creasing amounts of oils and tars are given up. For coals of higher volatile content, the relative quantity of oils and tars decreases, so it is low in the sub-bituminous coals and in lignite.

8 ● Is smoke a primary product in the burning of fuels?

Visible smoke may include very small particles of carbon, oil, tar, water (condensed steam), and ash. Of these, the oils, tars, and ash are mainly primary products, and the water is partly primary. The carbon, which usually comprises the greater part of the smoke, results from the breaking up by heat of oils, tars, and such gases as methane, so it may be considered a secondary product.

9 ● Is the sulphur in coals detrimental to combustion?

Not so far as is known, but its complete combustion gives only 25 per cent as much heat as is given by the same weight of carbon. Sulphur is undesirable because it causes corrosion of flues and stacks, and also because its gases pollute the atmosphere, and damage buildings and vegetation.

10 ● Can any one fuel be said to be the best fuel?

The term *best* can be applied to a fuel only after consideration of the cost factor of the fuel and the equipment necessary for its use. Gas seems to be the most convenient fuel because of its uniformity, and the ease with which it may be controlled and its burning made fully automatic.

Chapter 28

AUTOMATIC FUEL BURNING EQUIPMENT

Stokers, Residential Stokers, Apartment House Stokers, Commercial Stokers, Domestic Oil Burners, Commercial Oil Burners, Gas-Fired Appliances, Gas Boilers, Warm Air Furnaces, Space Heaters, Conversion Burners, Gas Appliances

AUTOMATIC, mechanical equipment for the efficient combustion of coal, oil, and gas is considered in this chapter.

MECHANICAL STOKERS

Assuming the same intelligence in handling the fire, coal can be burned more efficiently on a mechanical stoker than on any kind of hand-fired grate. This does not necessarily mean that a stoker installation may be more economical, because the amount of coal burned may be so small or the cost of the installation so high that the savings with stokers may not be sufficient to pay for the investment. The operation of burning coal involves uniformity in stoking, proper distribution over the fuel bed, admission of air as required to all parts of the fuel bed, and disposal of the ash. The handling of the volatile gas is largely a matter of furnace design but since this gas forms a considerable portion of the heating value of the coal, it may also be said that the proper handling of this gas is a function of firing. All mechanical stokers must provide means of taking care of these several functions in order fully to serve their purpose.

Stokers may be divided into four types according to their construction and operation, namely, (1) overfeed flat grate, (2) overfeed inclined grate, (3) underfeed side cleaning type, and (4) underfeed rear cleaning type. They may also be classified according to their uses. The following classification has been adopted by the U. S. Department of Commerce:

Class 1. Residential (Capacity less than 100 lb coal per hour).

Class 2. Apartment houses and small commercial heating jobs (Capacity 100 to 200 lb coal per hour).

Class 3. General commerical heating and small high pressure steam plants (Capacity 200 to 300 lb coal per hour).

Class 4. Large commercial and high pressure steam plants (Capacity over 300 lb per hour).

Overfeed Flat Grate Stokers

This type is represented by the various chain grate stokers. These stokers receive fuel at the front of the grate in a layer of uniform thickness and move it back horizontally to the rear of the furnace. Air is supplied