

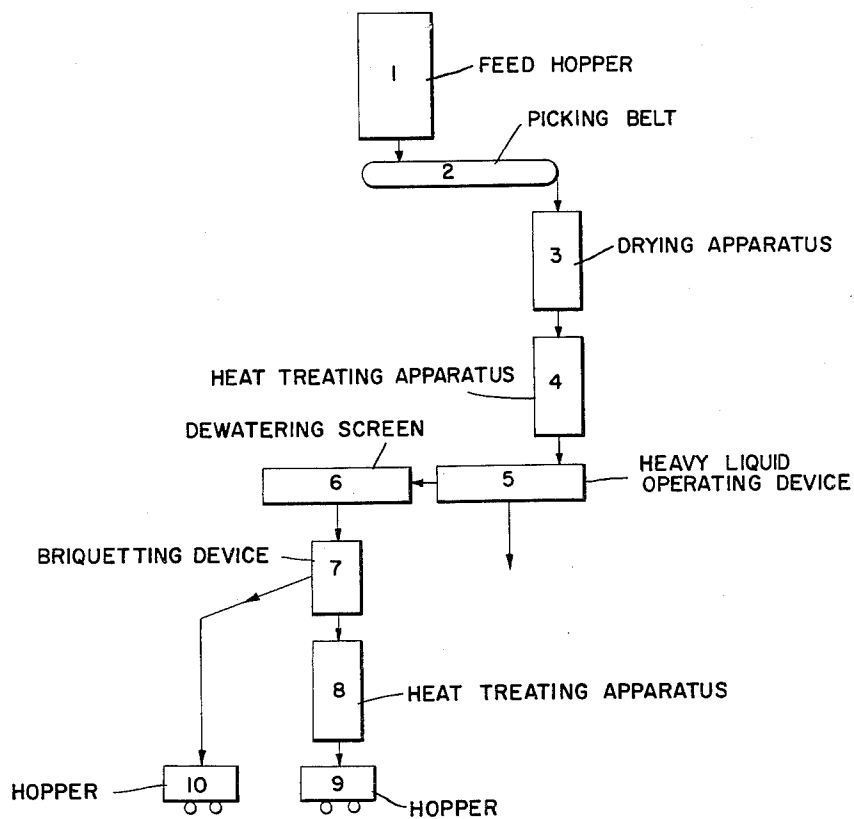
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METHOD OF PRODUCING BRIQUETTES FROM LOW-GRADE COAL

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METHOD OF PRODUCING BRIQUETTES FROM LOW-GRADE COAL

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6 Claims. (Cl. 202—26)

The invention relates to a method of producing block coke (i.e. moulded or briquetted coke) from low-grade raw materials containing coal.

The main object of the invention is to enable the production of good-quality coke from the extensive deposits that there are of such low-grade materials, and thus to overcome the shortage of coke which prevails in many countries due to the lack of coal which is capable of being coked.

The raw materials with which the invention is primarily concerned are the geologically more recent coals in which carbonisation has not reached an advanced state and which have a high proportion of volatile constituents.

If this coal is coked or subjected to low-temperature carbonisation, the product formed into briquettes by the addition of a binding agent, and the briquettes again coked, the final product of the twofold coking operation has—owing to the large ash content of the coal—far too much ash for it to be used on an economical basis.

It is impossible, or nearly so, to reduce at a tolerable cost the ash content of the raw material, prior to the coking operation, to a level low enough to render the final product usable: this is because the mineral components of the coal are very intimately combined with the carbonaceous components. Moreover the difference in their specific weights is too small, due to the comparatively small proportion in the raw coal of solid constituents (the total of solid carbonaceous substances and mineral substances) as compared with the volatile components and water; this is a characteristic feature of raw coal in a little advanced state of carbonisation.

The preparation of such coal requires special methods of dressing, such as a froth flotation or converter process, which call for the coal to be disintegrated to a very fine particle size. The high cost of these methods is, generally speaking not justified by the yield obtained. The cost of the coke produced from the concentrate is still further increased since the coal which is to be subjected to low-temperature carbonisation or to coking is now in extremely fine granular form and a relatively large amount of binding agent is necessary for briquetting prior to coking, as otherwise the product is very porous and very readily crumbles into dust due to the large percentage in the coal of volatile constituents and bound water, which are expelled during coking.

For this reason, to produce block coke, this low-temperature carbonisation product must again be briquetted and coked, with the addition of further amounts of binding agent. Even then the quality of the coke, and in particular its resistance to disintegration, is not wholly satisfactory.

