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METHOD OF PRODUCING CARBONIZED BRIQUETTES

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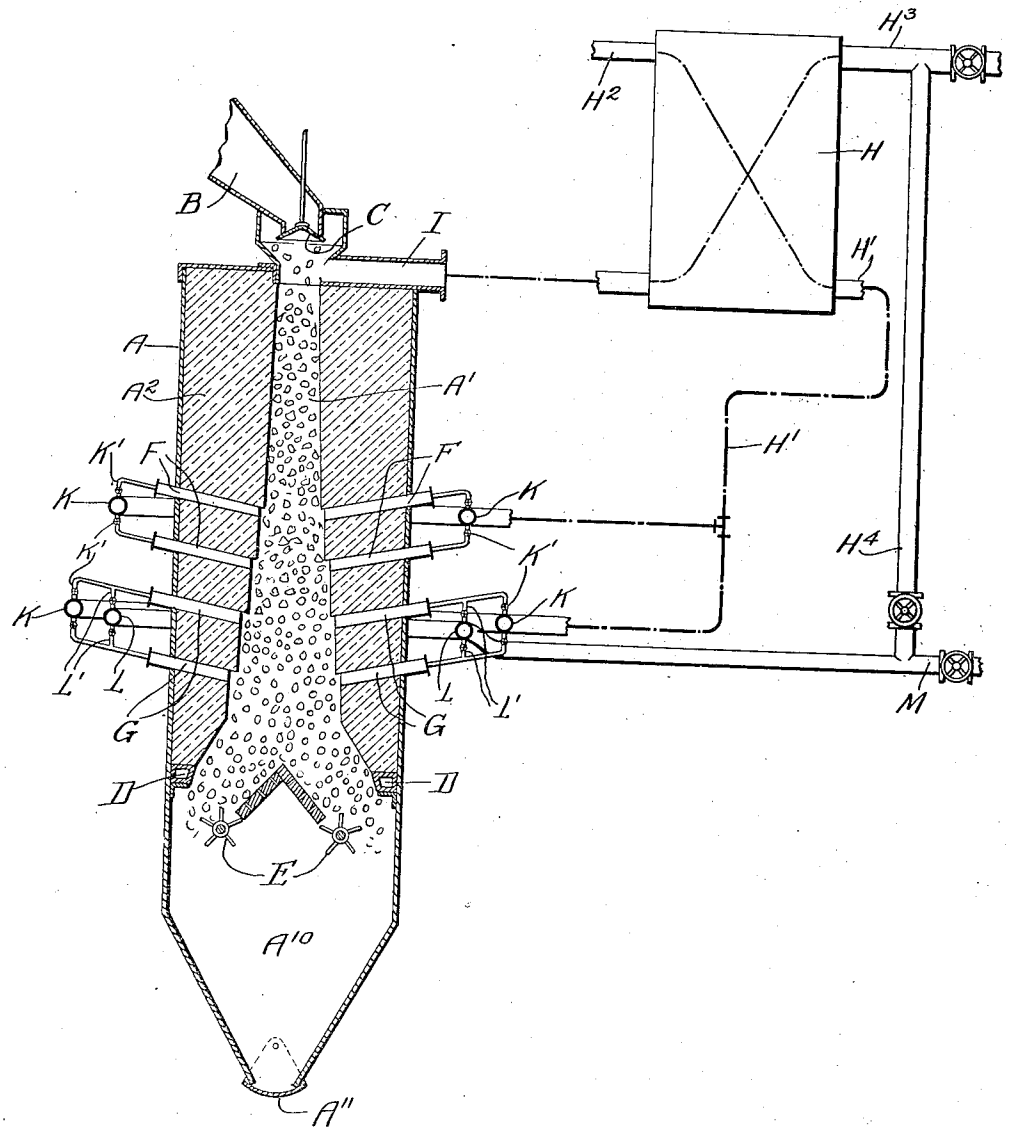

Charles V. McIntire INVENTOR

BY John E. Dubbell

his ATTORNEY

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CHARLES V. McINTIRE, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO CONSOLIDATION COAL PRODUCTS COMPANY, OF WILMINGTON, DELAWARE, A CORPORATION OF DELAWARE

METHOD OF PRODUCING CARBONIZED BRIQUETTES

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The general object of the present invention is to provide an improved method of producing briquettes.

More specifically, the object of my invention is to provide an improved method of treating briquettes formed from the char or so called semi-coke produced by the low temperature carbonization of coal and a suitable binder such as asphalt or pitch, to volatilize a large portion of the binder and thereby produce finished briquettes which will burn freely but with practically smokeless combustion, and which at the same time possess the strength and toughness required to avoid undesirable breaking of the briquettes in transportation and handling.

