level with the sill of the fire door. This keeps a bed of ignited coal in readiness against the time when a sudden demand for heat shall be made on the heater. When firing, the bright fuel should either be pulled forward or pushed to the back of the firepot, leaving a hollow in which to throw the fresh fuel and leaving a portion of the glowing coal exposed, to ignite the gases rising from the fuel; otherwise a gas explosion may occur.

Pea size coal requires a strong draft and therefore the best results generally will be obtained by keeping the choke damper open, the cold-air check closed and by controlling the fire with the air-inlet damper only. Pea size can also be fired in layers with stove or egg size anthracite and used in this manner will reduce the fuel costs and attention required.

Buckwheat size coal requires much the same attention as pea size coal, except that the smaller size of the fuel makes it more difficult to burn on ordinary grates. Even greater care must be taken in shaking the grates than with pea coal on account of the danger of the fuel falling through the grate. A good draft is required and consequently the fire is best controlled by the air-inlet damper only. Where frequent attention can be given and where there is not a big heat demand, this fuel is frequently burned without the aid of any special equipment.

In general it will be found more satisfactory with buckwheat coal to maintain a uniform heat output and consequently to keep the system warm all the time, rather than to allow the system to cool off at times and then to attempt to burn the fuel at a high rate while warming up. A uniform low fire will minimize the clinker formation and keep the clinker in an easily broken up condition so that it readily can be shaken through the grate.

Forced draft and special grates or retorts frequently are used with this fuel for best results.

No. 2 Buckwheat anthracite, or rice size, is used only with forced draft equipment on mechanical stokers. No. 3 Buckwheat anthracite, or barley, has no application in domestic heating.

Combustion of Bituminous Coal

Bituminous coal should never be fired over the entire fuel bed at one time. A portion of the glowing fuel should always be left exposed to ignite the gases leaving the fresh charge.

Air should be admitted over the fire through a special secondary air device, or through a slide in the fire door or by opening the fire door slightly. If the quantity of air admitted is too great the gases will be cooled below the ignition temperature and will fail to burn. The fireman can judge the quantity of air to admit by noting when the air supplied is just sufficient to make the gases burn rapidly and smokelessly above the fuel bed.

The red fuel in the firebox, before firing, excepting only a shallow layer of coke on the grate, should be pushed to one side or forward or backward to form a hollow in which to throw the fresh fuel. (Some manufacturers recommend that all red fuel be pushed to the rear of the firebox and that the fresh fuel be fired directly on the grate and allowed to ignite from the top. The object of this is to reduce the early rapid distillation

of gases and to reduce the quantity of secondary air required for smokeless combustion).

It is well to have the bright fuel in the firebox so placed that the gases from the freshly fired fuel, mixed with the air over the fuel bed, pass over the bed of bright fuel on the way to the flues. The bed of bright fuel then supplies the heat to raise the mixture of air and gas to the ignition temperature, thereby causing the gaseous matter to burn and preventing the formation of smoke.

The fuel bed should be carried as deep as the size of fuel and the available draft permit, in order to have as much coked fuel as possible for pushing to the rear of the firebox at the time of firing. A deep fuel bed obtains the longest firing intervals.

If the coal is of the caking kind the fresh charge will fuse into one solid mass which can be broken up with the stoking bar and leveled from 20 min. to one hour after firing, depending on the temperature of the firebox. Care should be exercised when stoking not to bring the bar up to the surface of the fuel as this will tend to bring ash into the high temperature zone at the top of the fire, where it will melt and form clinker. The stoking bar should be kept as near the grate as possible and should be raised only enough to break up the fuel. With fuels requiring stoking it may not be necessary to shake the grates, as the ash is usually dislodged during stoking.

The output obtained from any heater with bituminous coal will usually exceed that obtainable with anthracite, since soft coal burns more rapidly than hard coal and with less draft. Soft coal, however, will require frequent attention to the fuel bed, because it burns unevenly, even though the fuel bed may be level, forming holes in the fire which admit too much air, chilling the gases over the fuel bed and reducing the available draft.

Combustion of Semi-Bituminous Coal

Semi-bituminous coal is fired like bituminous coal and because of its caking characteristics requires practically the same attention. The *Pocahontas Operators Association* recommends the central cone method of firing in which the coal is heaped on to the center of the bed, forming a cone the top of which should be level with the middle of the firing door. This allows the larger lumps to fall to the sides, and the fines remain in the center and are coked. The poking should be limited to breaking down the coke without stirring and to gently rocking the grates. It is recommended to keep the slides in the firing door closed as the thinner fuel bed around the sides allows enough air to get through.

Combustion of Coke

Coke is a very desirable fuel and usually will give satisfaction as soon as the user learns how to control the fire. Coke ignites and burns very rapidly with less draft than anthracite coal. In order to control the air admitted to the fuel it is very important that all openings or leaks into the ashpit be closed tightly. A coke fire responds more rapidly than an anthracite fire to the opening of the dampers. This is an advantage in warming up the system, but it also makes it necessary to watch the