The aforesaid difficulties are all overcome by the invention which provides a method comprising the steps of subjecting the coal-containing basic materials (which are preferably of the kind referred to above), if desired after separation of the coarse mineral impurities, to a coking operation in which most of the by-products are extracted, separating the coke thus produced by a process of the usual kind in which it is divided in pure coke and coke rich in ash, briquetting the pure coke component with the addition of comparatively small amounts of binding agent

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of the usual kind, and finally by a further coking process converting the briquettes into block coke.

Reference to the schematic drawing will reveal the steps of the invention. In the drawing 1 is a feeding hopper; 2 is a picking belt; 3 is a drying apparatus; 4 is a heat treating apparatus, i.e. a furnace; 5 is a heavy liquid separating device; 6 is a dewatering screen; 7 is a briquetting device; 8 is another heat treating apparatus; and 9 and 10 are hoppers.

10 An example of the process of this invention is as follows. A raw coal-containing material having a high content of volatile matter and water was fed into hopper 1. The material was Magallanes coal of Chile which consisted of alternating strips having varying volatile matter and ash contents. The average ash content was about 18%, the average volatile matter was about 40%, and the average water content was about 30%. The total solids content was about 25% of which about 20% was clean coal. This coal-containing material could not be economically cleaned at all according to conventional separating processes. The material was fed from the hopper 1 to the picking belt 2 and the rock pieces of bigger size were removed. The material was passed into the drying apparatus 3 and dried by heating to a temperature of about 120° C. The dried material was then passed into the furnace 4 and heated to about 600° C. As a result of the heat treatment, the material disintegrated into granular particles of relatively small grain size. The particles now being of different apparent specific gravities due to the previous treatment was subjected to a heavy liquid separation in the separation device 5. The liquid in the device had a specific density of about 1.35. The particles were separated therein into a rich coke concentrate and a waste portion high in ash content. The ash portion was discarded and the coke concentrate was dewatered on the dewatering screen 6. The dewatered coke concentrate was briquetted in the briquetting device 7 using a conventional binder of hard pitch and oil. The briquettes were given a final heat treatment at conventional coking temperatures of about 1100° C. in the furnace 8. The block coke product is removed from the furnace into hopper 9.

As an alternative in the above described example, the separation step conducted in 5 may be altered to obtain an ash-containing intermediate fraction which may then be dewatered and briquetted. The briquette need not be coked and may be directly removed from 7 into a hopper 10. These briquettes are suitable for heating or generator purposes.

50 The new method is based on the fact that after the first coking operation, in consequence of expulsion of the volatile constituents, the difference in specific weight between the pure coke component and the impure or mineral component is much greater than the corresponding difference before coking. The difference is such as to enable the coked product to be separated into these components by a suitable separating method, preferably a heavy liquid treatment. As is well known in the art, various heavy liquids can be used in heavy liquid separation procedures. Such a heavy liquid can be carbon tetrachloride. One may also use a suspension of magnetite (Fe_3O_4) in water, adding more or less of the fine grained magnetite to the suspension to regulate its density.

65 A further appreciable advantage of the new method consists in the fact that disintegration of the raw coal prior to the first coking operation may usually be dispensed with. During the coking operation the coal breaks up by its own action, and the resulting product is usually of the granular size required for the wet mechanical treatment. If it is not, it may readily be broken up by reason of its great porosity and friable condition; less dust is then produced than when raw coal is disintegrated.

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The dressing operation may be so conducted as to produce an ash-containing intermediate fraction, which is suitable for heating or generator purposes.

The method according to the invention enables a highly satisfactory block coke to be produced.

We claim:

1. A method for producing block coke from low grade coal-containing material comprising disintegrating said material by coking, subjecting said disintegrated material to a wet separation process to separate a low-ash, coke-rich concentrate therefrom, briquetting said concentrate, and coking said briquette to produce block coke.

2. A method for producing block coke from low grade coal-containing material comprising disintegrating said material by coking, subjecting said disintegrated material to a wet separation process to separate a low-ash, coke-rich concentrate and an ash-rich component therefrom, adding a binder to said coke-rich concentrate and forming a briquette therefrom, and coking said briquette to produce block coke.

3. The method of claim 2 wherein said disintegrated material is subjected to a heavy liquid separation which

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involves the use of a heavy liquid in order to obtain said coke-rich concentrate and said ash-rich component.

4. The method of claim 2 wherein said coking step is a low temperature carbonization.

5 5. The method of claim 2 wherein said disintegrated material is subjected to froth flotation in order to obtain said coke-rich concentrate and said ash-rich component.

10 6. The method of claim 2 wherein said wet separation process in which said disintegrated material is subjected to, is so conducted as to also separate an ash-containing intermediate component.

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