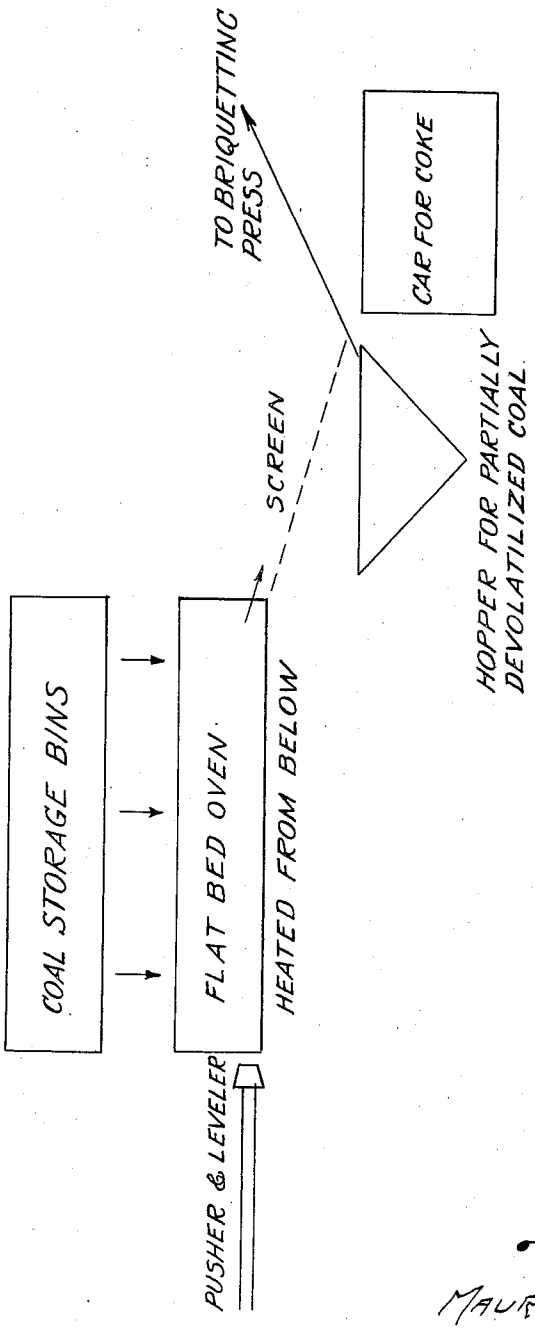
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PROCESS FOR TREATING COAL

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PROCESS FOR TREATING COAL

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3 Claims. (Cl. 202—9)

The present invention relates to improvements in processes for treating coal.

More particularly the present invention relates to a process of utilizing the partially devolatilized coal which results from the practice of certain coke making processes.

In certain of its aspects the present invention is analogous in certain respects to the invention disclosed and claimed in application Serial No. 134,552, filed April 2, 1937, which is in part a continuation of application Serial No. 91,325, filed July 18, 1936, by the present applicant.

In the application referred to, the coking process is carried out in the Knowles type of oven, an example of which is illustrated and described in the patent to Knowles and McIntyre No. 1,635,280, patented July 12, 1927. According to the type of oven referred to, coal or equivalent material is disposed on a horizontal floor heated by flues extending beneath said floor, the coking floor forming a part of the coking chamber, the oven having means for charging coal, means for withdrawing vapors and gases, means for sealing the ends of the chamber, and means permitting the pushing of the resulting coke out of the coking chamber. According to the method referred to in said application, the layer of coal or equivalent material is shallow relative to the width thereof.

According to the method of coking in which the bed of coal or its equivalent is shallow compared to its width and in which the heat is applied below the bed of coal or the like, vapors of distillation, water vapors and fixed gases from the coal adjacent to the bottom of said bed are liberated at the beginning of the coking period, a substantial portion of these vapors and gases passing upward through the coal and imparting their heat to the cooler coal mass. This results, first, in the vaporization of water in the coal, and then in vaporization of volatile matters and subsequent partial condensation of the vapors provided the temperature in the upper portion of the charge is sufficiently low, followed by redistillation and elimination from the coal mass as the coking process proceeds. The passage of vapors and gases through the coal mass results in a transfer of heat, by means of convection, to the coal mass and an increased thickness of the coking zone which may attain a thickness of two inches or more in the case of coals having a high coking index. The result of this additional thickness in the coking zone is a trapping of vapors or gases within the coking zone and the forming of bubbles by said vapors and gases. The resistance of the thickened coking zone leads to an unusually porous structure in the coke which in turn increases the reactivity of the coke to oxygen, and, other things being equal, increases combustibility. The upper part of the charge is very considerably devolatilized but is not sufficiently coked to form a hard coherent mass.

An object of the present invention is to provide a method which will provide a material readily applicable to a briquetting process.

A further object is to provide a method of removing the moisture and a portion of the volatile matter in coal so that such coal can be made into briquettes which will burn with very little smoke.

A further object is to provide a method for removing the moisture and a portion of the volatile matter in coal while it is being treated in a commercial coking process, so that such coal can be made into briquettes without the aid of added binders, which briquettes will burn with very little smoke.

A further object is to provide a method for removing from coal the moisture and a portion of the volatile matter which distills off at temperatures below the softening temperature of the coal, while using a commercial coking process so that such coal can be made into briquettes—with or without the use of added binders—which will burn with very little smoke.

A further object is to utilize the heat available in hot gases distilled from coal in a coke making process in a Knowles type of oven to remove the moisture and a portion of the volatile matter in the coal forming the upper part of the coal charge so that such partially devolatilized coal can be made into briquettes—with or without the aid of added binders—which will burn with very little smoke.

