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BRIQUETTE AND PROCESS OF
MANUFACTURING SAME

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The invention relates to briquettes and in its broader aspect, it is directed principally to improving the manufacture and properties of fuel briquettes.

Pitch is not now generally used in the United States as a binder for briquettes, although its use in European countries for this purpose is standard. Briquetting pitch is known in the industry as hard pitch. It has a melting point of 200 to 225 degrees F. Mixed in powdered or melted form with fine material which is dried and heated for the purpose and then briquetted, this product forms a tough and durable briquette. In burning, the pitch binder is coked, and burns no more rapidly than coal.

In the United States until the first World War, hard pitch was commonly used as a binder for briquettes. Its use for this purpose during the last twenty years has been superseded by petroleum asphalt. The reason is as follows:

The combustion of fuel briquettes made with the pitch binder is accompanied by the generation of smoke. This smoke, unlike that produced by the burning of coal or oil, is oily and acid. It is irritating to mucous membranes, and as it condenses in the air, it falls as mist or light rain, clinging to surfaces on which it falls and discoloring everything it touches. The odor of this pitch smoke is offensive. Under the usual conditions of domestic use, it creates an intolerable nuisance. These characteristics of hard pitch, when used as a binder for briquettes, have, in recent years, eliminated the use of pitch briquettes as a domestic fuel in the United States, even in the territory where soft coal, a smoky fuel, is generally used for domestic heating. In the middle west, to which the manufacture of briquettes is mainly confined, the universal binder is petroleum asphalt, which produces a light colored smoke in burning, by no means so damaging and offensive as that produced by briquetting pitch. Even when used in locomotives and stationary power plants, under controlled conditions, briquetting pitch, on account of this oily, irritating smoke, has not been able to maintain its position, although it is a strong and cheap binder, standing up well under forced draft, and as shown by many tests, superior in efficiency to the raw coal, out of which the briquettes are made. The use of pitch briquettes on the D. & L. & W. railroad was abandoned after some years, it is alleged, because of the objections of the firemen, who claimed that they could not endure noxious vapors.

The objectionable element in hard pitch smoke

is creosote oil, which represents about 33% of the weight of the pitch. During the last twenty years, beginning in the early twenties, a substantial industry has been developed in the recovery of creosote oil by distillation from coal tar. This distillation has been carried to the point of leaving only 13 to 15% of the creosote oil in the residual pitch. Beyond this point, it has not as yet been found economical to recover the oil. This process of distillation which removes over half the objectionable creosote oil, has unfitted the residual pitch to serve as a binder for briquettes. While the smoke is greatly reduced, the binding properties of the briquettes have been also reduced. The residual of this process of distillation is a hard, brittle, substance, easily pulverized, and having a melting point of 280 to 330 degrees F. Briquettes made with fuel (high melting point) pitch as a binder, because of the reduction of the binding elements in the process of distilling the oil, are very brittle and suffer considerable loss in weight in handling. The crushing strength of fuel pitch briquettes is less than half the strength of briquettes made with the combination of starch and asphalt. It is necessary, therefore, if an excessive amount of pitch is not to be used, to add to the pitch a plasticizing ingredient to toughen the briquette.

I have discovered that 3.5 per cent of this fuel pitch, when mixed with an equal percentage of a plastic substance, such as asphalt, starch or concentrated sulphite liquor, in an equal amount, can be used as a binder in the manufacture of a satisfactory briquette for domestic use. A test made of these pitch-starch briquettes, cured at 400 degrees F., showed a crushing strength of 475 lbs. per sq. inch, compared with 375 lbs. for briquettes made with the same percentage of starch-asphalt binder, and on the same press. The process which I employ is as follows:

Fuel pitch, pulverized by a single grinding to a fineness of 30 to 50 mesh, is mixed with a supplementary liquid binder, starch, asphalt or concentrated sulphite liquor, and the composite binder which represents about 7 per cent of the weight of fuel to be briquetted is then mixed with the coal. The pitch may be mixed dry with the coal and then melted, and the supplementary binder added to the mixture in dry form. It is then softened and fluxed, by the addition of super-heated steam. But owing to the high melting point of the fuel pitch, and the difficulty of keeping the mix at that temperature, it is more satisfactory to mix the powdered pitch cool, with the liquid binder, to which water may be added

to improve the distribution, and then mix the composite binder with the fines before briquetting. This substance, so mixed with the composite binder, is then briquetted. The briquettes are then passed through a drying oven in which they are subjected to a gradually increasing temperature, rising from 250 degrees F. for 15 minutes, a drying temperature which expels the moisture to 400 to 600 degrees F. from 15 to 30 minutes which melts the pitch, and distributes it throughout the substance of the briquette. This heating of the briquettes beyond the drying temperature evaporates an additional amount of the creosote oil. A temperature of 400 degrees removes 43% of the creosote oil remaining in the binder at that point, and a temperature of 600 degrees removes 72%.

