

extend the combustion chamber downward to include or even exceed the ashpit volume; in new installations the boiler may be raised to make added volume available. Approximately 1 cu ft of combustion volume should be provided for every developed boiler horsepower, and in this volume from 1.5 to 2.5 lb of oil per hour can properly be burned. This corresponds to an average liberation of about 38,000 Btu per cubic foot per hour. At times much higher fuel rates may be satisfactory. For best results, care should be taken to keep the gas velocity below 40 fps. Where checkerwork of brick is used to provide secondary air, good practice calls for about 1 sq in. of opening for each pound of oil fired per hour. Such checkerwork is best adapted to flat flames, or to conical flames that can

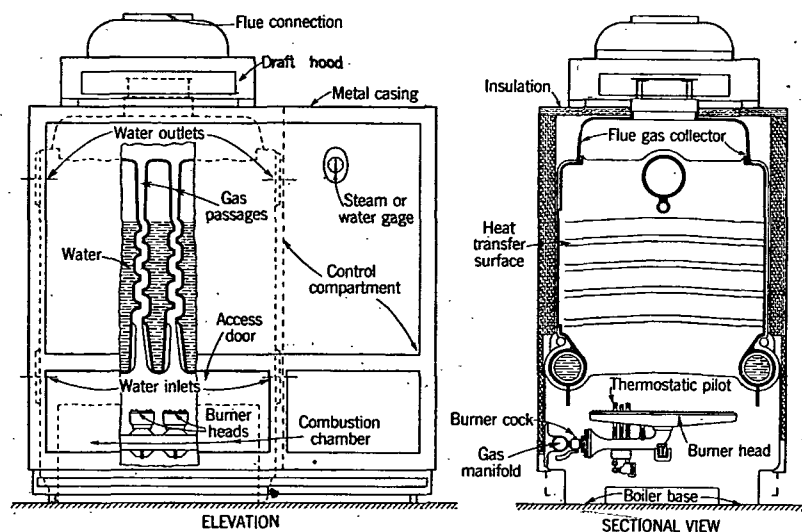


FIG. 17. COMBINATION GAS-FIRED BOILER

be spread over the floor of the combustion chamber. The proper bricking of a large or even medium sized boiler for oil firing is important and frequently it is advisable to consult an authority on this subject. The essential in combustion chamber design is to provide against flame impingement upon either metallic or firebrick surfaces. Manufacturers of oil burners usually have available detailed plans for adapting their burners to various types of boilers, and such information should be utilized.

Controls

Controls for oil burner operation, including devices for the safety and protection of a boiler or furnace, are fully described in Chapter 34.

GAS-FIRED HEATING EQUIPMENT

A gas burner is defined by the *American Gas Association* as "a device for the final conveyance of the gas, or a mixture of gas and air, to the

combustion zone." Burners used for domestic heating are of the atmospheric injection, yellow flame, or power burner types.

The use of gas has resulted in the production of a number of types of domestic gas heating appliances, and systems. These may be classified in types designed for central heating plants, and those for unit application. Gas-designed units and conversion burners are available for the several kinds of central systems. Unit heaters, space heaters and circulators may be had for installation in the space being heated.

Central Heating Systems

Boilers and furnaces specially designed for gas-firing incorporate design features for obtaining maximum efficiency and performance. Small flue passes to secure good heat transfer, the use of materials resistant to the corrosive effects of products of combustion, and draft hoods are notable features. Control equipment includes gas pressure regulators, thermostatic pilots and limit controls designed to protect the appliance and to insure safety of operation. A boiler designed for gas-burning is illustrated in Fig. 17.

Conversion burners are usually complete burner and control units designed for installation in existing boilers and furnaces. Burner heads are of circular or rectangular shape in order to fit in space available. The control equipment is generally the same as for gas boilers and furnaces. Various baffles made of clay radiants or metal are used for the purpose of guiding the products of combustion along the heating surface in the firebox or flues. Automatic air dampers are supplied on many models to prevent flow of air into the firebox when the burner is not operating.

One form of central heating system is the warm air floor furnace⁶. The use of these furnaces is adaptable to mild climates. They are used for heating first floors, or where heat is required in only one or two rooms. A number may be used to provide heat for the entire building where all rooms are on the ground floor, thus giving the heating system flexibility. With the usual type the register is installed in the floor, the heating element and gas piping being suspended below.

Unit Gas Heaters

Space heaters may be used for auxiliary heating, but in many cases are installed for furnishing heat to entire buildings. With the exception of wall heaters, they are portable. Although it is desirable to connect space heaters with solid piping, use of flexible tubing is frequently resorted to, particularly in the portable types. Where flexible tubing is used, a gas shut-off on the heater is not permitted and only *American Gas Association* approved tubing should be used.

Parlor heaters or *circulators* are usually of the cabinet type. They heat the room entirely by convection, i.e., the cold air of the room is drawn in near the base, passes up inside the jacket around a heating section, and out of the heater at or near the top. These heaters cause a continuous circulation of the air in the room during the time they are in operation.

⁶Gas Floor Furnaces, Gravity Circulating Type (U. S. Department of Commerce, National Bureau of Standards; Commercial Standard No. CS99-42).