Patented June 29, 1926. 1,590,706

UNITED STATES PATENT OFFICE.

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BRIQUETTE.

No Drawing. Application filed January 17, 1923. Serial No. 613,290.

This invention relates to briquettes and more particularly to fuel briquettes and has among its principal objects the production of briquettes of a quality superior to those hitherto known and as a further object the simplification of methods of manufacturing briquettes.

It has been the more common practice hitherto to prepare briquettes, particularly fuel briquettes, from finely divided coal, such as culm or the like by mixing the comminuted coal with pitch or similar binding material or bond, and then pressing the mixture into briquettes of the desired shape and subsequently hardening the briquettes by a suitable heat treatment.

In preparing briquettes in the manner just mentioned considerable difficulty is encountered in properly selecting or preparing the pitch and in mixing it with the finely divided material in order to obtain a homogeneous mixture and difficulty is also met with in the subsequent operations of pressing the mixture into shapes having uniform density and other desirable properties and in hardening the formed briquette by heat treatment.

Thus, for example, because of the peculiar physical properties of pitch, the grinding machinery for comminuting the same, as well as the mixing machinery for incorporating the binding material with the coal, is ordinarily of special construction and a large number of different types of pitch grinders or crackers and special mixing apparatus have been designed for the purpose of overcoming the very serious difficulties met with in these two steps of the manufacturing process. Also similar complications and difficulties are met with (and to even a greater degree) in connection with the methods and apparatus for pressing the mixture of coal and pitch into the form of briquettes, and, in short, the briquette manufacturing processes in their entirety are quite complicated and laborious, especially when considered in connection with the nature and commercial uses of the finished product.

The present invention completely or largely overcomes the foregoing difficuties and complications in part by selecting and utilizing a briquetting bond or binding material which does not possess the disadvantages of pitch or similar materials in the practice of this art. The binding material employed in accordance with the present invention is very easy to mix with the powdered coal or other comminuted material and the resulting mixture is readily hardened after pressing by a simple heat treatment, producing a finished briquette which possesses unusual mechanical strength and hardness as well as a remarkably high resistance to the action of moisture, warm weather, etc. and which burns completely without objectionable disintegration or crumbling or smoke formation and which also does not undergo objectionable deterioration or breakage or softening while in storage or during necessary handling, and which also has many other desirable properties not possessed by briquettes hitherto known.

I am aware that various other materials besides pitch have hitherto been proposed as a suitable briquette-bond or binding material and among these materials are such substances as dextrine, starch, oil, silicate of soda, molasses, waste liquor from paper pulp manufacturing, resin, various mucilaginous decoctions from plants, sea-weed moss, sulphur, soap waste, mixtures of lime and salt, soda lye, sulphuric acid (for dry peat, or fibrous material), chalk, clay, magnesia cement, plaster of Paris, and many other materials of widely different character, but none of these binding materials possess the advantages, either with respect to manufacturing processes or with respect to the finished product which are peculiar to the process and product of the present invention and very few of them have ever been successfully applied industrially because of certain disadvantages met with either in manufacturing or in use which arise from the properties peculiar to the binding material itself in each instance. Thus, for example, a great deal of effort has been expended in an endeavor to employ sodium silicate as a binding material in the production of briquettes but it has been found that the finished product is not satisfactory because of its high ash content and lack of resist-

ance to the action of water or atmospheric moisture. And again, certain other of the binding materials hitherto proposed produce smokiness when the briquette is burned, whereas others impart undersirable burning properties to the briquette and still others produce briquettes having inferior water resisting properties, or low mechanical strength, etc. besides giving rise to additional complications in methods of manufacture rather than to a simplification of the same.

The binding material employed in accordance with the present invention in the production of briquettes is ordinary phosphoric acid or similar soluble acidic derivative of phosphorous pentoxide. In the preferred form of my invention I employ as the binding material or bond crude soluble phosphate extract obtained by treating phosphatic rock or similar phosphate material with sulphuric acid as in the manufacture of soluble phosphates. I have also discovered that when comminuted coal or certain other finely divided material, such as dried ore pulp, is mixed with relatively small percentages of phosphoric acid or a soluble phosphate and a little water, the mixture may be readily moulded into briquettes with the application of an appropriate pressure, and these pressed briquettes when dried or preferably when heated to a temperature above about 200° C. for a short time produce a finished briquette possessing all the desirable properties hereinbefore mentioned, being remarkably hard and, what is yet more surprising, being very resistant toward the action of water or moisture in any form.