In accordance with the present invention, I preferably form the briquettes in the usual manner from semi-coke to which has been added 10% or so of its weight of asphalt or pitch as a binder. In such briquettes as they come from the briquetting machine, the semi-coke may advantageously contain about 15% of volatile matter, although the coal from which the semi-coke was produced by low temperature carbonization may have contained 36% or more of volatile matter. Of the binder added to the semi-coke, approximately 50% will be of an oily volatile nature and the remainder will be carbon. The briquettes as they come from the briquetting machine, will also contain something like 5 to 10% of moisture.

The briquettes produced as above described as they come from the briquetting machine contain an undesirably large amount of volatile matter and their combustion is attended with an excessive and highly objectionable smoke formation. To eliminate excess volatile matter and to make it possible to burn the briquettes without objectionable smoke, it has heretofore been proposed to subject the briquettes to a carbonizing action in a closed retort at a temperature equal to or approaching that employed in the so-called high temperature carbonization of coal. In accordance with the present invention, I subject them to a heat treatment at a temperature preferably well below that last mentioned, in an internally heated retort, so as to eliminate the smoke producing volatile constituents while at the same time leaving a sufficient amount of volatile material in the finished briquettes to make the latter easy to ignite and to enable them to burn about as freely, and with the same character of flame, as anthracite coal.

The one figure of the drawing is a somewhat diagrammatic elevation partly in section of one form of apparatus suitable for carrying out the invention.

The retort A shown in the drawing is of the vertical continuous type comprising an upper heating portion or retort chamber A′ proper, of progressively increasing diameter from top to bottom, and a lower cooling chamber A^{10}. The briquettes are passed into the upper end of the retort A′ from a chute B, past a gate or valve C which may be arranged and operated in a known manner to supply briquettes at the required rate, and to prevent the escape of gases from the retort into the chute B. Advantageously, as shown, the retort structure comprises a casing shell of metal and a fire brick lining A^2 for the heating chamber A′, the lining being sufficiently massive to avoid objectionable heat radiation losses. The brick work lining A^2, as shown, is supported at its lower end by water cooled supports D. E represents discharge rolls the operation of which controls the rate of discharge from the retort chamber proper into the cooling chamber A^{10}, from which the finished briquettes when sufficiently cooled are discharged through a valve controlled outlet A^{11}.

Adjacent the lower end of the retort chamber A′ are ports G through which air and a combustible gas are introduced into the retort. At higher levels though still substantially below the top of the retort are other ports F through which air alone is introduced into the retort. Preferably the air supplied to the ports G and F is preheated, and as shown in the drawing, the air supplied to the ports G and F comes from the outlet pipe H′ of an air preheater H which is a heat exchanger for transferring heat from the gases leaving the top of the retort through the gas outlet I, to air supplied to the heat

exchanger H through a pipe H^2 under pressure as by means of a blower (not shown). Gases coming from the retort outlet to the preheater H escape from the latter through conduit H^3. As shown, the pipe H′ is connected to distributing piping K from which there is a separate valved outlet K′ to each of the ports G and F. Gas is supplied to the ports G from distributing piping L which has a separate valved outlet L′ to each port G. The combustible gas supplied to the piping L may consist in part of a portion of the gases leaving the heat exchanger through the outlet H^3, and in part of a somewhat richer gas, or of a gas from some independent source. As shown in the drawings, a valved pipe M forms a means for supplying a richer gas to the piping L, and a valved branch H^4 from the pipe H^3 forms a means for supplying gas to the piping L from the gas outlet of the heat exchanger H.

In the contemplated operation of the apparatus shown in the drawing, air and combustible gas are supplied to the retort through the ports G as required to heat the briquettes to a maximum temperature of something like 1300° F. this maximum temperature being obtained at or about the level of the lowermost ports G. The briquettes entering the retort through the chute B at atmospheric temperatures, or somewhat above when they come directly from the briquetting machine, are heated up more or less gradually as they pass down to the zone of maximum temperature. As the briquettes are thus progressively heated up, the most of the volatile constituents of the briquette binder are driven out of the briquettes, as is an appreciable portion of the volatile constituents of the semi-coke. A characteristic advantage of the invention is found in the fact, however, that by heating briquettes in accordance with the present invention, I am enabled to free them almost entirely from smoke forming constituents while they still retain some 8 to 10% of volatile matter.

