Controls

The heat delivery from the stoker of the smallest household type to the largest industrial unit can be accurately regulated with fully automatic controls. The smaller heating applications are normally controlled by a thermostat placed in the building to be heated. Limit controls are supplied to prevent excessive temperature or pressure being developed in the furnace or boiler and refueling controls are used to maintain ignition

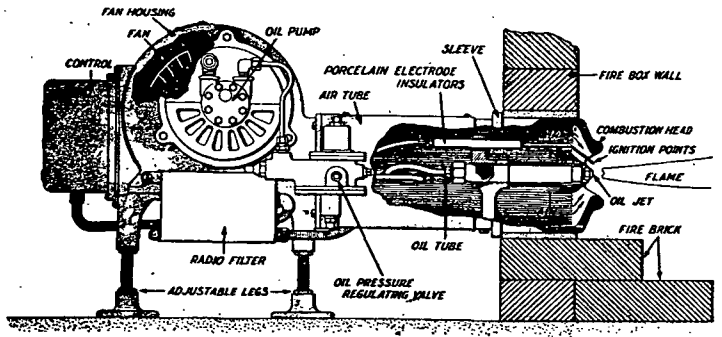

FIG. 12. GUN TYPE PRESSURE ATOMIZING OIL BURNER

during periods of low heat demand. Automatic low water cut-outs are recommended for use with all automatically-fired steam boilers. (See Chapter 34).

DOMESTIC OIL BURNERS

An oil burner is a mechanical device for producing heat automatically from liquid fuels. Two methods are employed for the preparation of the oil for the combustion process; atomization, and vaporization. The simpler types of burners depend upon the natural chimney draft for supplying the air for combustion. Other burners provide mechanical air supply or a combination of atmospheric, and mechanical. Ignition is accomplished by an electrical spark or hot wire, or by an oil or gas pilot. Some burners utilize a combination of these methods. Continuously operating burners may use manual ignition. Burners of different types operate with luminous or non-luminous flame. Operation may be intermittent, continuous with high-low flame, or continuous with graduated flame.

CLASSIFICATION OF BURNERS

Domestic oil burners may be classified by type of design or operation into the following groups: pressure atomizing or gun, rotary, and vaporizing or pot. These are further classified as mechanical draft, and natural draft.

Pressure Atomizing (Gun Type)

Gun type burners may be divided into two classes, low-pressure, and high-pressure atomization. In the first group, a mixture of oil and

primary air is pumped as a spray through the nozzle at a pressure of 2 to 7 lb per square inch. Secondary air is supplied by a fan. Ignition is obtained by means of a high-voltage electric spark used alone, or as primary ignition for a gas pilot.

The high-pressure atomizing type, illustrated in Fig. 12, is characterized by an air tube, usually horizontal, with oil supply pipe centrally located in the tube and arranged so that a spray of atomized oil is introduced, at about 100 lb per square inch, and mixed in the combustion chamber with the air stream emerging from the air tube. A variety of patented shapes is employed at the end of the air tube to influence the direction and speed of the air and thus the effectiveness of the mixing process.

This type of burner utilizes a fan to supply the air for combustion, and ignition is established by a high-voltage electric spark that may be operative continuously while the burner is running, or just at the beginning of the running period. Gun type burners operate on the intermittent *on-off* principle, and with a luminous flame.

The combustion process is completed in a chamber constructed of refractory material, or stainless steel, this being a part of the installation. Pressure-atomizing burners generally use the distillate oils, No. 1, 2 and 3 grades. (See Chapter 8).

Rotary Type

This class of burners may be divided into two groups: vertical, and horizontal. Most of the smaller rotary burners are of the vertical type, and use the lighter distillate oils, No. 1 and 2 grades.

The most distinguishing feature of vertical rotary burners is the principle of flame application. These burners are of two general types: the center flame and wall flame. In the former type (Fig. 13), the oil is atomized by being thrown from the rim of a revolving disc or cup and the flame burns in suspension with a characteristic yellow color. Combustion is supported by means of a bowl-shaped chamber or hearth. The wall flame burner (Fig. 14) differs in that combustion takes place in a ring of refractory material, which is placed around the hearth. Dependent upon combustion adjustment, these burners may operate with either a luminous or non-luminous flame.

Both types of vertical rotary burners are further characterized by their installation within the ash pit of the boiler or furnace. Various types of ignition are utilized, gas and electric, either spark or hot wire. The air for combustion is supplied partially by natural draft, and partially by fan effect of the central spinner element.

Horizontal rotary burners are used principally to burn the heavier oils, Nos. 5 and 6 grades, principally in larger commercial and industrial installations, although domestic sizes are available. Such burners are of the mechanical atomizing type, using rotating cups which throw the oil from the edge of the cup at high velocity into the surrounding stream of air delivered by the blower (Fig. 15).

Horizontal rotary burners commonly use a combination electric-gas ignition system, or are lighted manually. Primary air for combustion is