above the horizontal. Chimney walls should be not less than one brick in width; and they should be lined with fire clay tile of the size required for the attached heating unit. Tile lining sizes are stated as outside dimensions; therefore, their effective dimensions are less by the thickness of the wall.

17 ● What is the purpose of a back draft diverter as used on gas burning units?

Since the fuel is supplied under pressure independent of draft it is necessary to free the unit from the variable chimney draft and to supply air for combustion in direct proportion to the supply of fuel gas. The back draft diverter protects the pilot and burners from down drafts.

Chapter 27

FUELS AND COMBUSTION

Classification of Coal, Air for Combustion, Draft Required, Combustion of Anthracite, Firing Bituminous Coal, Burning Coke, Hand Firing, Classification and Use of Oil, Classification and Use of Gas

THE choice of fuel for heating is a question of economy, cleanliness, fuel availability, operation requirements, and control. The principal fuels to be considered are coal, oil, and gas.

COAL

The complex composition of coal makes it difficult to classify it into clear-cut types. Its chemical composition is some indication but coals having the same chemical analysis may have distinctly different burning characteristics. Users are mainly interested in the available heat per pound of coal, in the handling and storing properties, and in the burning characteristics. A description of the relationship between the qualities of coals and these characteristics requires considerable space; a treatment applicable to heating boilers is given in *U. S. Bureau of Mines Bulletin* 276.

A classification of coals is given in Table 1, and a brief description of the kinds of fuels is given in the following paragraphs, but it should be recognized that there are no distinct lines of demarcation between the kinds, and that they graduate into each other:

Anthracite is a clean, dense, hard coal which creates very little dust in handling. It is comparatively hard to ignite but it burns freely when well started. It is non-caking, it burns uniformly and smokelessly with a short flame, and it requires little attention to the fuel beds between firings. It is capable of giving a high efficiency in the common types of hand-fired furnaces.

Semi-anthracite has a higher volatile content than anthracite, it is not as hard and ignites somewhat more easily; otherwise its properties are similar to those of anthracite.

Semi-bituminous coal is soft and friable, and fines and dust are created by handling it. It ignites somewhat slowly and burns with a medium length of flame. Its caking properties increase as the volatile matter increases, but the coke formed is relatively weak. Having only half the volatile matter content of the more abundant bituminous coals it can be burned with less production of smoke, and it is sometimes called *smokeless coal.*

The term *bituminous coal* covers a large range of coals and includes many types having distinctly different composition, properties, and burning characteristics. The coals range from the high-grade bituminous coals of the East to the poorer coals of the West. Their caking properties range from coals which completely melt, to those from which the volatiles and tars are distilled without change of form, so that they are classed as non-caking or free-burning. Most bituminous coals are strong and non-friable enough to permit of the screened sizes being delivered free from fines. In general, they ignite