FUEL, AND COMPOSITIONS OF MATTER FOR TREATING SOLID CARBONACEOUS FUEL

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My invention relates to improvements in compositions of matter for treating solid carbonaceous fuel, and particularly relates to such compositions for treating coal, both in the natural state as mined, and in the various artificial shapes into which the same is formed after mining, such as briquettes. The invention is especially adapted to the treatment of Pocahontas and all forms of bituminous coal. The invention also includes improved solid fuel products.

The design of the invention is to provide a composition with which the entire surface of coal may be coated so as to give the coal a clean appearance, which will permit the coal to be handled without creating dust or unduly blackening the operator, which will cause the coal when initially ignited to burn without smoke, and which will enhance the heating value of the coal. These desirable effects are accomplished by my improvements. Furthermore, the cost of the materials of which my improved composition is comprised, and the cost of compounding the same, and of applying it to the coal, is so comparatively slight that no material increase in the cost of producing and furnishing coal coated with my improved composition results.

It may be well explained that all coal, whether in natural form or shaped into briquettes, and the like, is considerably broken during handling and hence produces considerable dust. Different coals vary widely in these respects but this characteristic is considerable in all grades of coal and, generally speaking, a particular disadvantage in the best and most expensive grades of coal, such as Pocahontas. Special coal shapes, such as briquettes, are particularly objectionable from the standpoint of dust produced during handling because these special shapes have a binder material which renders the dust sticky. Furthermore, natural coal, when subjected to atmospheric conditions, breaks up or slacks, creating dust and making the coal less valuable. Also, natural coal has pores and minute cracks through which volatile gases pour, whereby the coal is applied to a hot bed of coals, and these gases are immediately burned, creating much smoke, which is very objectionable from the standpoint of the furnace operator and furnace appliances, as well as being uneconomical from the standpoint of heating value, the breaking of coal in handling and shipping, particularly of the better grades of coal, such as Pocahontas, is frequently as great as 50 percent, so that the lump portion of the coal laid down at its place of use is reduced to one half of what it was when the coal was mined.

Primarily, my invention consists in securely applying to the coal a thin film or coating of titanium dioxide. This coating is applied by mixing the titanium dioxide with a suitable neutral carrier which is evaporable, preferably water, or an emulsion containing water and a suitable oil with which the coal is treated. The titanium dioxide is mixed with the water in powdered form. In order to effect secure adherence of the coating to the coal, I also incorporate in the composition mixed with the water or the emulsion a suitable binder having glue-like characteristics, and for this purpose, I preferably use casein. I also use a suitable dispersing agent for the titanium dioxide and, for this purpose, I prefer to use materials of the order of tri-sodium phosphate, sodium fluoride, and borax.

By reason of the comparatively high cost, under usual conditions, of titanium dioxide, I form a part of the proposed coating material from a suitable filler, such as various forms of talc, preferably a fibrous talc known in the trade as "Asbestine". Furthermore, I preferably use the titanium dioxide in the form of titanox which is approximately 25 percent titanium dioxide and 75 percent barium sulphate. For certain compositions for the purpose stated, I prefer to add calcium hydroxide. In order that the various materials mentioned may be definitely held in suspension in the liquid carrier, I preferably add a suitable medium for this purpose, and preferably I use starch.

A suitable composition consists of powdered titanox, the dispersing agent therefor, the suspending medium, and the binding agent, with water, or the emulsion containing water and a suitable oil, but, for purposes of economy, I prefer to substitute a suitable filler, such as Asbestine, for a part of the titanox. The calcium hydroxide may be added to either the more expensive or the more economical composition. Furthermore, lithopane may be substituted for a part of the titanox.

The ingredients above mentioned are mixed together in powdered form and then form a whitish powdered mixture which is mixed with water or other suitable neutral and evaporable vehicle. In addition to the water, some suitable oil to form an emulsion, such as linseed oil, soybean oil, or
toluol, or a combination of such oils may be used to form the vehicle. The water mixture or emulsion applied to the solid fuel in any suitable manner, such as by spraying, or by passing the solid fuel through a bath of the coating mixture. I have ascertained that the above-mentioned ingredients may be compounded, to form a suitable powdered composition, in approximately equal parts, although there is considerable possible variation therein for the purpose of meeting different conditions or treating different grades of fuel.

I have also ascertained that from 2 to 8 pounds of the mixed powder can be mixed with 1 gallon of water, and that about 1 ton of coal, in briquette form, can be suitably coated with 1 gallon of the coating mixture. If oil is used with the water, I preferably use about one pint of oil per gallon of coating mixture. The varying requirements of hard and porous coal and briquettes vary the necessary strength of the coating mixture and, further, a comparatively thick or thin mixture may be applied to produce heavy or light coatings. About four pounds of the mixed powder to one gallon of vehicle is a standard mixture.

The coating mixture above-mentioned is white, but if it is desired to color it, this result can readily be effected by adding suitable coloring matter, such as dyes and pigments. The particular coloring of the coal, other than the substantially pure white appearance effected by my coating composition, I consider no part of my invention, inasmuch, as stated, a great number of coloring materials may be employed to effect the particular coloring desired.

