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PROCESS OF PREPARING OIL AND COAL AMALGAM

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This invention relates to the amalgamation of coal, and relates more particularly to an improved procedure which greatly facilitates said amalgamation.

It is an object of this invention to provide a process in which a heavy oil can be amalgamated with the coal, thus permitting the formation from the amalgam of fuel briquets which when baked are clean and hard and consist of carbonized coal particles held together by asphaltized residuum of the oil, while at the same time making it possible to dispense with the heating of the water used in effecting the amalgamation and de-ashing of the coal which heating has been heretofore necessary when using heavy oils to secure proper amalgamation.

Another object of the invention is to provide a process in which a light oil is used to amalgamate, with resulting advantages in ease of manipulation, and an increased separation of ash constituents from the coal, and yet in which the resulting amalgam contains asphaltizable constituents to serve as binder for the carbonized coal particles in briquets baked therefrom.

A still further object is a process in which oils of different physical and chemical characteristics are added to the coal at different stages of the treatment, each oil being best adapted to the particular steps which follow its addition.

Still another object of the invention is to recover the lighter oils introduced in the multiple stage amalgamating treatment above described as well as the light volatilizable constituents of the coal and utilize at least part thereof in further amalgamating operations.

These and other advantages will be explained and will appear from the following description, in which specific examples are to be considered as merely illustrative.

It is assumed in the following that the general principles of operation in the manufacture of a fuel amalgam from oil and coal are known. As specific examples of disclosures of such processes I may refer to my prior patents, Nos. 1,420,164 and 1,420,165, issued June 20, 1922.

In preparing a coal and oil amalgam, I have found that a light oil is more satisfactory than a heavy oil in initiating amalgamation and in effecting the separation of the ash constituents from the coal. This is true for many reasons; a light oil amalgamates with wet coal particles more readily than heavy oil; it coats the coal particles with a much thinner film which enables both water and ash particles to become liberated from the amalgam with greater efficiency. The water does not have to be heated to amalgamate with light oil.

I have also found that amalgamation is improved by adding part of the amalgamating oil to the pulverizer while grinding the coal in the presence of water, also that if part of the oil is fed to the pulverizer it is preferable to use light oil. When wet coal particles have once been coated with a film of oil, no matter how thin, it is much easier and faster to complete the amalgamation with more oil than when the coal has had no coating.

If, however, it is desired to bake the amalgam subsequently to its formation, in order to prepare smokeless fuel briquets then the presence of a heavy oil is very desirable. A heavy oil will asphaltize, forming an excellent binder for the coal particles, making a clean, hard briquet, whereas a light oil would in large measure distill off, leaving the coal without an adequate binder.

One way of getting around this dilemma has been described in my co-pending application, Serial No. 204,069. In this case, I used a heavy oil, and heated the water used in the de-ashing and amalgamating treatment to a temperature which rendered the heavy oil practicable and usable. I propose in the present specification to describe a process in which the advantages of both types of oil are obtained, with the disadvantages of neither.

These results I have achieved by dividing the process into two stages; in the first stage a light oil is used to coat and partially amalgamate the coal particles so as to facilitate the removal of the ash and the later completion of the amalgam. After this partial amalgamation is completed the heavy oil is

added, which, because of the presence of the light oil combines readily to form a true amalgam. The amalgam can then be molded or formed into briquets in any conventional manner which forms no part of the present invention, and then baked. The light oil first used and the light fraction of the heavy oil used in the second stage will largely distill off during the baking treatment, and can be collected and used if desired. The residuum of the heavy oil can be asphaltized giving the resulting briquet the desirable characteristics of hardness and cleanliness.

After adding the light oil to the finely ground coal, the ash will separate, and remain with the water. I can, if desired, remove this water in any convenient manner, for example, by screening. Fresh water can then be supplied, and the heavy oil added to complete the amalgam.

It may not always be necessary to change the water, before adding the heavy oil. With some types of easily amalgamated coal, it is only necessary to add the light oil, to coat the coal and start the reaction. Then, without changing the water, the heavy oil will be added, which latter, due to the start given by the light oil, will act much more rapidly than it would in the absence of the light oil.

As a specific example, supposing an amalgam containing fifteen per cent oil is to be obtained; one-half to one-third of this amount of a light oil may be added to the finely pulverized coal in the presence of water at ordinary temperatures. After amalgamation, I may remove the water, adding a fresh supply, and then add enough heavy oil to bring up the oil content of the amalgam to the desired figure. Or I may add the heavy oil without changing the water, as previously described. The proportions therefore in the above example would be coal 85%, light oil 5–7.5%, heavy oil 10–7.5%, all by weight. The proportions of coal to oil and of the respective oils may be varied considerably, depending upon the kind of coal being treated and upon the use or subsequent treatment to which the amalgam is to be put.

Any light oil suitable for amalgamation in general, may be employed. For example, I may use a Navy fuel oil, although my process is in no sense limited to the use of any particular oil. For the heavy oil, any oil which will asphaltize to give a good clean, hard briquet is useful; a 12–14° Bé. asphalt base had been found quite satisfactory.

During the heating of the briquets in baking the light oils will obviously distill off. They are collected and condensed. For various reasons, such as the cracking of the heavy oil, the removal of volatiles from the coal itself, etc., the light oil recovered from the baking step will generally be greater in quantity than the light oil originally used. The recycling of at least a part of this oil, using it as the light fraction in making further amalgam is contemplated as within my invention. Of course, to start the process originally, light oil from an extraneous source must be supplied. After the baking stage is well under way, however, most if not all the light oil needed will be supplied from the condensers. If there is a surplus, it can be used for any desired commercial purpose.

