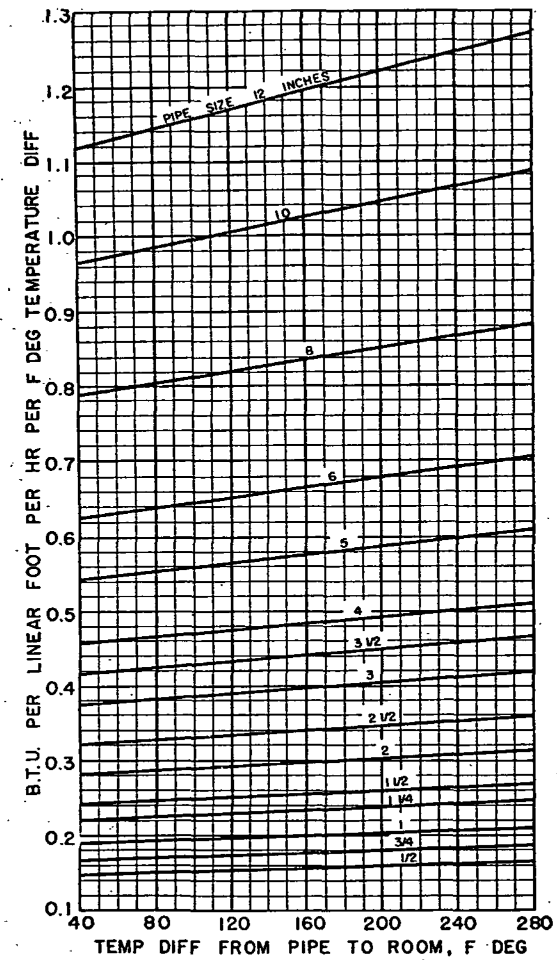


FIG. 1. HEAT LOSS THROUGH 1 IN. THICK 85 PER CENT MAGNESIA TYPE COVERING

Pipes operating at high temperatures are frequently insulated to the best advantage by combining a high temperature insulation near the pipe with a moderate or low temperature insulation around it as an outer layer. By this method an efficient material may be used for each of the two temperature ranges encountered. In calculating the heat loss through such a combination the mean temperature of each layer must be determined along with the thickness of each. This is readily done in three or four calculations performed as a series of approximations in which assumptions of thickness and mean temperature are adjusted as indicated in the discussion which follows.

In the case of a single thickness of pipe covering, the quantity of heat



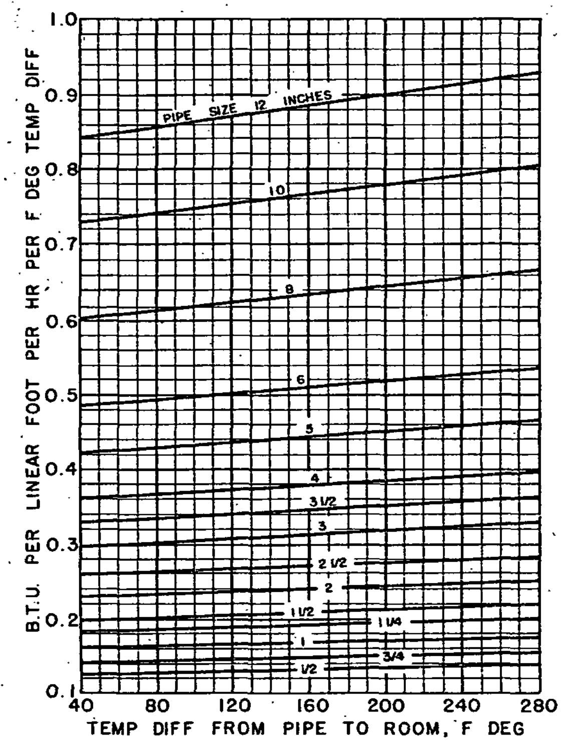


FIG. 2. HEAT LOSS THROUGH $1\frac{1}{2}$ IN. THICK 85 PER CENT MAGNESIA TYPE COVERING

transferred per square foot of outer surface of the insulation is given by the equation:

$$q_o = \frac{k\,(t_1 - t_2)}{r_2 \log_e \frac{r_2}{r_1}} \tag{1}$$

*where*

$q_o$ = Btu per (hour) (square foot of outer surface of insulation).

$r_1$ = outer radius of pipe or inner radius of insulation, inches.

$r_2$ = outer radius of insulation, inches.

$k$ = thermal conductivity of insulation, Btu per (hour) (square foot) (Fahrenheit degree per inch).

$t_1$ = temperature of inner surface of insulation, Fahrenheit degrees.

$t_2$ = temperature of outer surface of insulation, Fahrenheit degrees.

It is convenient to work from the outer surface of the insulation, since the loss through the covering must be determined from the outer surface loss by means of surface loss curves such as given in Fig. 4.