RELATIVE HEATING COSTS

A comparison of the relative cost of heating with different fuels can be made with even a fair degree of accuracy only when there is a full knowledge of the equipment which will be used with each fuel, and the efficiency with which each will be operated. When proposing to substitute one fuel for another, the yearly cost with the fuel being used can be obtained. The accuracy of the comparison will depend upon the care taken in estimating the cost of the new fuel with the equipment which will be used.

A convenient basis for comparison of various fuels is the cost per million Btu. The formula used in estimating costs for coal is:

$$X = \frac{500 \times c}{C_c \times E_c} \tag{4}$$

where

X = cost of heating with coal in dollars per million Btu.
c = cost of coal in dollars per ton.
C_c = calorific value of coal, Btu per pound.
E_c = over-all or house efficiency for coal, expressed as a decimal.

Example 4. If coal having a calorific value of 13,000 Btu per pound costs $10.00 per ton, the cost per million Btu, assuming an efficiency of 60 per cent, will be:

$$X = \frac{500 \times 10}{13{,}000 \times 0.60} = \$0.64$$

The formula used in estimating costs for oil is:

$$Y = \frac{1{,}000{,}000 \times p}{C_o \times W \times E_o} \tag{5}$$

where

Y = cost of heating with oil in dollars per million Btu.
p = cost of oil in dollars per gallon.
C_o = calorific value of oil, Btu per pound.
W = weight of oil per gallon, pounds.
E_o = over-all or house efficiency for oil, expressed as a decimal.

Example 5. If oil having a calorific value of 141,000 Btu per gallon ($C_o \times W$) costs 10¢ per gallon, the cost per million Btu, assuming an efficiency of 70 per cent, will be:

$$Y = \frac{1{,}000{,}000 \times 0.10}{141{,}000 \times 0.70} = \$1.01$$

The formula used in estimating costs for gas is:

$$Z = \frac{1000g}{C_g \times E_g} \tag{6}$$

where

Z = cost of heating with gas in dollars per million Btu.
g = average cost of gas, including demand and commodity charges, dollars per thousand cubic feet.
C_g = calorific value of gas, Btu per cubic foot.
E_g = over-all or house efficiency for gas, expressed as a decimal.

Example 6. If manufactured gas, having a calorific value of 535 Btu per cubic foot, costs 60¢ per thousand cubic feet, the cost per million Btu, assuming an efficiency of 80 per cent, will be:

$$Z = \frac{1000 \times 0.60}{535 \times 0.80} = \$1.40$$

Chapter 30

RADIATORS AND GRAVITY CONVECTORS

Heat Emission of Radiators and Convectors, Types of Radiators, Output of Radiators, Heating Effect, Heating Up the Radiator, Enclosed Radiators, Convectors, Code Tests, Gravity-Indirect Heating Systems

COMMERCIAL heating units are termed (1) *radiator*, for direct surfaces, either exposed, enclosed, or shielded; and (2) *convector*, or concealed heater, for extended surfaces that are built in as part of an enclosure or cabinet. Some heating units are also available that are a combination of radiator and convector.

HEAT EMISSION OF RADIATORS AND CONVECTORS

All heating units emit heat by *radiation* and *conduction*. The resultant heat from these processes depends upon whether or not the heating unit is exposed or enclosed and upon the contour and surface characteristics of the material in the units.

An exposed radiator emits less than half of its heat by radiation, the amount depending upon the size and number of sections. When the radiator is enclosed or shielded, radiation is further reduced. The balance of the emission is by conduction to the air in contact with the heating surface, and the resulting circulation of the air warms by convection.

A built-in heating unit in a convector emits practically all of its heat by conduction to the air surrounding it and this heated air is in turn transmitted by convection to the rooms or spaces to be warmed, the heat emitted by radiation being negligible. The small amount of heat transmitted by radiation to the inside surface of the enclosure diminishes as the surface temperature of the enclosure approaches the surface temperature of the heating unit.

TYPES OF RADIATORS

Present day radiators may be classified as tubular, wall, or window types, and are generally made of cast iron. Catalogs showing the many designs and patterns available now include a junior size which is more compact than the standard unit.

Pipe Coil Radiators

Pipe coils are assemblies of standard pipe or tubing (1 in. to 2 in.) which are used as radiators. In older practice these coils were commonly used in factory buildings, but now wall type radiators are most frequently used