

permit of the screened sizes being delivered free from fines. In general, they ignite easily and burn freely; the length of flame varies with different coals, but it is long. Much smoke and soot are possible, if improperly fired, especially at low rates of burning.

Sub-bituminous coals occur in the western states; they are high in moisture when mined and tend to break up as they dry or when exposed to the weather; they are liable to ignite spontaneously when piled or stored. They ignite easily and quickly and have a medium length flame, are non-caking and free-burning; the lumps tend to break into small pieces if poked; very little smoke and soot are formed.

Lignite is of woody structure, very high in moisture as mined, and of low heating 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.

TABLE 2. CLASSIFICATION OF COALS BY RANK^a

Legend: F.C. = Fixed Carbon. V.M. = Volatile Matter. Btu = British thermal units.

CLASS	GROUP	LIMITS OF FIXED CARBON OR BTU MINERAL-MATTER-FREE BASIS	REQUISITE PHYSICAL PROPERTIES
I. Anthracite	1. Meta-anthracite	Dry F.C., 98 per cent or more (Dry V.M., 2 per cent or less)	Non-agglomerating ^b
	2. Anthracite	Dry F.C., 92 per cent or more and less than 98 per cent (Dry V.M., 8 per cent or less and more than 2 per cent)	
	3. Semi-anthracite	Dry F.C., 86 per cent or more and less than 92 per cent (Dry V.M., 14 per cent or less and more than 8 per cent)	
II. Bituminous ^c	1. Low volatile bituminous coal	Dry F.C., 78 per cent or more and less than 86 per cent (Dry V.M., 22 per cent or less and more than 14 per cent)	Either agglomerating ^b or non-weathering ^d
	2. Medium volatile bituminous coal	Dry F.C., 69 per cent or more and less than 78 per cent (Dry V.M., 31 per cent or less and more than 22 per cent)	
	3. High volatile A bituminous coal	Dry F.C., less than 69 per cent (Dry V.M., more than 31 per cent); and moist ^e Btu, 14,000 ^e or more	
	4. High volatile B bituminous coal	Moist ^e Btu, 13,000 or more and less than 14,000 ^e	
	5. High volatile C bituminous coal	Moist ^e Btu, 11,000 or more and less than 13,000 ^e	
III. Sub-bituminous	1. Sub-bituminous A coal	Moist ^e Btu, 11,000 or more and less than 13,000 ^e	Both weathering and non-agglomerating ^b
	2. Sub-bituminous B coal	Moist ^e Btu, 9500 or more and less than 11,000 ^e	
	3. Sub-bituminous C coal	Moist ^e Btu, 8300 or more and less than 9500 ^e	
IV. Lignite	1. Lignite	Moist ^e Btu less than 8300	Consolidated Unconsolidated
	2. Brown coal	Moist ^e Btu less than 8300	

^aThis classification does not include a few coals which have unusual physical and chemical properties and which come within the limits of fixed carbon or Btu of the high-volatile bituminous and sub-bituminous ranks. All of these coals either contain less than 48 per cent dry, mineral-matter-free fixed carbon or have more than 15,500 moist; mineral-matter-free Btu.

^bIf agglomerating, classify in low-volatile group of the bituminous class.

^cMoist Btu refers to coal containing its natural bed moisture but not including visible water on the surface of the coal.

^dIt is recognized that there may be non-caking varieties in each group of the bituminous class.

^eCoals having 69 per cent or more fixed carbon on the dry, mineral-matter-free basis shall be classified according to fixed carbon, regardless of Btu.

^fThere are three varieties of coal in the high-volatile C bituminous coal group, namely, Variety 1, agglomerating and non-weathering; Variety 2, agglomerating and weathering; Variety 3, non-agglomerating and non-weathering.

Adapted from A.S.T.M. Standards, 1937, Supplement, p. 145, American Society for Testing Materials Philadelphia.

DUSTLESS TREATMENT OF COAL

The practice of treating the more friable coals to allay the dust they create is increasing. The coal is 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.

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 per cent 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 the more easily.

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 per cent 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.

TABLE 3. STANDARD ANTHRACITE SIZING SPECIFICATIONS^a

SIZE	TEST MESH, IN.		ROUND MESH			MAXIMUM IMPURITIES, PER CENT	
	Through	Over	Oversize		Undersize	Slate ^b	Bone
			Max. Per Cent	Min. Per Cent			
Broken	4 3/8	3 1/4	-----	15	7 1/2	1 1/2	2
Egg	3 1/4 to 3	2 1/8	5	15	7 1/2	1 1/2	2
Stove	2 1/8	1 3/8	7 1/2	12 1/2	7 1/2	2	3
Nut	1 3/8	1 1/8	7 1/2	10	5	3	4
Pea	1 1/8	3/4	10	15	7 1/2	4	5
Buckwheat	3/4	5/8	10	15	7 1/2	12 Ash	
Rice	5/8	3/4	10	15	7 1/2	13 Ash	
Barley	3/4	3/2	10	20	10	-----	

^aApproved and adopted by Anthracite Committee, State Street Building, Harrisburg, Pa.

^bWhen slate content on Broken to Pea inclusive is less than above standards, bone content may be correspondingly increased, but slate content specified above shall not be exceeded in any event and the total maximum impurities shall not exceed those above specified.