In the practice of my invention I thoroughly mix, for example, about two or three per cent of pure phosphoric acid in the form of a fifty per cent solution of phosphoric acid or its equivalent with dried anthracite culm or other finely divided coal product and then press this mixture into briquettes of any desired shape by means of a press of any convenient type, preferably a brick-press having a mould of suitable size and shape or a roll type press, and then convey the partially pressed briquettes without subjecting them to objectionable shocks or strains to a suitable drying device or bake oven where they are heated at a temperature preferably above about 200° C. for about one-half hour or until they acquire the requisite degree of hardness. After cooling, the briquettes are then in condition for use.

In the foregoing specific example of my invention I may change the proportions of the ingredients of the mixture, varying the proportion of the soluble acid derivative of phosphorous pentoxide from an amount equivalent to about 1% or ordinary orthophosphoric acid to an amount corresponding to about 10% orthophosphoric acid and I may also vary the proportion of water and the heat treatment all according to the requirements of each particular case and depending upon the nature of the material which is being briquetted and the particular use to which the finished briquettes are to be put.

In pressing the briquettes I prefer to use as high a pressure as is practicable in each instance since the briquettes formed under higher pressures require less binding material and also can be more conveniently handled without danger of breakage, etc. before they are hardened.

When certain ores are formed into briquettes in accordance with my invention, as for example iron sulphide ore, considerably less heat treatment or none is required to produce a finished briquette having the required hardness and other desirable properties and more particularly the heat treatment may be conducted at a considerably lower range of temperature. However, certain advantages sometimes result even in this instance when the hardening operation is carried out at temperatures running up to about 200° C. and above.

A finished fuel briquette made in accordance with my invention in its preferred form and when egg shaped and weighing about two or three ounces is sufficiently hard to withstand the weight of a man weighing 150 pounds or more when this weight is applied by stepping on the briquette with the heel of the shoe. The briquette of my invention is not objectionably affected by moisture or water under any ordinary conditions. Even when completely immersed in water only a slight softening occurs and this softening ordinarily takes place within the first ten minutes after immersion, and does not increase to an objectionable extent thereafter.

It will be understood that the term "briquette" as used herein includes articles of all sizes and shapes formed from comminuted material of the character described whether or no said articles are intended for uses involving the destruction of the articles as such, as by direct useful consumption or as a step in a melting or reducing operation.

I claim:

1. The method of making briquettes which comprises subjecting fibrous material to combination, and then subjecting the comminuted material to the action of an acid phosphate and heat.

2. The method of making briquettes which comprises mixing comminuted material with acid calcium phosphate, moulding the mixture into the desired shape, and hardening the moulded material to form a briquette.

3. The method of making briquettes which comprises mixing comminuted material with an acid phosphate, and heating the mixture at a temperature above about 200° C.

4. The method of making briquettes which comprises subjecting non-fibrous material to comminution, and then subjecting the comminuated material to the action of an acid phosphate and heat.

In testimony whereof I affix my signature.

HUGH McCURDY SPENCER.

3. The method of making briquettes which comprises mixing comminuted material with an acid phosphate, and heating the mixture at a temperature above about 200° C.

4. The method of making briquettes which comprises subjecting non-fibrous material to comminution, and then subjecting the comminuated material to the action of an acid phosphate and heat.

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Certificate of Correction.

It is hereby certified that in Letters Patent No. 1,590,706, granted June 29, 1926, upon the application of Hugh McCurdy Spencer, of Newark, New Jersey, for an improvement in "Briquettes," an error appears in the printed specification requiring correction as follows: Page 2, line 122, claim 1, for the word "combination" read *comminution;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 3d day of August, A. D. 1926.

[SEAL.]

M. J. MOORE,
Acting Commissioner of Patents.

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