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UNITED STATES PATENT OFFICE.

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METHOD OF MAKING FINELY-DIVIDED CARBONACEOUS CHAR.

No Drawing. Application filed September 9, 1918. Serial No. 253,282.

To all whom it may concern:

Be it known that I, HUGH RODMAN, a citizen of the United States, and a resident of Oakmont, in the county of Allegheny and State of Pennsylvania, have made a new and useful Invention in Methods of Making Finely-Divided Carbonaceous Char, of which the following is a specification.

This invention relates to the manufacture of a carbon having special and peculiar qualities, and to the method and means of making this carbon.

I find that carbon produced by the method herein described has different qualities from carbon produced from the same raw material but by older methods.

The older methods of producing carbon are familiar enough. Wood is heated in closed retorts, generally to a low red heat, and the resulting product is commercial charcoal. Coking coal is heated to a bright red heat, for example in by product ovens, and the resulting product is commercial coke. Other carbonaceous materials are heated in various but similar ways in manufacturing other well known carbon bearing poducts.

I find that, by first reducing the various carbonaceous materials to a fine powder and then heating them, preferably while being stirred or agitated, the fine char produced has some characteristics which are absolutely lacking in carbon produced by heating lump material in the old way and then reducing the carbon to fine powder.

This effect seems to be obtained from all carbonaceous materials, when treated in accordance with my invention or discovery, but I will describe it as obtained from coking coal, the effect being well marked with this material.

Coking in any state of division, lump or powder, and under practically any system of heating, will produce solid coke, though the firmness of this coke will vary with the method of heating and the condition of the coal. When the coal is heated in accordance with any of the well known methods of coking, it loses all trace of its coal structure and takes the well known cellular coke condition.

If this same coking coal is first reduced to a fine powder and then heated to a coking temperature while being stirred or agitated, it will not coke at all but will char to a finely divided carbon having special characteristics.

The apparatus for heating the powdered coal is not specially important, but I have found it expedient to heat the coal slowly in cast iron pans, heated from the bottom and having about six inches of powdered coal in the pan. I prefer to stir the coal by means of a depending iron stirrer having a blade or blades which sweep the bottom of the pan. The rate of stirring and the permissible rate of heating are related, the more vigorous the stirring, the faster the permissible heating. I find that a six inch bed heated from the bottom may be sucessfully charred in about two hours with ordinary stirring, but that a somewhat better char can be obtained with slower heating.

When the coal powder, preferably reduced so that it will all pass a 100 mesh screen, is first put in the charring pan and stirred it piles and flows much like any powder. After it has been thoroughly dried of all traces of moisture and the volatile matter begins to come off, this condition is changed for one of extreme mobility. The coal powder bubbles and flows quite like water, and this bubbling and mobility greatly assist in the stirring. In fact, after this mobile, boiling condition is reached, the coal will practically take care of its own stirring.

The temperature to which the powdered coal is raised will depend upon the use to which it is to be put. It may be taken only a few degrees beyond the softening and smoking temperature of the particular coal used, or it may be carried to a bright red heat, depending upon the amount of volatile matter required in the finished product.

Material made in this way has different characteristics from carbon made in accordance with the old methods and then pulverized. It retains the powdered condition throughout the heating, is much more active chemically, and differs also in appearance and feel. The difference due to this way of charring the raw material seems to be a general one; that is, applying to various materials capable of being carbonized, but it is especially noticeable with coking coal.

When coking coal is finely pulverized and then heated in the manner described, the product is a much blacker powder than when the same coal is coked in any ordinary way

and then pulverized to the same degree of fineness. It is a softer powder and reacts more freely with chemical reagents. For example, it makes a fair base for ordinary black powder, whereas the same coal coked in the ordinary ways to the same temperature and then pulverized to the same degree of fineness is not at all satisfactory as a powder base. It may be noted that the coal before coking is not a satisfactory powder base.

This changed condition of the stirred carbon seems to fit it more or less for various uses to which the ordinary crushed carbon is not suited. Carbon made in accordance with my invention is more active as an absorbent, has increased covering power when mixed with oils for paints, and seems to be generally in a more active state than the ordinary crushed carbons.

I have described my improved method of producing powdered chars as particularly applying to coking coal, and it is possible that its greatest value lies in treating this material. However, I have also subjected non-coking materials to the same process and found that the same improvement follows. Non-coking coals, such as the lignites and the thoroughly weathered outcrop of coking coal seams, give an improved product, when treated in accordance with my invention, as compared with the product obtained by charring the material in lumps and then pulverizing the carbonized lumps.

Another advantage of my invention lies in the fact that it is frequently easier to pulverize the raw material than the carbonized lumps. Coking coal, for example, is very easily pulverized, it being of a friable nature and not abrasive, whereas the coke made from this same coal is difficult to crush and rapidly cuts out screens and other machinery, because of being highly abrasive. Large quantities of coke powder are used in the arts and it is therefore evident that my method of first powdering the raw material and then charring this dust offers an advantage in the ease of crushing quite aside from the better quality of material produced.

The stirring means I have described works satisfactorily, but it is probable that other means could be devised which would work as well. The powdered raw material might be tumbled in an externally heated tumling device, or possibly blown through a hot chamber and the same good results obtained. I should add that the method of stirring in the pan should preferably be followed with an open pan, since the best results are obtained by heating the powdered material under such conditions that the air has access to it.

What I claim is:

1. The method of producing powdered carbonaceous chars, which consists in reducing coking coal to a powder, gradually heating a mass of the powder to a coking temperature by applying a slow external heat to the receptacle in which the mass is located while the mass is exposed to the air, and in agitating the mass during at least a portion of the heating operation and thereby maintaining the mass in powdered form throughout the coking operation.

2. The method of producing commercial carbonaceous char, which consists in powdering carbonaceous material, subjecting the powdered material to a slow heat and thereby raising its temperature to a charring temperature, and in agitating the material at least throughout a portion of the heating operation to maintain it in powdered form throughout the charring operation.

3. The method of producing finely divided carbonaceous char, which consists in reducing raw coal to a finely divided powder, then subjecting the powder to a slow heat and thereby raising it to a coking temperature, and in agitating the powder while initially heating the same for the purpose of maintaining it in powdered form throughout the coking operation.

4. The method of producing finely divided carbonaceous char, which consists in powdering coking coal, subjecting the powdered mass to a slow heat in an open receptacle and thereby raising its temperature to a red heat, and in agitating the mass during at least a portion of the heating operation to maintain it in powdered form throughout the entire heating operation.

In testimony whereof, I have hereunto subscribed my name this 6th day of September, 1918.

HUGH RODMAN.

Witness:
R. L. KENT.

Certificate of Correction.

It is hereby certified that in Letters Patent No. 1,433,039, granted October 24, 1922, upon the application of Hugh Rodman, of Oakmont, Pennsylvania, for an improvement in "Methods of Making Finely-Divided Carbonaceous Char," errors appear in the printed specification requiring correction as follows: Page 1, line 41, after the word "Coking" insert the word *coal;* page 2, line 54, for the misspelled word "tumling" read *tumbling;* and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 14th day of November, A. D., 1922.

[SEAL.]

KARL FENNING,

Acting Commissioner of Patents.