After this heating, the briquettes are allowed to cool. As the temperature falls below the melting point of the pitch, this composite binder hardens, blended with the supplementary material, it forms a tough, hard and strong briquette, which will stand rough handling, and which produces a negligible amount of creosote smoke in burning.

Fuel pitch, to the best of my knowledge, has never been used as a binder for briquettes. The fact that, as compared with briquetting pitch, nearly all the creosote oil has been removed by the above described process, which supplements the preliminary distillation of creosote oil, entitles it to rank as a new product. This second evaporation (or distillation) of creosote oil from the pitch-bound briquettes, which follows the primary distillation of creosote oil from tar, reduces the creosote oil remaining to 3.64% of the binder and .016% of the weight of the briquette, is new.

This process is not a coking or carbonization process. To carbonize a pitch binder, after it is incorporated in the briquette, requires a much higher temperature than that which I employ. In fact, 1200 to 1800 degrees F. is necessary. The process covered in this application is an evaporation (or distillation) process which aims, not to convert the pitch binder into coke—this will be done in the process of combustion—but to produce additional distillation which will serve to further reduce the percentage of creosote oil remaining after the distillation of the creosote oil from coal tar, in its original process of manufacturing this product. The oven through which the briquettes are passed, for the purpose of drying and heating, is, in fact, a supplementary still in which almost all the remaining objectionable creosote is eliminated.

I am aware that the carbonization of pitch binders in briquettes has been known for many years, and that many patents have been issued in the United States and in foreign countries covering the carbonization of pitch binders. This process, described in the instant application, to repeat, is not a coking process. The temperatures used are far below those necessary for carbonization of the pitch. The binding property of the asphalt, moreover, because of these low temperatures, is not weakened by carbonization, and the amount necessary to use in combination with the pitch in the composite binding material, as the briquetting binder, is materially reduced.

The percentage of composite binder used in the manufacture of fuel briquettes to be burned under natural draft, must be increased when the briquettes are to be burned under forced draft; or, in metallurgical use, when considerable weight must be sustained by the fuel. I do not wish to be limited to any specific percentage, since this must be modified according to the conditions under which the fuel is to be used.

Having thus described my invention and the method by which it is operated, I claim the following:

1. A fuel briquette comprising coal fines and a binder therefor; said binder comprising fuel pitch including creosote oil and a supplementary binder; the creosote oil in said binder comprising about 3.64 per cent by weight of said binder and about .016 per cent by weight of said briquette.

2. A fuel briquette comprising coal fines and a binder therefor; said binder comprising fuel pitch including creosote oil and an asphalt, each in a quantity of about 3.5 per cent by weight of the briquette; the creosote oil in said binder comprising about 3.64 per cent by weight of said binder and about .016 per cent by weight of said briquette.

3. In the process of manufacturing a fuel briquette of coal fines and a fuel pitch including creosote oil, the steps of mixing the said fuel pitch in which the creosote oil has been reduced to 13 to 15 per cent of the original quantity and a substantially equal quantity of a supplementary liquid binder; mixing said composite binders with said coal fines in a proportion whereby said binders comprise about 7 per cent by weight of the fully mixed material; briquetting said mixed material; drying said briquettes at a temperature higher than the melting point of the fuel pitch but lower than the carbonizing point thereof, and distilling additional creosote oil out of said fuel pitch.

4. A fuel briquette comprising coal fines and a binder therefor; said binder comprising fuel pitch including creosote oil and an asphalt, each in a quantity of about 3.5 per cent by weight of the briquette; the creosote oil in said binder comprising about 3.64 per cent by weight of said binder and about .016 per cent by weight of said briquette; said briquette having a crushing strength greater than 450 pounds per square inch.

5. In the process of manufacturing a fuel briquette of coal fines and a fuel pitch including creosote oil, the steps of mixing the said fuel pitch in which the creosote oil has been reduced to 13 to 15 per cent of the original quantity and a substantially equal quantity of a supplementary liquid binder; mixing said composite binders with said coal fines in a proportion whereby said binders comprise about 7 per cent by weight of the fully mixed material; briquetting said mixed material; drying said briquettes at a temperature higher than the melting point of the fuel pitch but lower than the carbonizing point thereof, and distilling additional creosote oil out of said fuel pitch; said pitch being intimately dispersed through said coal fines in uncarbonized form.

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