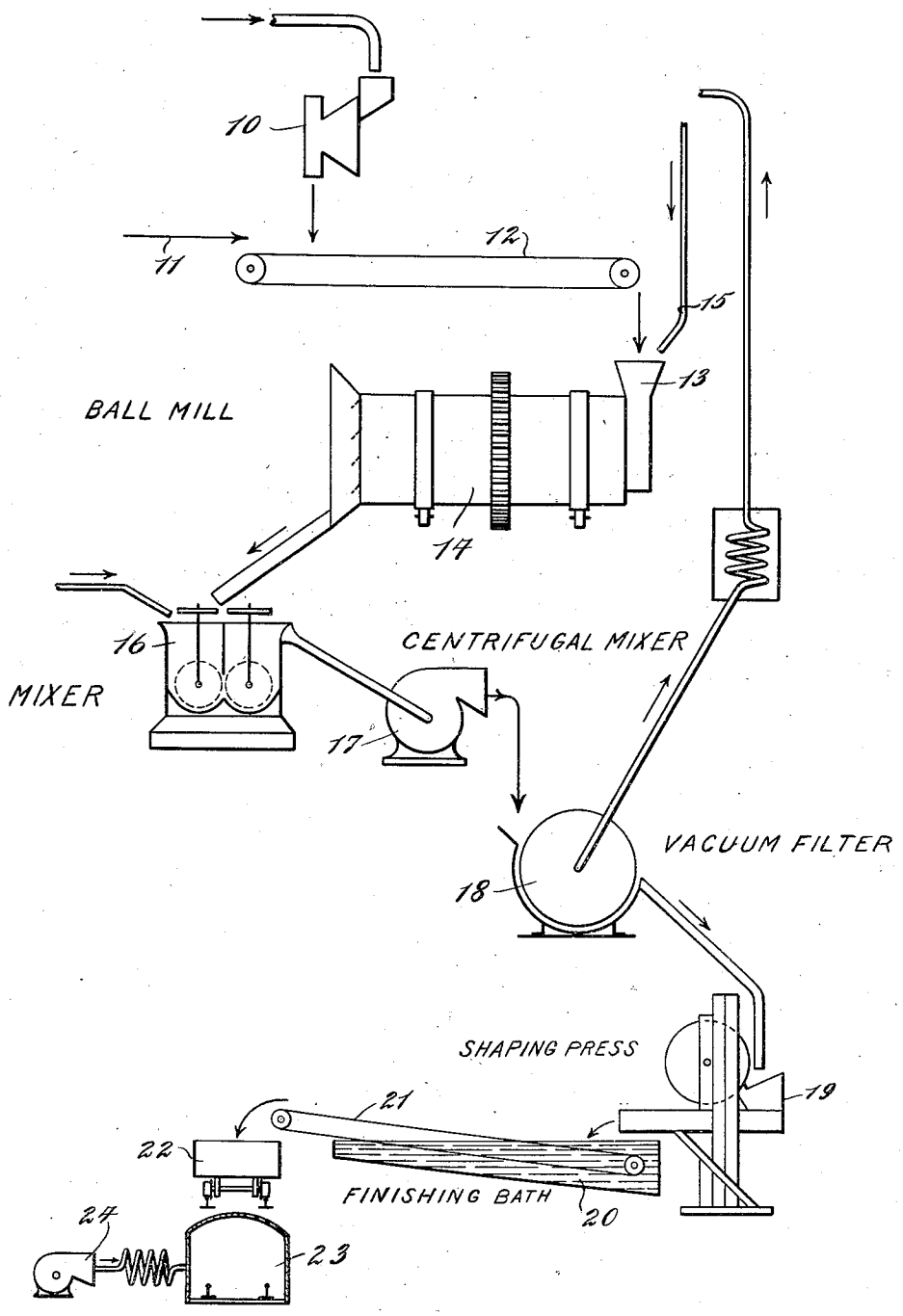
Jan. 27, 1931. R. V. SMITH 1,790,356

SOLID FUEL

Filed Oct. 23, 1929



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Patented Jan. 27, 1931 1,790,356

UNITED STATES PATENT OFFICE

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SOLID FUEL

Application filed October 23, 1929. Serial No. 401,830.

My invention more particularly relates to solid fuel formed of pieces in each of which the ingredients are cemented together and is not formed under substantial pressure as is done in the briquetting art.

I have illustrated my invention in conjunction with an apparatus that is suitable for producing fuel embodying my invention, although it will be understood that my process could be carried out by apparatus differing from that illustrated.

One of the essential materials of the fuel embodying my invention is the hydrocarbon gilsonite. This is an asphaltic material found in its natural state principally in Utah and Cuba. The material is a solid at ordinary temperatures and breaks with a conchoidal fracture.

My invention will best be understood by reference to the accompanying drawing, in which I have illustrated in a diagrammatic way an apparatus suitable for producing fuel embodying my invention.

I first grind the gilsonite in a dry condition in a pulverizer 10, preferably of the impact type and run cold. The ground gilsonite is then mixed with carbonaceous material, such as coal which may be anthracite, bituminous, or cannel coal, lignite, charcoal from any source, or coke either from coal or petroleum, or distilled fuel formed in accordance with my present process. The carbonaceous material is fed to the apparatus as at 11, preferably onto a conveyor 12 from the end of which it is fed or dropped into the feed hopper 13 of a ball mill 14, a suitable amount of water being also introduced to the hopper as at 15 to form with the ground mixture of gilsonite a mixture in the nature of a slurry.

In order to keep the price of the product down to a commercially permissible limit, I use less than 9% of gilsonite to 100% of the finished fuel. I have found in practice, however, that it is not desirable to reduce the amount of gilsonite to less than about 3 to 3½% in order to produce a satisfactory fuel.