Ordinarily, I regulate the relative amounts of air and combustible gas supplied to the retort so as to make the air supply insufficient for the complete combustion of all the combustile gas in the retort at any level therein, and I am thus able to burn the combustible material supplied through the ports G and that driven out of the briquettes in amount sufficient to heat the briquettes to the maximum temperature desired with practically no combustion of the solid carbonaceous framework of the briquettes. The elimination of the smoke forming constituents of the binder from the briquettes, in the manner described, leaves the latter sufficiently strong and tough or elastic to avoid objectionable breakage in the handling and transportation of the briquettes. The gases escaping from the retort through the outlet I are a mixture of products of combustion and volatile gases analogous in character to a low grade producer gas. These gases carry ammonia and tar oils in amount sufficient to justify byproduct recovery. As already stated, some of the gas can well be employed in heating the retort. It will be obvious, however, that not all of the gas leaving the retort can be returned to the latter, and I consider it necessary in most cases to supply some of the retort heating requirements by the combustion of a substantially richer gas than that withdrawn from the retort. The portion of the gas withdrawn from the retort and not returned to the latter may ordinarily be used with advantage in heating the primary retorts in which the semi-coke for the briquettes is produced by low temperature carbonization.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. The method of treating carbonizable briquettes molded from semi-coke and a pitch binder having readily volatile smoke forming constituents which comprises heating the briquettes progressively up to a temperature high enough to volatilize substantially all of the smoke forming constituents in the briquettes and low enough to avoid volatilizing a considerable portion of the volatile constituents of the semi-coke, by passing the briquettes continuously through a retort and furnishing the required heat by the combustion of gas within the retort in contact with the briquettes.

2. The method of treating carbonizable biquettes molded from semi-coke and a pitch binder having readily volatile smoke forming constituents which comprises heating the briquettes progressively up to a temperature high enough to volatilize substantially all of the smoke forming constituents in the briquettes and low enough to maintain the volatile content exclusive of moisture of the briquettes when carbonized over seven per cent (7%), by passing the briquettes continuously through a retort in one direction, withdrawing gases from, and maintaining an atmosphere of burning gases in said retort by supplying air and combustible gas to the retort in contact with the briquettes to create a flow of the retort atmosphere counter to said direction and the generation of sufficient heat to effect such volatilization while restricting combustion to reduce combustion of the non-volatile portion of the briquettes to a negligible amount.

3. The method of treating carbonizable briquettes molded from semi-coke and a hydrocarbonaceous binder which comprises heating the briquettes progressively up to a temperature high enough to volatilize substantially all of the smoke forming constituents in the briquettes and low enough to avoid volatilizing a considerable portion of the volatile con-

stituents of the semi-coke, by passing the briquettes continuously through a retort and heating the retort by the combustion of gases in contact with said briquettes.

4. The method of treating carbonizable briquettes molded from semi-coke and a hydrocarbonaceous binder which comprises heating the briquettes progressively up to a temperature high enough to volatilize substantially all of the smoke forming constituents in the briquettes and low enough to avoid volatilizing a considerable portion of the volatile constituents of the semi-coke by passing the briquettes continuously through a retort and generating the necessary heat by supplying combustible gas to the retort and burning the gas therein including the supplying of sufficient air to the retort chamber to produce partial combustion in contact with the briquettes of the combustible gases supplied to the retort and volatilized out of the briquettes therein.

5. The method of treating carbonizable briquettes molded from semi-coke and a pitch binder which comprises passing the briquettes continuously through a retort, carbonizing the said briquettes in said retort so as to avoid volatilizing a considerable portion of the volatile constituents of the semi-coke, withdrawing gases produced by the carbonization from the retort, returning some of said gases to the retort, and supplying the heat for the carbonization by burning the returned gases therein in contact with the briquettes including supplying air for combustion to the retort chamber in contact with the briquettes in amount sufficient to avoid the consumption in combustion of an appreciable portion of the volatile constituents of the semi-coke.

6. The method of treating carbonizable briquettes molded from semi-coke and a pitch binder which comprises passing the briquettes continuously through a retort, carbonizing the said briquettes in said retort so as to avoid volatilizing a considerable portion of the volatile constituents of the semi-coke, withdrawing gases produced by the carbonization from the retort, returning some of said gases to the retort, supplying to said retort additional combustible gas of a higher B. t. u. value than the gases withdrawn from the retort, and supplying the heat for the carbonization by burning the gases returned and supplied to the retort in contact with the briquettes in the retort including supplying air for combustion to the retort chamber in amount sufficient to maintain temperature conditions low enough to avoid volatilizing a considerable portion of the volatile constituents of the semi-coke.

7. The method of treating carbonizable briquettes molded from semi-coke and a pitch binder which comprises passing the briquettes continuously through a retort, carbonizing the said briquettes in said retort so as to avoid volatilizing a considerable portion of the volatile constituents of the semi-coke, withdrawing gases produced by the carbonization from the retort, returning a portion of said gases to the retort, supplying the heat for the carbonization by burning the gases returned in contact with the briquettes in the retort including supplying air for combustion to the retort chamber in amount sufficient to avoid volatilizing an appreciable portion of the volatile constituents of the semi-coke, and preheating said air by transferring heat thereto from the gases withdrawn from the retort.

Signed at Fairmont, in the county of Marion and State of West Virginia this 8th day of July, A. D. 1924.

CHARLES V. McINTIRE.