Figs. 1 and 2 show common types of portable and wall-mounted radiant heaters.

Gravity convection electric heaters, designed to induce thermal air circulation, deliver heat largely by convection, and should be located and used

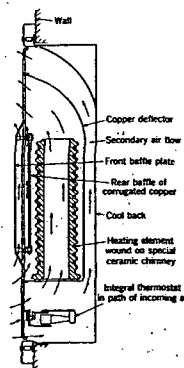


FIG. 3. CONVECTION ELECTRIC HEATER RECESSED IN WALL

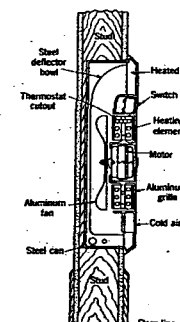


FIG. 4. FAN CONVECTION ELECTRIC HEATER RECESSED IN WALL

in much the same manner as steam and hot water radiators or convectors. They generally have heating elements of large area, with moderate surface temperature, enclosed to give proper stack effect to draw cold air from the floor line (Figs. 3 and 4). The flexibility possible with electric heating elements should discourage the use of secondary mediums for heat transfer. Water and steam add nothing to the efficiency of an electric heater and entail expensive construction.