Aug. 5, 1930. C. V. McINTIRE 1,772,053

METHOD OF MAKING FUEL BRIQUETTES

Filed May 29, 1926

Fig. 1,

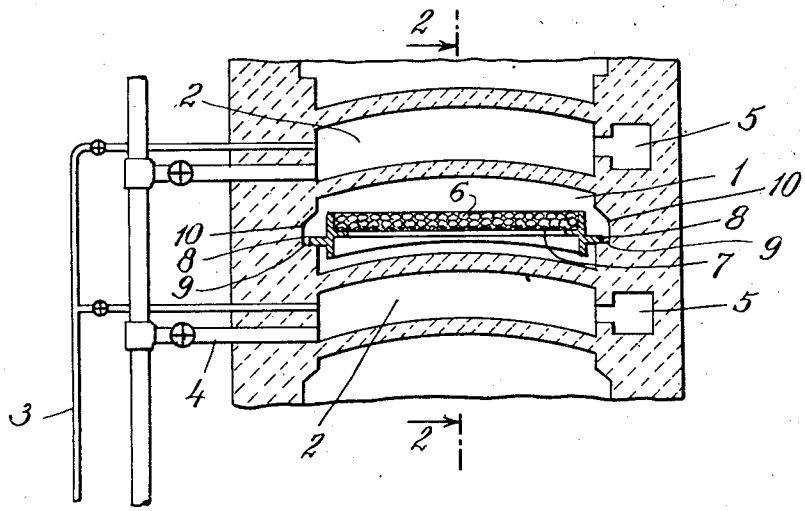


Fig. 2,

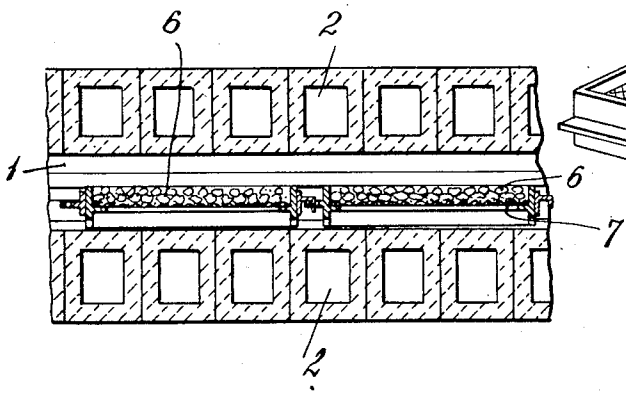
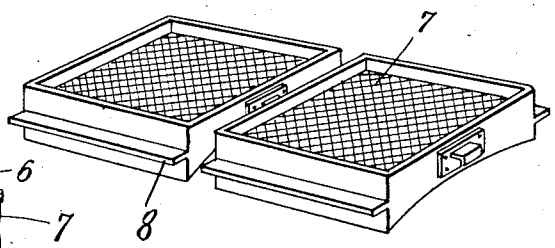


Fig. 3,



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UNITED STATES PATENT OFFICE

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METHOD OF MAKING FUEL BRIQUETTES

Application filed May 29, 1926. Serial No. 112,497.

This invention relates to fuel briquettes of the type described in the Smith Patent No. 1,276,429, and has for its object to improve the method and product of that patent.

The briquette of the Smith patent has a hard, dense strong physical structure, a specific gravity of 1.3 or more, and a volatile content of less than 3%—a briquette in short resembling anthracite as closely as possible. The base of this briquette is a semi-anthracite having a naturally low volatile content, or, more commonly, a semi-coke made by partially carbonizing bituminous coal at low temperature to reduce its volatile to about 10%. This base material is crushed, mixed with a quantity of coal tar pitch, or its equivalent, sufficient to bring the volatile content of the whole, exclusive of water, to form 11 to 17%, and the mixture briquetted. The volatile content of the briquette at this stage of the process is important and great stress is laid upon it in the patent. The raw briquette is then subjected to a second and final carbonization at temperatures ranging from 1400° F. to 2000° F. in a retort of the type illustrated in Smith Patent No. 1,409,597, until the volatile content has been reduced to below 3% and the hard, dense anthracitic structure described above has been produced.

In carrying out this process in actual practice, using retorts of the Smith Patent No. 1,409,597, 16 inches wide I have found that the time required to reduce the volatile content of the briquettes to less than 3% at the temperatures specified makes the process impracticable, and that even when employing recarbonization temperatures as high as 2600° F., the average time required for carbonizing a charge of briquettes, is about 12 hours. Not only is the cost of operating at such high temperatures prohibitive, but it is almost impossible to carbonize a briquette successfully by placing it against a hot surface 1600° F. or higher (as is necessary in the continuous commercial operation of the Smith process) the sudden and rapid evolution of gas usually causing it to split open. Thus, although hard, dense, low volatile briquettes can be made by the Smith method and in the Smith apparatus, the time and care required and the expense entailed are excessive. Besides, high temperature carbonization destroys desirable cell structure by too much shrinkage and too great reduction in volatile.

