value; it is clean to handle. It has a greater tendency than the sub-bituminous coals to disintegrate as it dries, and it also is more liable to spontaneous ignition. Freshly mined lignite, because of its high moisture, ignites slowly. It is non-caking. The char left after the moisture and volatile matter are driven off burns very easily, like charcoal. The lumps tend to break up in the fuel bed, and pieces of char falling into the ashpit continue to burn. Very little smoke or soot is formed.

Dustless Treatment

In order to allay the dust, the more friable coals are sometimes sprayed with various petroleum products, a solution of calcium chloride, or a mixture of calcium and magnesium chlorides.

The coal is usually treated at the mine, but sometimes by the local distributor just before delivery. The salt solutions are sprayed under high pressure, using from 2 to 4 gal or from 5 to 10 lb of the salt per ton of coal, depending on its friability and size. Oil for the dustless treatment of coal is also applied under high pressure, in concentrations of 1 to 8 qt per ton of coal, depending upon the characteristics of the coal and oil.

Dustless treatments, which are of such a corrosive nature that they may damage coal handling or burning equipment, should not be used.

TABLE 3. STANDARD ANTHRACITE SPECIFICATIONS[a]
Test Mesh Round

SIZE OF COAL	THROUGH In.	OVER In.	OVERSIZE MAX. %	UNDERSIZE		MAXIMUM IMPURITIES		
				Max. %	Min. %	Slate[b] %	Bone[b] % or Ash[c] %	
Broken	4¾	3¼ to 3	—	15	7½	1½	2	11
Egg	3¼ to 3	2 1/16	5	15	7½	1½	2	11
Stove	2 1/16	1⅝	7½	15	7½	2	3	11
Nut	1⅝	13/16	7½	15	7½	3	4	11
Pea	13/16	⅝	10	15	7½	4	5	12
Buckwheat	⅝	5/16	10	15	7½	.....	.....	13
Rice	5/16	3/16	10	17	7½	.....	.....	13
Barley	⅜	3/32	10	20	10	.....	.....	15
No. 4	3/32	3/64	20	30	10	.....	.....	15
No. 5	3/64	.....	30	No limit		.....	.....	16

[a] Approved and adopted, effective July 28, 1947, by the Anthracite Committee (Manual of Statistical Information, *Anthracite Institute*).
[b] When slate content in the sizes from Broken to Nut inclusive is less than above standards, bone content may be increased by one and one-half times the decrease in the slate content under the allowable limits, but slate content specified above shall not be exceeded in any event.
[c] Ash determinations are on a dry basis.
A tolerance of 1 percent is allowed on the maximum percentage of undersize and the maximum percentage of ash content. The maximum percentage of undersize is applicable only to anthracite as it is produced at the preparation plant.
Slate is defined as any material which has less than 40 percent of fixed carbon.
Bone is defined as any material which has 40 percent or more, but less than 75 percent of fixed carbon.

Classification of Cokes

Coke is produced by the distillation of the volatile matter from coal. The type of coke depends on the coal or mixture of coals used, the temperatures and time of distillation and, to some extent, on the type of retort or oven. Coke is also produced as a residue from the destructive distillation of oil.

High-temperature cokes. Coke, as usually available, is of the high-temperature type, and contains between 1 and 2 percent volatile matter. High-temperature cokes are subdivided into *beehive coke* of which comparatively little is now sold for domestic use, *by-product coke*, which covers the greater part of the coke sold, and *gas-house coke*. The differences among these three cokes are relatively small; their denseness and hardness decrease and friability increases in the order named. In general, the lighter and more friable cokes ignite and burn more readily.

Low-temperature cokes are produced at low coking temperatures, and only a portion of the volatile matter is distilled off. Cokes, as made by various processes under development, have contained from 10 to 15 percent volatile matter. In general, these cokes ignite and burn more readily than high-temperature cokes. The properties of various low-temperature cokes may differ more than those of the various high-temperature cokes because of the differences in the quantities of volatile matter, and because some may be light and others briquetted.

Petroleum cokes, which are obtained by coking the residue left from the distillation of petroleum, vary in the amount of volatile matter they contain, but all have the common property of a very low ash content, which necessitates the use of refractory pieces to protect the grates from being burned.

COMBUSTION OF SOLID FUELS

Firing Methods for Anthracite

An anthracite fire should never be poked or disturbed, as this serves to bring ash to the surface of the fuel bed, where it may melt into clinker.

Egg size is suitable for large fire-pots (grates 24 in. and over) if the fuel can be fired at least 16 in. deep. For best results this coal should be fired deeply.

Stove is the proper size of anthracite for many boilers and furnaces. It burns well on grates at least 16 in. in diameter, on which it is fired about 12 in. deep. The fuel should be fired deeply and uniformly.

Chestnut size coal is in demand for fire-pots up to 20 in. in diameter, and is usually fired to a depth of from 10 to 15 in.

Pea size coal is often an economical fuel to burn. When fired carefully, pea coal can be burned on standard grates. Care should be taken to shake the grates only until the first bright coals begin to fall through the grates. The fuel bed, after a new fire has been built, should be increased in thickness by the addition of small charges until it is at least level with the sill of the fire-door. A satisfactory method of firing pea coal consists of drawing the red coals toward the front end, and piling fresh fuel toward the back of the firebox.

Pea size coal requires a strong draft, and therefore the best results generally will be obtained by keeping the choke damper open, and regulating solely by means of the cold air check and the air inlet damper.

Buckwheat size coal, for best results, requires more attention than pea size coal, and in addition the smaller size of the fuel makes it more difficult to burn on ordinary grates. Greater care must be taken in shaking the grates than with the pea coal on account of the danger of having fuel fall through the grate. In house heating furnaces, the coal should be fired lightly and more frequently than pea coal. When banking a buckwheat coal fire, it is advisable after coaling to expose a small spot of hot fire by putting a straight poker down through the bed of fresh coal. This will serve to ignite the gas that will be distilled from the fresh coal and prevent delayed ignition which, in some cases, depending upon the thickness of the bed of fresh coal, is severe enough to blow open the doors and dampers of the furnace. Where frequent attention can be given and care exercised in manipulation of the grates, this fuel can be burned satisfactorily without the aid of any special equipment, except small mesh grates.

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 any clinker formed in an easily broken up condition so that it readily can be shaken through the grate. Forced draft and small mesh grates or, for greater convenience, domestic stokers are frequently used.

Buckwheat anthracite No. 2, or rice size, is used principally in stokers