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PROCESS OF BAKING FUEL BRIQUETTES

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1 Claim. (Cl. 202—19)

This invention relates to a process of baking fuel briquettes.

The principal objects of this invention are to provide for hardening at least the external surface of each briquette to make the surface dustless and clean as well as hard; to provide for coking at an indicated temperature much lower than that actually required for coking; to secure this result by providing for the extraction from the briquettes themselves of the additional heat necessary; to provide an effective procedure to control the exothermic reaction for this purpose; to make this process applicable, with some modifications, to bituminous and anthracite coals as well as other fuels; to prevent swelling or bursting of bituminous briquettes by the employment of a binder in connection with the coking at low temperatures, as indicated; to prevent disintegration of anthracite briquettes during combustion by admixture therewith of a percentage of coking coal and carbonizing only the outer shell to give the briquettes sufficient structural strength.

This process, whether used for anthracite or bituminous briquettes, can be carried out in an apparatus similar to that shown in my Patent No. 1,750,721, patented March 18, 1930. In the production of bituminous coals the percentage of degradation which produces slack is very great. At times, it is rather difficult to dispose of it and even then it commands a lower price. There are only two ways by which briquetting of this slack has been successfully done. By merely adding a binder, mixing and molding the paste into the form of briquettes a green or unbaked briquette is obtained. It is always very dirty and, owing to the binder, gives off objectionable fumes during combustion and disintegrates very readily.

The second method consists in carbonizing bituminous coal first to convert it into a coke or char, which chemically is very similar to anthracite, and then briquetting it. The conversion of the bituminous coal into coke or char is an expensive operation and, furthermore, it is believed that nobody has succeeded in making a satisfactory briquette from it except by the process which is the subject of this invention. Furthermore, it is believed that no one has ever succeeded in adding a binder to bituminous coal, forming it into a briquette, and then baking it so as to partly or completely carbonize it without its swelling or bursting open. As will appear, I accomplish this result by using comparatively low temperatures.

In this bituminous coal process, briquettes are

formed of bituminous coal and any suitable binder which may be preferably an asphalt base fuel oil or a similar hydrocarbon residuum. It would seem unnecessary to add a binder for the reason that bituminous coal already contains the elements of the binder, but I find that, if the binder is not used, the briquettes subjected to the process to be described will swell up into all sorts of shapes and burst and useful briquettes will not be produced.

These briquettes are introduced into an oven in the same manner as in the aforementioned patent and subjected immediately after entering the oven on an endless conveyor to an initial temperature of about 1000° F. for about twenty minutes or less. This is merely for the purpose of evaporating quickly the lighter hydrocarbons and moisture and at the same time raise the temperature of the briquettes sufficiently to create the exothermic reaction which causes the actual carbonizing or coking. This period can be about the length of time that it takes the conveyor to pass along the first stage. The duration of the entire process may be from about five hours down to less than one hour according to the ingredients used, quantity of binder and extent of carbonizing desired.

Although this is coking temperature, no coking can take place at this time because it cannot start until these liquids are evaporated. After that the endless chain of briquettes passes back and forth through the oven a plurality of times and the oven is kept at such a temperature at all other points that coking could not be accomplished by it alone. In other words, the maximum indicated temperature in the rest of the oven is not more than 700° F. and the usual temperature below 600° F. The oxygen or air required in the process is introduced preferably diluted in the products of combustion used in heating the oven. The amount of oxygen is regulated in any suitable manner. The presence of the oxygen permits a regulated amount of combustion to take place on the external surfaces of the briquettes. This adds enough heat so that at those surfaces a coking temperature is reached and the surfaces are hardened thereby without keeping the whole oven at coking temperature. In the case of bituminous coal this hardening may penetrate as deeply as desired into the briquettes but the essential feature is to carbonize the surfaces.

The exothermic reaction on the part of the briquettes is controlled in three different ways, first, by regulating the temperature of the gases

entering the oven; second, by regulating the time of baking or carbonizing, and third, by controlling the percentage of oxygen in the gases entering the oven. Nevertheless, thermometers in the oven in the later stages will invariably register temperature under 700° F.

It will be observed that the process is continuous because the endless chain of briquette carrying baskets is run through the oven in a continuous manner as stated. The maximum baking or carbonizing time will be controlled by the speed of this conveyor. The first stage of the conveyor in the ordinary operation of the oven is long enough so that the time during which the briquettes are subjected to a temperature over 700° F. is less than twenty minutes.

When it is desired to apply this process to anthracite coal, a percentage of coking coal is added to it before briquetting. This percentage should not be less than ten percent by weight. Then the briquettes are subjected to the same process. It is found that anthracite briquettes made in this way are decidedly superior in smoothness and cleanliness as well as hardness during combustion. The exothermic reaction, which is controlled so as to carbonize only the outer shell, gives the briquettes sufficient structural strength but it is not important in the case of bituminous briquettes to restrict the "coking" to the outer shell. The coking ingredient in the inside of the anthracite briquette retains stronger coking properties and the great tendency to disintegration during combustion is reduced to practically nothing by this method. This is in great contrast to any other anthracite briquettes previously on the market. Ordinarily this disintegration blocks

the drafts, interfering with combustion, and results in the dropping of a lot of unconsumed fuel into the ash pit when the fire is raked and in most cases without even disturbing the fuel bed.

In either case all by-products driven off are utilized most effectively. This greatly simplifies the operation; does away with all by-product recovery, storage, and handling equipment; reduces the cost of the plant and of the operation thereof; eliminates all problems of by-product disposal, and renders the entire output a primary product.

It will be understood that this method can be employed with other forms of fuels that can be briquetted, even sawdust.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claim, but what I claim is:

The method of baking fuel briquettes by a continuous process which consists in directly heating a stream of briquettes passing within an enclosed retort, and containing coking coal with an asphalt base binder, by introducing hot flue gases at about 1000° F. containing a controlled amount of oxygen, each briquette being heated for a period not over twenty minutes to remove moisture and the lighter hydro-carbons and to create an exothermic reaction, the amount of oxygen being so controlled that the briquettes do not reach a temperature in excess of 700° F. as they pass continuously in the gradually cooling inert gas atmosphere for a period of several hours to produce hard, clean, weatherproof briquettes not subject to disintegration during combustion.

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