I have discovered that a highly satisfactory and, in many respects, superior fuel can be made by retaining much more than 3% of the volatile constituents in the briquette—that instead of recarbonizing the raw briquette until the volatile content is reduced to less than 3%, it is sufficient if that content be reduced only to about 8% to 13%. The practical advantage of this is two-fold—first, a better briquette is obtained, and, second the process of making it is improved by cutting down both the time and temperature of the carbonization, thus greatly reducing the cost of operation, and also greatly increasing the certitude of producing a sound product. I have also discovered that an improved briquette is obtained if the volatile content of the raw fuel before recarbonization be about 18% to 20% instead of less than this amount.

As a further improvement I carbonize my briquettes without permitting them to come in contact with the hot walls of the retort ovens, supporting them in thin layers upon a screen supported between the floor and the roof of the ovens, so that practically all of the heat is delivered in the form of radiant energy with little or no danger of local overheating.

The resulting fuel is not so dense and strong as the product of more intensive recarbonization, but its high volatile content together with its peculiar cellular structure, resembling charcoal, give it a combination of properties which are far more desirable than mere density; yet it has all the toughness and strength necessary for commercial handling. It can also be produced more efficiently and at lower cost.

In order that my invention may be more clearly understood I shall now give a specific example of the manner in which I prefer to carry it out, starting with the raw coal and ending up with the recarbonized briquettes: Bituminous coal having a volatile content of

about 25% to 45% is fed to a primary retort of the type illustrated in my Patents Nos. 1,457,083 and 1,479,827 and heated at about 750° F. to 850° F. while being agitated. The coal melts into a plastic mass shortly after it enters the retort and extends in this condition for about half the length of the retort. From that point on, however, as more and more of the volatile is removed the product becomes more and more granular in character and when finally discharged is fully converted into a semi-coke containing about 10% to 15% volatile. As the coke leaves the retort it is quenched by means of steam. The larger lumps are screened out, allowed to stand for an hour while being sprayed occasionally and then the whole product ground to pass a 6 mesh screen. Other methods of forming the semi-coke might be employed; the foregoing is given as one which I have found to be satisfactory.

The pulverized semi-coke is then fluxed with a binder of 10% to 12% of coal tar pitch or other equivalent hydrocarbon to form a mash which is briquetted in a press of the standard Belgium type. The pitch is preferably added in liquid form and is usually a by-product of the process itself. The raw briquettes, containing about 18% to 20% volatile matter exclusive of water, are then ready for the recarbonization step.

In the accompanying drawing I have illustrated, more or less diagrammatically, a retort in which I recarbonize the briquettes in accordance with my process. In these drawings Figure 1 is a vertical transverse section through the retort showing a plurality of superimposed muffle ovens with the briquettes supported upon screen trays between the upper and lower walls of the ovens; Figure 2 is a longitudinal section taken along line 2—2 of Figure 1 and Figure 3 is a perspective view of two of the screen trays which support the briquettes within the ovens.

The retort illustrated comprises a series of superposed ovens 1 which are heated from above and below by means of transverse heat flues 2 to which gas and air are fed through conduits 3 and 4 respectively and from which the products of combustion are removed through waste heat flues 5. The briquettes 6 are placed in a thin layer, preferably two rows deep, upon a heating resistant screen cloth 7 of a tray 8 and placed within an oven. The tray is provided with longitudinal flanges 9 which are received and supported by longitudinal recesses 10 in the side walls of the oven. As clearly illustrated in Figures 1 and 2 the briquettes are supported substantially mid-way between the bottom and roof of the oven and are therefore heated by radiant heat, never coming into contact with the hot flue walls.

The temperature of the roof and floor of the ovens is about 1200 to 1400° F. With a chamber about 12″ high, two layers of briquettes containing an initial volatile content from 18% to 20% can be carbonized down to about 8% to 13% volatile in thirty minutes, and as the two layers weigh from 10 to 12 pounds per square foot, this gives a carbonizing rate for the oven of from 10 to 12 pounds per square foot of heated surface per hour, each square foot of tray having two square feet of heated surface. After the briquettes have remained within the oven for about thirty minutes the trays are withdrawn, the briquettes removed and quenched, and the trays re-loaded and returned to the oven.

The resultant briquettes with their volatile content from 8% to 13% compare favorably with anthracite in burning qualities. If carbonized to 10% or below they are absolutely smokeless, while those of higher volatile content will give off a light brown or yellow smoke for a few minutes after being placed on the fire. They are not so strong and dense as the lower volatile briquettes made by recarbonizing at higher temperatures and for longer periods, but they have a peculiar cellular structure resembling charcoal which imparts combustion properties far more valuable than mere density while at the same time they have sufficient strength and density to enable them to withstand commercial handling without disintegration. Not only is the product of my process highly desirable, but the process itself with its low temperature recarbonization can be carried on much more economically than the high temperature process and produce a much higher percentage of perfect briquettes.