The slurry from the ball mill is fed to a mixed 16 of the agitator type and which is illustrated as a U-shaped paddle mixer. I also introduce into the mixer 16 a suitable petroleum oil which is in a fluid condition, the slurry coming from the ball mill being at such a temperature as to preclude the possibility of solidifying the petroleum oil. For example, if the petroleum oil is in the form of waxed tailings, then the slurry should be introduced to the centrifugal mixer 16 at a temperature of about 140°. If, on the other hand, No. 8 gravity oil is used, the temperature of the slurry should be about 70° F. If a more thorough mixture of gilsonite, carbonaceous material and oil is desired than is obtained in the mixer 16, then I prefer to pass it through one or more centrifugal mixers 17 from which the mixture is fed to a vacuum filter 18 which removes the excess of water and from which the solid portions are peeled off in a light, fluffy, solid mass. This material is then fed to a shaping press 19, the function of which, however, is to form the material into suitable pieces rather than exert heavy pressure thereon. In fact, I desire to apply as little pressure as possible, since high pressure is detrimental to the quality and value of the fuel.

From the press, the pieces of fuel are preferably passed through a finishing bath 20 preferably containing soap and water, and which is deeper at the receiving end than at the delivery end. A conveyor 21 receives the pieces of fuel and delivers the same into a receiving crate 22 which may, if desired, be passed through a tunnel 23 through which air may be forced by a blower 24.

The function of the finishing bath is to remove any loose particles adhering to the surface of the pieces of fuel, and, second, to case-harden the surfaces of the pieces of fuel themselves. While I have mentioned soapy water as suitable for this purpose, it is to be understood that any solution which performs the function of removing the loose particles of material and of case hardening the surfaces of the pieces of fuel may be used.

I have found that while briquets of fuel made in accordance with the briquetting art as known in practice are coherent and solid

and are adapted to withstand disintegration in shipment, they invariably burn with the production of an excessive amount of soot and smoke, and frequently burn with the crumbling and destruction of the briquets themselves when the heating begins, and I have further found that, in order to produce briquettes, it has been necessary to use a more expensive apparatus than is justified, and to expend an excessive amount of power, especially in the mixing and pressing portions of the process.

I have chosen to depart from the briquetting art, and to incorporate water as an integral part of the fuel, so that its decomposition during the act of burning furnishes gases useful in cracking the tars produced as the burning proceeds and thus eliminates soot and smoke. I have found that the incorporation of this water permits the use of comparatively smaller quantities of power and very much cheaper and more highly efficient apparatus, and at the same time produces a more nearly smokeless form of fuel and one that is more easily saleable. I choose to depart from the method of mixing petroleum oils and asphaltic compounds in a hot and molten condition, which would require a considerable expenditure of time and power, as I secure a much more intimate mixture by the wet mixing of the mass and the subsequent abstraction of the excess water on a vacuum filter, which gives me a most complete mixture and a high degree of uniformity, together with a residual quantity of moisture which becomes incorporated in the emulsion which results from this process of treatment.

The power and the cost of filtering and a subsequent compression under light pressure, more to shape than to consolidate the material, results in the use of simpler apparatus and a marked reduction in the cost of production. I also find that the last step of washing and case-hardening the particles leaves them clean when handled, and thereby materially enhances the saleability of the material. I thus gain a reduction of cost in the matter of power and labor, reduction of cost in the matter of the plant involved, and gain saleability as well.

The vacuum filter removes from the mixture water in such an amount that there is 5% to 8%, and preferably approximately 5%, in the finished fuel. Gilsonite is present in the finished fuel in the proportion of 3½% to 9%, preferably approximately 5%, carbonaceous material in the proportion of 76% to 84%, preferably approximately 80%, while petroleum residue is present in the proportion of 8% to 13%, preferably approximately 10%.

Gilsonite is used instead of asphalts produced in the petroleum industry, for the further reason that the natural asphalt, gilsonite, has an extremely narrow margin between its melting point and the temperature at which it undergoes decomposition—a margin which is far narrower than any yet known to exist in the case of artificial or prepared asphalts. Thus, when the natural asphalt is put into the fire, the decomposition starts and the material burns before it melts, with the result that the briquet remains coherent instead of breaking up when burned.

In a copending application #401,829 the process of making these briquets is claimed.

I claim:

1. A fuel consisting of 76% to 84% of carbonaceous material, 2½% to 9% of gilsonite, 5% to 8% of water, and 8% to 13% of petroleum residue.

2. A fuel consisting of approximately 80% of carbonaceous material, approximately 5% of gilsonite, approximately 5% of water, and approximately 10% of petroleum residue.

3. A cementitious fuel formed in the absence of a substantial amount of pressure and consisting of 76% to 84% of carbonaceous material, 3½% to 9% of gilsonite, 5% to 8% of water, and 8% to 13% of petroleum residue.

4. A cementitious fuel consisting of 76% to 84% of carbonaceous material, 3½% to 9% of gilsonite, 5% to 8% of water, 8% to 13% of petroleum residue, and having its surface case-hardened and free from loose particles.

5. A cementitious fuel consisting of pieces formed in the absence of substantial pressure, each piece consisting of 76% to 84% of carbonaceous material, 2½% to 9% of gilsonite, 5% to 8% of water, and 8% to 13% of petroleum residue.

6. A cementitious fuel consisting of pieces formed in the absence of substantial pressure, each piece consisting of 76% to 84% of carbonaceous material, 2½% to 9% of gilsonite, 5% to 8% of water, and 8% to 13% of petroleum residue, the surface of each piece being case-hardened and substantially free from loose particles.

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