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MANUFACTURE OF COAL OR LIKE BRIQUETTES.

No Drawing.

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To all whom it may concern:

Be it known that I, HENRY GARDINER LLOYD, a subject of the King of England, residing at Surbiton, Surrey, England, have invented certain new and useful Improvements in the Manufacture of Coal or like Briquettes, of which the following is a specification.

This invention is for improvements in or relating to the manufacture of coal or other briquettes, and has for one of its objects to provide for the more efficient intermixing of the binding agent with the material to be briquetted.

The invention relates to the manufacture of that type of briquettes which use bitumen, asphalt, asphaltum, pitch or like compounds as the binding agent. A convenient test for determining whether the bitumen or the like is suitable for use as a binding agent is its solubility in carbon disulphide or chloroform at a temperature of 77° F. Insoluble impurities or adulterants are of no use as binding agents.

It has been proposed to crush pitch with the coal or other material to be briquetted and after mixing them together to apply heat, but for some purposes and in some circumstances it is preferable to incorporate the binding agent with the material to be briquetted without subjecting them both to this process.

As is known, these binders are, even at a high temperature, very thick and sticky substances which are difficult to mix thoroughly with the material to be briquetted. The binders are comparatively expensive materials and it is desirable to use as little of them as possible in the briquettes. It will be appreciated, therefore, that the thorough mixing with the material to be briquetted of the least possible quantity of bitumen, pitch or the like, that is sufficient to secure the binding action, is desirable from the commercial point of view.

According to the primary feature of the present invention (which invention is not one that operates on the froth-flotation process or method because the amount of water added in carrying it out in no case exceeds about 15% by weight of the binding agent used, as hereinafter described, which binding agent is, as already stated, only used in small quantities relatively to the coal or other material being briquetted) there is provided a method of manufactur-

ing coal or other briquettes which comprises:—

- (a) melting bitumen, pitch or the like.
- (b) adding water (or wet steam) to the said molten material in a small quantity i. e. sufficient to cause the molten material to froth, and
- (c) mixing with the frothing bitumen, pitch or the like, the material to be briquetted.

By bringing water, hot or cold, in contact with molten bitumen, pitch or the like, at a suitable temperature, a froth or foam is created in which the mass of bitumen, pitch or the like, is in very thin films or bubbles which can be readily mixed with the material to be briquetted. A very thorough intermixing of the two materials can thus be readily obtained and a small quantity of binding agent will serve to unite together a large quantity of coal or other material. For example 4–12 parts by weight of bitumen, pitch or the like may be employed to briquette 96–88 parts by weight of coal or other similar material to be briquetted.

The temperature to which the bitumen, pitch or the like should be raised will vary with the nature and quality of the material employed. The temperature should not exceed the cracking point of the binding agent, however, as otherwise there will be danger of losing some of its volatile constituents, and in practice it is a good general rule not to exceed 350° F. On the other hand, the temperature must be above the flowing point of the binding agent and must be sufficient to ensure it being thoroughly melted. Preferably, the temperature of the binding agent should be maintained considerably above the boiling point of water whilst the water is added, and care taken to ensure that the temperature does not fall below this point until the desired amount of frothing has been obtained. With a bitumen having a specific gravity at 60° F. of 1.05, a penetrometer reading at 77° F. of 23, a ductility reading at 77° F. of 66 centimeters, a softening point of 150° F., a flowing point of 175° F., and a total solubility in carbon disulphide of 99.97%, a temperature of 190° F. to 220° F. is suitable. It is to be understood, however, that these details are given merely by way of example and that to ensure accurate results the flowing and cracking points of the binding agent should be determined and

care taken to exceed the former without approaching too near the latter. The temperature may be maintained at that suitable for frothing during the operation of adding the water, and adding the coal or other material to be briquetted, in order to ensure that the whole may be a homogeneous mass ready for briquetting.

The water may, as already stated, be added either hot or cold. It may also be added in the form of wet steam, or it may be mixed with the material to be briquetted and the two simultaneously added to the molten bitumen, pitch or the like; while the latter is at a temperature suitable to produce frothing. For example a jet of water or wet steam, with or without the coal or other material mixed with it, may be brought into contact with a stream of bitumen, pitch or the like, at the desired temperature, this method being suitable for the manufacture of briquettes on a large scale. But as aforesaid the amount of water used in the processes according to the present invention is small, i. e. not exceeding the amount required to secure frothing of the binding agent.

The bitumen or asphalt may be as manufactured by oil producers during the distillation of oil. This type of bitumen is comparatively pure. A native bitumen such as Bermudez may also be used or a mixture of different bitumen. The pitch may be that at present in use in briquetting processes already in adoption.

As already stated, the amount of water required is extremely small and in some instances has been found not to exceed 10%–13% by weight of the bitumen. The proportion just mentioned, however, is subject to variations within fairly large limits either up or down according to circumstances. It is given merely by way of example, and the proportion of total water to binding agent may vary, according to the nature of the binding agent, between 4% and 15% by weight of the binding agent. It is important that no more water than is actually necessary should be added, since the presence of large quantities of water in the finished briquettes is extremely undesirable. Obviously if the binding agent itself contains water, less extra water need be added than would be the case if the binding agent were quite dry. The materials to be employed should, therefore, be tested to ascertain their condition and as small a quantity of water used as will give satisfactory frothing. With a dry bitumen conforming to the specification quoted earlier herein a proportion of 9% to 13% by weight of water to bitumen is suitable.