The water, or water and oil, with which my powdered composition is mixed serves only as a vehicle for applying the composition, and complete results are obtained from the coating only after the evaporable content of the coating film on the fuel surface has come off or been burned off. This evaporable content may be allowed naturally to disappear in the air, or mechanically applied heated air may be used to dry the treated fuel, as and when conditions warrant.

The composition applied to the fuel, as above outlined, gives the fuel a clean appearance and a color character different from that of the natural black of coal, so as to render the improved fuel attractive and thus creates in the mind of the customer the idea of cleanliness. Furthermore, the fuel so coated is clean and may be handled without the hands of the operator becoming soiled or blackened by coal dust. Much of this dust is always on the surface of solid fuel and tenaciously clings thereto, and my coating mixture which forms a thin film over the entire surface of the coal covers the small particles of adhering dust or the dust is incorporated therewith creating of the latter a burning character so as to prevent the dust and a material deterioration in the fuel value. My improved composition materially improves the heating value of the coal. These results arise to a considerable degree from the following facts. Solid fuel, particularly the more expensive grades thereof, such as Pocahontas coal, is formed with small pores and minute cracks in the surface. My improved composition coats these pores and cracks. Therefore, when the treated coal is applied to a hot furnace bed, the particles of the coal are immediately burned and volatilize and create a great amount of smoke, such as is experienced by all furnace operators, when firing a furnace, cannot flare out with the production of much smoke. In fact, the dust and particles are not substantially burned, but volatile gases and smoke produced, from fuel treated by my improved composition, until the temperature is materially raised, so that more efficient combustion of the coal is assured. Thus, the heating value of what would be lost, viz., soot and black smoke, which are the most valuable heating units in coal, is saved and greatly increases the heating value of the coal. Also, incident to the improved burning of the fuel itself, there is eliminated to a large degree the formation of objectionable glassy slag-like cinders. All of these characteristics are simply more or less combustion-retarding so that, particularly in the case of the more expensive fuels, the value thereof is materially enhanced by reason of the retarding to the burning thereof caused by my improved composition.

The lumps or pieces of coal treated by my improved composition are not tacky and will not stick together or agglomerate into a mixed mass and lose their individuality.

The said coating can be made and applied so economically as not materially to increase the cost of marketing the coal.

The lime constituent, calcium hydroxide, which I may use in my improved composition, contributes to the white color of the complete composition, and also acts as an emulsifying agent, thus assisting the oil, if the latter is used, and promoting the dispersion in the water of the other ingredients of the composition.

Instead of using more or less refined titanox and lithopone, and materials of their order, for producing the titanium dioxide coating, I may use titanium or titanium dioxide in the form in which it occurs in nature.

Whereas

1. A solid carbaceous fuel consisting of a coal body having its entire surface covered with a uniform coating of titanium dioxide rendered tightly-adherent through the agency of casein, said coating imparting to the fuel a color appearance different from that of natural coal, and said coating being effective to reduce material atmospheric deterioration of the coal body and to make the fuel clean and dustless and, when the fuel is ignited, being effective in controlling its burning character so as to substantially prevent creation of smoke and soot.

2. A solid carbaceous fuel, as set forth in claim 1, characterized in that the tightly-adherent coating is comprised of titanox consisting of approximately twenty-five per cent titanium dioxide and seventy-five per cent barium sulphate.

3. A solid carbaceous fuel, as set forth in claim 1, characterized in that the coating is comprised of titanium dioxide, fibrous tale, and cafdium hydroxide and has been rendered tightly adherent through the agency of tri-sodium phosphate and casein.

4. A solid carbaceous fuel, as set forth in claim 1, characterized in that the coating is comprised of titanium dioxide and calcium hydroxide.
and has been uniformly applied and rendered tightly adherent through the agency of tri-sodium phosphate and casein.

5. A solid carbonaceous fuel consisting of a coal body having its entire surface covered with a tightly-adherent coating of titanium dioxide, fibrous talc and calcium hydroxide, which coating has been made uniform by the dispersion of the constituents thereof through the agency of tri-sodium phosphate, said coating being effective in imparting to the fuel a color appearance different from that of natural coal, and effective to reduce material atmospheric deterioration of the coal body and in making the fuel clean and dustless and, when the fuel is ignited being effective in controlling its burning characteristics so as substantially to prevent creation of smoke and soot.

6. A composition of matter for treating coal to form a uniform tightly-adherent pigment coating, and to change its appearance and to improve its weather-resistant, handling, and burning characteristics, comprising a mixture in water of titanium dioxide, talc, sodium fluoride, casein, and starch, the sodium fluoride, the casein, the starch and the combined titanium dioxide and talc being in substantially the same proportions by weight and the water being in amount by weight from one to four times the combined weight of the other materials.

7. A composition of matter for treating coal to form a uniform tightly-adherent pigment coating, and to change its appearance and to improve its weather-resistant, handling, and burning properties, comprising a mixture in water of titanium dioxide, barium sulphate, talc, casein, an agent of the order of tri-sodium phosphate, sodium fluoride, and borax for uniformly dispersing the aforementioned materials in the water, and starch, the water being in amount by weight from one to four times the combined weight of the other materials.

8. A composition of matter, as set forth in claim 6, in which a water and oil emulsion is utilized in lieu of water.

9. A composition of matter, as set forth in claim 7, in which is included calcium hydroxide.

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