Another advantage of my process is that agglomeration of the amalgam is facilitated. As pointed out in my previous application, the amalgam as it is at first produced takes the form of small pellets, which are given the descriptive term "caviar". If the agitation of the amalgam with water is continued, these small pellets may be agglomerated into larger masses, the size of which will depend upon the duration, violence or rate of agitation, and temperature of the water used. The temperature of the water used plays a particularly important part in determining the size of the agglomerates of amalgam, cold water favoring agglomeration while hot water retards it. Consequently, heretofore in using heavy oil in amalgamating operations it has been necessary, in order to produce agglomerates of any substantial size, to replace by cold water the hot water which was necessarily present during the deashing stage. It will be seen that, according to the process herein disclosed, I avoid the necessity of providing hot water, and at the same time secure conditions best suited to the production of an amalgam that will be cohesive when baked.

While I have described certain specific procedures, it is not to be understood that I limit myself to these particular procedures, or to the exact proportions or figures mentioned, but that these are intended to be illustrative only; my invention to be considered as limited only by the prior art and the scope of the appended claims.

I claim:

1. A process which comprises treating finely divided coals with a light oil and water to form an amalgam and to separate the ash constituents from the coal, removing the water and ash, adding fresh water, adding a heavy oil to the amalgam, forming the amalgam into briquets, and in heating said briquets, to distill off said light oil, and to asphaltize said heavy oil.

2. A process which comprises treating finely divided coal with water and a light oil to form an amalgam, separating the amalgam from the water and the ash constituents, adding fresh water, adding a heavy asphaltic base oil to the amalgam, forming the amalgam into briquets, and in heating said briquets, to distill off said light oil, and to asphaltize said heavy oil.

3. A process which comprises treating finely divided coal with unheated water and a light oil to form an amalgam, separating the amalgam from the water and the ash constituents, adding a fresh supply of unheated water, adding a heavy asphaltic base oil to the amalgam, forming the amalgam into briquets, and in heating said briquets, to distill off said light oil, and to asphaltize said heavy oil.

4. A process which comprises treating seventeen parts of finely divided coal with from one to one and one half parts of a light oil, and with unheated water, separating the amalgam so formed from the water and ash constituents, adding a fresh supply of unheated water, incorporating with the amalgam from two to one and one half parts of a heavy asphaltic base oil, forming the amalgam into briquets, and in heating said briquets, to distill off said light oil, and to asphaltize said heavy oil.

5. A process which comprises treating approximately seventeen parts by weight of finely divided coal with from one to one and one half parts of a light oil, and with water, separating water and ash incorporating with the amalgam so formed from two to one and one half parts of a heavy asphaltic base oil, forming the amalgam into briquets, and in heating said briquets, to distill off said light oil, and to asphaltize said heavy oil.

6. A process for preparing oil and coal amalgams comprising treating finely ground coal with a light oil and water to form an amalgam, separating the amalgam from said water and ash constituents, adding fresh water, adding a heavy asphaltic base oil and incorporating same into the amalgam, shaping said amalgam into briquets, heating said briquets to volatilize the light oil, further heating said briquets to asphaltize said heavy oil, condensing said volatilized light oil, together with condensible volatiles extracted from the coal, and utilizing at least a part of said condensate as light oil in the preparation of fresh amalgam.

7. A process for preparing oil and coal amalgams comprising wet grinding coal with water and a small percentage of a light oil, adding water and a light oil to the ground coal to form an amalgam, subsequently incorporating a heavy asphaltic base oil into the amalgam, separating the amalgam from water and ash, shaping said amalgam into briquets, heating the briquets to volatilize the light oil, further heating said briquets to asphaltize said asphaltic base oil, condensing said volatilized light oil, together with condensible volatiles extracted from the coal, and utilizing at least a part of said condensate to prepare fresh amalgam.

8. A process for producing fuel which comprises initially amalgamating finely divided coal with a light oil in the presence of water, incorporating a heavy oil into the thus amalgamated coal and further amalgamating the coal therewith, and separating the amalgam from the water and ash-forming constituents of the coal, forming the resultant amalgam into briquets, and heating the briquets to distill off the light oil and to asphaltize the heavy oil.

9. A process for producing fuel which comprises initially amalgamating finely divided coal with a light oil in the presence of water, separating water and ash, incorporating a heavy oil into the thus amalgamated coal and further amalgamating the coal therewith, forming the resultant amalgam into briquets, and heating the briquets to distill off the light oil and to asphaltize the heavy oil.

10. A process for producing fuel which comprises initially amalgamating finely divided coal with a light oil in the presence of water, incorporating a heavy oil into the thus amalgamated coal and further amalgamating the coal therewith, separating the amalgam from the water and ash-forming constituents of the coal, forming the resultant amalgam into briquets, heating the briquets to distill off the light oil and to asphaltize the heavy oil, condensing the volatilized light oil and utilizing at least a part thereof in the amalgamation of additional finely divided coal.

11. A process for producing fuel which comprises amalgamating finely divided coal with a light oil in the presence of water, separating water and ash, incorporating a heavy oil into the resultant amalgam, forming the amalgam into briquets, and heating the briquets to volatilize said light oil and to asphaltize said heavy oil.

12. A process for producing fuel which comprises amalgamating finely divided coal with a light oil in the presence of water, separating the resultant amalgam from the water and ash forming constituents of the coal, incorporating a heavy asphaltic base oil into the amalgam, forming the amalgam into briquets, and heating the briquets to volatilize said light oil and to asphaltize said heavy oil.

13. A fuel producing process which comprises amalgamating finely divided coal in the presence of water, first with a light oil and then with a heavy oil, separating the resultant amalgam from the water and non-carbonaceous constituents of the coal, molding the amalgam into shaped masses, and baking the masses.

In testimony whereof, I have signed my name to this specification this 19th day of October, 1928.

WALTER E. TRENT.