dollars per 1,000,000 B.t.u. for other efficiencies can be estimated from the following formula:

$$Z = \frac{1{,}000{,}000 \times P}{C_o \times W \times E_o}$$

where

Z = cost of oil in dollars per 1,000,000 B.t.u.
P = cost of oil in cents per gallon.
C_o = calorific value of oil, B.t.u. per pound.
W = weight of oil per gallon, pounds.
E_o = efficiency of heating system.

For example, if the cost of oil is 7¼ cents per gallon, the heat content

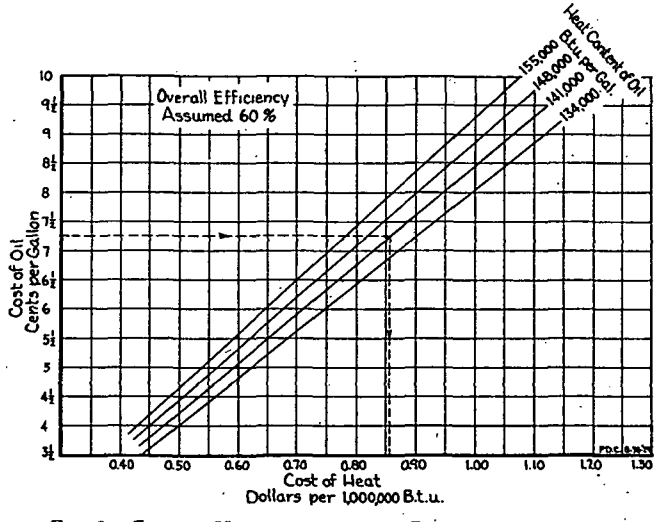


FIG. 2. COST OF HEAT PER 1,000,000 B.T.U. WITH OIL FOR VARIOUS HEAT CONTENTS PER GALLON

141,000 B.t.u per gallon (the product of C_o and W) and the efficiency 65 per cent, the cost per 1,000,000 B.t.u. will be:

$$Z = \frac{1{,}000{,}000 \times 7.25}{141{,}000 \times 65} = \$0.792 \text{ per } 1{,}000{,}000 \text{ B.t.u.}$$

It is frequently desirable to compare the cost of producing heat with oil with the cost for other fuels, giving consideration to the efficiency of the heating system as well as the calorific value of the fuel and the cost. Information concerning heating costs with other fuels is given in the chapters on Heating by Coal, Heating by Gas and Heating by Electricity.

MECHANICAL AND COMBUSTION SOUNDS

The perceptible sound incident to the combustion of oil is dependent largely upon the means employed to mix the oil and air and the rate of heat liberation per unit of combustion volume. It is obvious that this

characteristic can be controlled to some degree by the design of the burner and by the method of application to the combustion chamber of the heater. A further controllable factor is the amount of mechanical sound which will vary with design, mechanical condition and the adjustment of the unit. The transmission of both mechanical and combustion sounds can be governed to some extent by the utilization of some means of absorbing vibration.

DOMESTIC HEATING

With the large number of domestic oil-heating units that are available, it is important to look into the construction of the burner as to design, workmanship and materials, but one of the most important points to be kept in mind is the ability of the man making the installation and adjusting the burner to meet the needs of each application and to give the proper service to the installation. Further considerations in making a choice are the adaptability of the particular burner to the boiler, its ability satisfactorily to burn the fuel that is available in a given locality, and its quietness of operation.

Fuel Oils for Domestic Heating

Oils Nos. 1 to 3 are those used for domestic heating installations as they are available in most territories and they do no require pre-heating. They are suitable for installations requiring up to 30 gal. per hour, or more, in districts where heavy oil is not available. Burners should be selected that will satisfactorily handle the grade of oil available and owners should be advised to employ only the grade of fuel for which the burner is designed, except that a lighter grade than the one specified, can be used in most any type of burner.

Methods of Operation

There are three fundamental methods of operation: (1) Intermittent; (2) High-Low Continuous Flame; (3) Graduated Continuous Flame. The majority of burners operate on the intermittent system.

Intermittent Operation: With this method of operation the flame is all on or all off. Usually when the flame is on it is adjusted for fuel and air to carry from 20 to 25 per cent in excess of the maximum demand for heat. Thus, during a protracted cold spell, this type of burner operates nearly continuously and must be capable of maintaining continuous operation for many hours. On warm days, when no heat is needed, the burner is, of course, inoperative. Throughout the average heating season such as is experienced in the latitudes of Chicago and New York, the burner operates from one-quarter to one-third of the time.

High-Low Continuous Flame: As the name would indicate, this type of burner operates on a low flame when there is little or no demand for heat and a high flame when heat is required. The low flame serves as a pilot light and must be sufficiently small to avoid waste of fuel and discomfort during unseasonable warm days in the spring and fall. As with the intermittent type of burner, the high flame should deliver from 20 to 25 per cent in excess of the maximum demand for heat.

Oil and air supply controls are usually interlocking and must be adjusted for both operating positions. If mechanical draft is used, the