I claim:

1. The method of making fuel briquettes which comprises mixing a pulverized, solid, carbonaceous fuel with a hydrocarbon binder to form a mixture containing about 18% to 20% volatile matter exclusive of water and one which forms a coherent coke upon carbonization, briquetting the mixture and carbonizing the briquettes.

2. The method of making fuel briquettes which comprises mixing a pulverized, solid, carbonaceous fuel with a hydrocarbon binder to form a mixture containing about 18% to 20% volatile matter exclusive of water and one which forms a coherent coke upon carbonization, briquetting the mixture and carbonizing the briquettes, so that the resultant carbonized briquettes contain about 8% to 13% volatile matter.

3. The method of making fuel briquettes which comprises mixing a partially carbonized pulverized, solid, carbonaceous fuel containing about 10% to 15% volatile matter with about 10% to 12% of a hydrocarbon binder so as to form a mixture having a volatile content of about 18% to 20% exclusive of water and one which forms a coherent coke

upon carbonization, briquetting the mixture, and carbonizing the briquettes so as to reduce the volatile content to about 8% to 13%.

4. The method of making fuel briquettes which comprises making a mash of a pulverized semi-coke containing about 10% to 15% volatile matter, exclusive of water and about 10% to 12% coal tar pitch, briquetting the mash, and carbonizing the briquettes, so that the resultant carbonized briquettes have a volatile content of about 8% to 13%.

5. The method of making fuel briquettes which comprises partially carbonizing a high volatile coal to form a semi-coke, pulverizing the semi-coke, mixing with it a hydrocarbon binder, the mixture containing from 18% to 20% volatile matter exclusive of water, briquetting the mixture, and carbonizing the briquettes until their volatile content lies between 8% and 13%.

6. The method of making fuel briquettes which comprises partially carbonizing a high volatile coal so as to form a soft porous semi-coke having a volatile content of about 10% to 15%, pulverizing the semi-coke, mixing with it a binder of about 10% to 12% of coal tar pitch, briquetting the mixture, and carbonizing the briquettes so as to form a coherent coke containing from 8% to 13% volatile matter.

7. The method of making fuel briquettes which comprises mixing a pulverized, solid, carbonaceous fuel with a hydrocarbon binder so as to form a mixture containing about 18% to 20% volatile matter exclusive of water and one which forms a coherent coke upon carbonization, briquetting the mixture and carbonizing the briquettes at about 1200° F. to 1400° F.

8. The method of making fuel briquettes which comprises mixing a pulverized, solid, carbonaceous fuel with a hydrocarbon binder so as to form a mixture containing about 18% to 20% volatile matter exclusive of water and one which forms a coherent coke upon carbonization, briquetting the mixture, and carbonizing the briquettes at about 1200° F. to 1400° F. so that the resultant carbonizing briquettes contain about 8% to 13% volatile matter.

9. The method of making fuel briquettes which comprises making a mash of a pulverized semi-coke containing about 10% to 15% volatile matter, exclusive of water and about 10% to 12% coal tar pitch, briquetting the mash, and carbonizing the briquettes at about 1200° F. to 1400° F. so that the resultant carbonized briquettes have a volatile content of about 8% to 13%.

10. The method of making fuel briquettes which comprises making a mash of a pulverized semi-coke containing about 10% to 15% volatile matter, exclusive of water and about 10% to 12% coal tar pitch, briquetting the mash, and carbonizing the briquettes by subjecting a thin layer of them to a temperature of 1200° F. to 1400° F. in an externally heated retort without permitting the briquettes to come into contact with the hot walls of the retort so that the resultant carbonized briquettes have a volatile content of about 8% to 13%.

11. The method of making fuel briquettes which comprises mixing a pulverized, solid, carbonaceous fuel with a hydrocarbon binder so as to form a mixture containing about 18% to 20% volatile matter exclusive of water and one which forms a coherent coke upon carbonization briquetting the mixtures and carbonizing the briquettes by subjecting a thin layer of them to radiant heat for about 30 minutes, so that the resultant carbonized briquettes contain about 8% to 13% volatile matter.

12. The method of making fuel briquettes which comprises partially carbonizing a high volatile coal to form a soft porous semi-coke having a volatile content of about 10% to 15%, pulverizing the semi-coke, mixing with it a binder of about 10% to 12% of coal tar pitch, briquetting the mixture, and carbonizing the briquettes so as to form a coherent coke by subjecting a thin layer of them to radiant heat for about 30 minutes at 1200° F. to 1400° F. so that the resultant carbonized briquettes contain from 8% to 13% volatile matter.

In testimony whereof I affix my signature.

CHARLES V. McINTIRE.