A further object is to provide an improved coking process which will remove the moisture and a part of the volatile matter, including the lower boiling tar oils which are liberated when coal is heated to temperatures just under the softening temperature of such coal, so that such partially devolatilized coal can be made into briquettes—with or without the use of added binders, which briquettes will burn with very little smoke.

A further object is to provide a commercial coking process to produce two types of smokeless domestic fuel, namely coke and smokeless briquettes, by carrying on the distilling operation in said coking process so that the lower portion of the coal charge will be converted to so-called

high temperature coke in such a way that some of the products of distillation are utilized to heat the coal in the upper part of the charge to the point where all the free moisture and a portion of the volatile matter in such coal will be distilled off so that such coal, when made into briquettes, will burn with very little smoke.

A further object is to provide a method which will remove the low boiling tar oils which are distilled off when coal is heated for a comparatively long time (6 to 12 hours) at temperatures below the softening temperature of the coal so that such coal can be formed into strong briquettes—with or without the aid of added binders—which will burn with very little smoke.

A further object is to provide a method which will remove from coal a part of those lower boiling tar oils and the accompanying volatile combustible matter which are known to be the principal causes of smoky combustion, and which are distilled off when coal is heated to temperatures just under the softening temperature of the coal, so that such coal can be compressed into briquettes—with or without the use of added binders—which will burn with very little smoke.

A further object is to provide a method which will remove from coal a part of those lower boiling tar oils and the accompanying volatile combustible matter which are known to be the principal causes of smoky combustion, and which are distilled off when coal is heated to temperatures under the softening temperature of the coal, so that such coal can be compressed into briquettes—with or without the aid of added binders—which briquettes will be of good combustibility and sufficiently strong as to be free of excessive degradation losses while being handled and transported to the consumer.

Further objects will appear as the description proceeds.

In the figure of the drawing a system is indicated diagrammatically showing how the coal to be treated passes through the oven to the screen or separator which separates the partially devolatilized coal from the commercial coke, how the partially devolatilized coal is conducted to the briquetting press and how the commercial coke may be delivered to a car.

As noted in the application above referred to, the process of coking is carried on from the bottom of the charge toward the top to the point where the upper part of the charge is considerably devolatilized but is not sufficiently coked to form a hard coherent mass.

According to the present invention the ovens are charged with a layer of coal, so that a few inches of hot, partially devolatilized but unfused coal will remain on the top of the coke substance when the charge is pushed from the oven. During the process of coking, the material in the lower portion of the bed, the moisture and a part of the volatile matter including the lower boiling tar oils will be liberated from the upper part of said bed. The temperature conditions may be maintained in said upper part of the bed at a value below the softening temperature thereof. This partially devolatilized coal is separated from the coke substance preferably while hot and before quenching. Said partially devolatilized coal is charged directly to a briquetting press preferably while it is still hot, where it will be formed into good solid briquettes without the use of any binder except those tarry substances remaining in said partially devolatilized coal. Said briquettes will burn with very little smoke.

No difficulty need be encountered in preserving the temperature of the partially devolatilized coal after it has been pushed from the coking chamber up to the point where it is formed into the briquettes. By utilizing conveyors, tram cars, lorries, or other means of conveyance, which may be properly insulated, the hot devolatilized coal can be delivered to the briquetting presses without substantial heat loss

Furthermore, oxidation of the hot devolatilized coal may be avoided by handling the hot coke and partially devolatilized coal in an atmosphere of steam, water vapor, or other non-combustible gas.

It will be understood that the temperature of and/or the amount and character of the tarry matter in the hot, partially devolatilized coal within the coking chamber can be controlled by regulation of the charge and the heat treatment given in the oven so that said partially devolatilized coal can be delivered to the briquetting presses at any desired temperature and/or with the desired content of volatile substances, said temperature being either above or below the softening temperature of the coal. The temperature is limited on the one side by the softening point of the coal which must not be exceeded and on the other side by a sufficiently high temperature to drive off practically all of the moisture and a considerable proportion of the volatile matter, the volatile matter driven off containing substantially all of the smoke producing portion of the volatile matter of the original coal. Thus the briquettes finally produced are substantially smokeless.

It need not be explained further that by utilization of the steps above described the objects hereinabove recited will be attained.

Though a preferred process has been described in detail, many modifications will occur to those skilled in the art. It is intended to cover all such modifications that fall within the scope of the appended claims.

What is claimed is—

1. The process of treating high volatile, cokable coal which consists in providing a bed of coal shallow relative to its width and length, applying heat thereto below said bed, stopping the coking process at a point which will produce a predetermined amount of partially devolatilized coal on the top of the coke, which partially devolatilized coal has its moisture driven off and those volatiles removed which distill off at temperatures below the softening temperature of said high volatile, cokable coal, separating said partially devolatilized coal from the coke in said charge, and, while said partially devolatilized coal is hot, pressing it into briquettes.

2. The method of producing material suitable for combustible briquettes and for producing commercial coke which consists in heating a bed of high volatile, cokable coal shallow relative to its width and length, the heat being applied substantially entirely from below, carrying said process to a point where the lower portion of said bed is converted into coke while freeing the upper portion of said bed from moisture and a portion of the low boiling tar oils and volatile matter therein, and thereafter separating said partially devolatilized coal from said coke and while the contents of said upper portion are still hot pressing said contents into briquettes.

3. The method of treating coal which consists in heating a bed of high volatile, cokable coal,

the heat being applied from below, proceeding with this step until the lower portion of said bed is converted into coke while removing a large part of the moisture and low-boiling tar oils and volatile combustible matter from the upper portion of said bed, separating said coke from the material in the upper portion of said bed, the temperature in the upper portion of said bed being maintained under the softening temperature of the coal, and pressing the contents of said upper portion while still hot into briquettes.

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