The maximum hourly heat loss will be:

$$H = 92{,}000 - \frac{26{,}000}{2} = 79{,}000 \text{ Btu.}$$

$$M = \frac{79{,}000\ (66.3 - 36.4) \times 24 \times 210}{100{,}000 \times 0.75 \times (72 - 0)} = 2204.6 \text{ hundred thousand Btu.}$$

$2204.6 \times \$0.07 = \$154.34$ = estimated fuel cost per year of heating building.

Equation 1 can be expressed as:

$$F = \frac{H}{EC} \times \frac{(t - t_a)\ N}{(t_d - t_o)} \qquad (2)$$

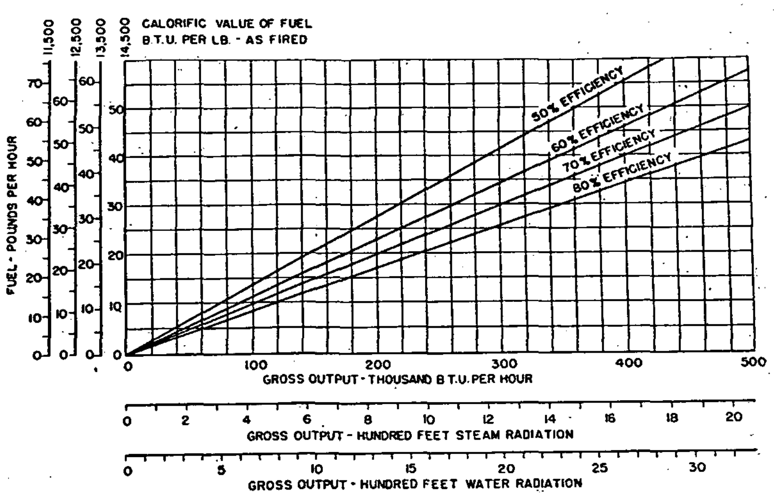

FIG. 1. COAL FUEL BURNING RATE CHART

where the expression $\frac{H}{EC}$ is the rate at which fuel is burned during the design hour. Values of this rate are plotted as ordinates in Figs. 1, 2 and 3 for coal, oil and gas. For a given efficiency, the rate of fuel burning is directly proportional to the load and therefore these charts can be extended by moving the decimal points the same number of digits in both vertical and horizontal scales. Use of these charts thus expedites the estimate.

The charts are plotted so that the load is expressed in three terms: (a) hourly heat loss at design conditions, (b) square feet of steam radiator surface (240 Btu per hour), and (c) square feet of hot water radiator surface (150 Btu per hour). By entering the chart at the correct point on the abcissa corresponding to the calculated heat loss (H), following vertically to the seasonal efficiency assumed and thence horizontally to the fuel rate, the rate of fuel burning during a maximum or design hour will be found along the left hand scale for various calorific values of the fuel.

In the case of gravity warm air heating installations, the load is usually expressed in square inches of leader pipe. This can be converted into hourly heat loss by multiplying by the factors in Table 1.

Example 4. A building located in Salt Lake City with an oil-burning heating plant has a calculated hourly heat loss of 260,000 Btu per hour. The plant is designed to maintain a temperature of 70 F inside during all 24 hours of the day, the outside design temperature is −5 F, the average outside temperature 40 F, the heating season 5088 hours long, the assumed efficiency 60 per cent, and the oil has a calorific value of 143,400 Btu per gallon. What will be the seasonal fuel consumption?

Solution. Enter Fig. 2 at 260,000 on the upper horizontal scale, move vertically to the 60 per cent efficiency curve, and horizontally to the vertical scale where the firing rate $\left(\frac{H}{EC}\right)$ is found as 3.0 gal per hour.

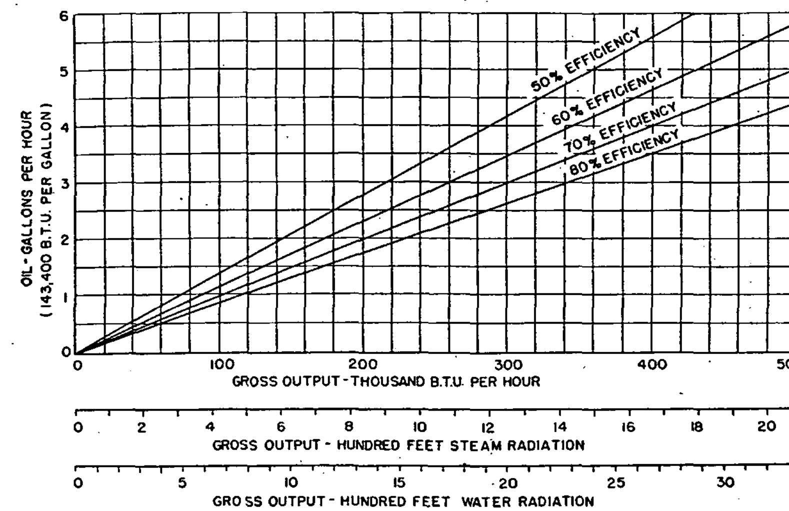

FIG. 2. OIL FUEL BURNING RATE CHART[a]

[a]This chart is based upon No. 3 oil having a heat content of 143,400 Btu per gallon. If other grades of oil are used multiply the value obtained from this chart by the following factors: No. 1 oil (139,000 Btu per gallon) 1.032; No. 2 oil (141,000 Btu per gallon) 1.017; No. 4 oil (144,500 Btu per gallon) 0.992; No. 5 oil (146,000 Btu per gallon) 0.982; and No. 6 oil (150,000 Btu per gallon) 0.956.

Substituting this in Equation 2 for $\left(\frac{H}{EC}\right)$:

$$F = 3.0 \times \frac{(70 - 40)\ 5088}{70 - (-5)} = 6106 \text{ gal.}$$

Example 5. What would be the total gas consumption over a full heating season of a gas-fired gravity warm air furnace designed according to the Code[1], and with four 12 in. and two 8 in. round leaders to the first floor and six 10 in. leaders to the second floor, if the gas has a heating value of 500 Btu per cubic foot, the plant operates at a 70 per cent

[1]Standard Code Regulating the Installation of Gravity Warm Air Heating Systems in Residences (9th edition), and the Technical Code for the Design and Installation of Mechanical Warm Air Heating Systems, may be obtained from the *National Warm Air Heating and Air Conditioning Association*, 5 E. Long St., Columbus, Ohio.