The coal or other material to be briquetted need not necessarily be reduced completely to dust form. In some circum-

stances it will be found convenient to include lumps of convenient size in the material being briquetted.

It will be appreciated that the invention is not limited to the precise proportions and temperatures, and other details, hereinbefore specified.

What I claim as my invention and desire to secure by Letters Patent is:—

1. The method of manufacturing briquettes which comprises:—(a) melting bituminous material, (b) adding water to the said molten material in a small quantity, i. e. sufficient to cause the molten material to froth, and (c) mixing with the frothing bituminous material the material to be briquetted.

2. The method of manufacturing briquettes which comprises:—(a) melting bituminous material, (b) adding water in the form of wet steam to the said molten material in a small quantity, i. e. sufficient to cause the molten material to froth, and (c) mixing with the frothing bituminous material the material to be briquetted.

3. The method of manufacturing briquettes which comprises:—(a) heating bituminous material to a temperature between its flowing and cracking points, (b) adding 4% to 15% by weight of water to the said molten material to cause it to froth, and (c) mixing with the frothing bituminous material, the material to be briquetted, in the proportion of 4–12 parts by weight of bituminous material to 96–88 parts by weight of the material to be briquetted.

4. The method of manufacturing briquettes which comprises:—(a) heating bituminous material to a temperature between its flowing and cracking points, (b) adding 4% to 15% by weight of water in the form of wet steam to the said molten material to cause it to froth, and (c) mixing with the frothing bituminous material, the material to be briquetted, in the proportion of 4–12 parts by weight of bituminous material to 96–88 parts by weight of the material to be briquetted.

5. The method of manufacturing briquettes which comprises:—(a) heating bituminous material to a temperature exceeding the boiling point of water and the flowing point of the bituminous material, but not exceeding the cracking point of the latter, (b) maintaining it at that temperature while adding water to it in a small quantity, i. e. sufficient to cause it to froth, and (c) mixing with the frothing bituminous material the material to be briquetted.

6. The method of manufacturing briquettes which comprises:—(a) heating bituminous material to a temperature exceeding the boiling point of water and the flowing point of the bituminous material, but not exceeding the cracking point of the lat-

ter, (b) maintaining it at that temperature while adding water in the form of wet steam to it in a small quantity, i. e. sufficient to cause it to froth, and (c) mixing with the frothing bituminous material the material to be briquetted.

bituminous material, and (b) mixing together the material to be briquetted and a small quantity of water in the form of wet steam, i. e., sufficient to cause the molten material to froth, and simultaneously adding them to the molten bituminous material, while the latter is at a temperature suitable to produce frothing.

7. The method of manufacturing briquettes which comprises:—(a) heating bituminous material to a temperature exceeding the boiling point of water and the flowing point of the bituminous material, but not exceeding the cracking point of the latter, (b) maintaining it at that temperature while adding 4% to 15% by weight of water to it to cause it to froth, and (c) mixing with the frothing bituminous material the material to be briquetted, in the proportion of 4–12 parts by weight of bituminous material to 96–88 parts by weight of the material to be briquetted.

11. The method of manufacturing briquettes which comprises:—(a) heating bituminous material to a temperature between its flowing and cracking points, and (b) mixing together the material to be briquetted, in the proportion of 4–12 parts by weight of bituminous material to 96–88 parts by weight of the material to be briquetted, and water in the proportion of 4% to 15% by weight of the bituminous material, and simultaneously adding them to the latter.

8. The method of manufacturing briquettes which comprises:—(a) heating bituminous material to a temperature exceeding the boiling point of water and the flowing point of the bituminous material, but not exceeding the cracking point of the latter, (b) maintaining it at that temperature while adding 4% to 15% by weight of water in the form of wet steam to it to cause it to froth, and (c) mixing with the frothing bituminous material the material to be briquetted, in the proportion of 4–12 parts by weight of bituminous material to 96–88 parts by weight of the material to be briquetted.

12. The method of manufacturing briquettes which comprises:—(a) heating bituminous material to a temperature between its flowing and cracking points, and (b) mixing together the material to be briquetted, in the proportion of 4–12 parts by weight of bituminous material to 96–88 parts by weight of the material to be briquetted, and water in the form of wet steam in the proportion of 4% to 15% by weight of the bituminous material, and simultaneously adding them to the latter.

9. The method of manufacturing briquettes which comprises:—(a) melting bitumen, pitch or the like, and (b) mixing together the material to be briquetted and a small quantity of water, i. e., sufficient to cause the molten material to froth, and simultaneously adding them to the molten bituminous material, while the latter is at a temperature suitable to produce frothing.

13. The method of making briquettes, which consists in frothing a bituminous binder with heat and water and applying the same to the particles to be briquetted while the binder is in a frothing state.

10. The method of manufacturing briquettes which comprises:—(a) melting bi-

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY GARDINER LLOYD.

Witnesses:

ARTHUR ABBEY,

RONALD STUART DOLLEYMORE.