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T. H. BUTLER ET AL

PROCESS FOR THE PRODUCTION OF LIQUID FUEL MIXTURES

Filed August 13, 1925

Fig. 1.

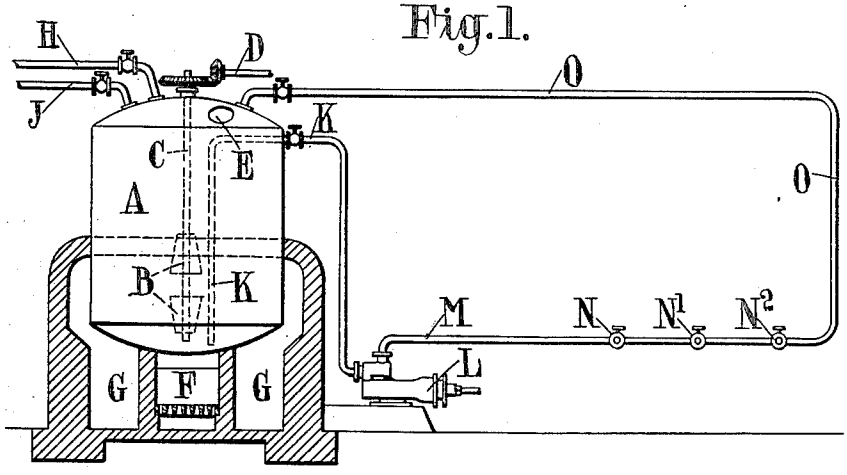
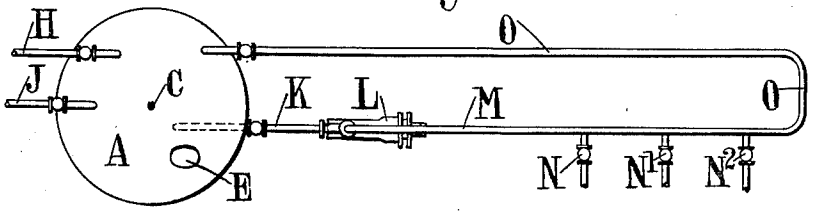


Fig. 2.



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UNITED STATES PATENT OFFICE.

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PROCESS FOR THE PRODUCTION OF LIQUID-FUEL MIXTURES.

Application filed August 13, 1925. Serial No. 50,058.

To all whom it may concern:

Be it known that we, THOMAS HOWARD BUTLER, FREDERICK JAMES WILLIAM POPHAM, JOHN CHRISTOPHER MANN, and HERBERT WILLIAM ROBINSON, British subjects, and residents of Bristol, England, Birmingham, England, and Cleobury Mortimer, England, have invented a certain new and useful Improved Process for the Production of Liquid-Fuel Mixtures, of which the following is a specification.

This invention relates to the production of liquid fuels by blending coal tar pitch with fuel oils of petroleum or asphaltic origin. The fuel value of pitch has been, of course, already recognized, and attempts have been made to blend pitch with fuel oils such as petroleum.

When pitch is blended with fuel oil of the above kinds, there is a tendency for the bitumen to separate out and to carry with it the free carbon. It is the object of the present invention to produce pitch and fuel oil mixtures in such a condition that they may be employed as liquid fuels while maintained at a temperature above the melting point of the pitch.

According to the present invention, the pitch to be blended with the fuel oil has its temperature raised and maintained substantially above its melting point, and the fuel oil is slowly stirred in. The pitch may be melted and its temperature raised to the requisite point or the pitch may be run direct from the stills wherein it is produced and the temperature maintained at the necessary point. In the case of most pitches the temperature may be raised to from 170 to 200° C., and should not be allowed to fall below 150° C. The stirring is continuous but not necessarily vigorous. The necessary temperature may be maintained either by the gentle application of heat to the vessel in which the pitch is melted, or by pre-heating the fuel oil before stirring it into the pitch. The stirring should be more vigorous if the oil is added more rapidly, but there is generally no difficulty in effecting the mixing. Too high a temperature must not be employed at this stage as there is a liability for the free carbon to be deposited from the pitch.

It is found that the critical temperature above which the blending must be carried out varies with qualities of pitch of different melting points. It also varies for different fuel oils which are to be mixed, and also for different proportions between the fuel oil and pitch. When utilizing the mixture for fuel purposes, it is preferred to pump the mixture, while still in the heated and liquid condition, through a pipe circuit, so that a portion of it returns to the melting and blending vessel. The rate of pumping is so regulated that any desired amounts are tapped off from the pipe circuit by branches leading to burner nozzles, and yet leaving a certain amount of the mixture to be returned by the circuit to the melting and blending vessel, as mentioned above, thus maintaining a continuous cycle.

Some embodiments of the present invention will now be described with reference to the accompanying drawings, wherein:—

Figure 1 is a diagrammatic side elevation of the blending vessel, the pipe circuit and the associated equipment; while

Figure 2 is a plan of the same.

In these drawings, A is the melting and blending vessel mounted in brickwork for heating by means of a fire-grate F with side flues G. A pair of reversed cones B forming an agitating mechanism are mounted on a vertical spindle C, and rotated from a driving shaft D through bevel gearing. The hot pitch from the stills enters through the pipe H, and the fuel oil is admitted by way of the inlet pipe J. There is a manhole E provided in the cover of the vessel A, so that cold pitch may be charged in if necessary. The heated and blended mixture may be taken off by means of a pipe K extending down to the bottom of the vessel A, the mixture being drawn into the pipe K by a reciprocating suction pump L, and then forced into the pipe M supplying the branches N, N′, N″ leading to burner nozzles. The surplus mixture returns by way of the pipe O to the vessel A for further heating and mixing.

According to one example, one ton of

medium pitch and one ton of black fuel oil are admitted to the vessel A. The pitch has, for example, a melting point of from 72 to 80° C, and the black oil may be a thick oil of asphaltic origin having a specific gravity of from .950 to .980. Such an oil is a thick viscous oil having a viscosity (Redwood at 60° C.) of 292 and a flash point of 205° C. The pitch is heated to 200° C. and the fuel oil steadily added through the pipe J. The fire on the grate F is continued and care taken that the temperature does not fall below 150° C. The stirring cones B are kept in rotation and a mixture homogeneous above 150° C is obtained. On cooling below this, bituminous matter separates out, but is easily stirred in again on warming. The pipe circuit M, O may be of any length, depending upon the rate of pumping to ensure the return of a portion of the hot mixture to the vessel or tank A. To prevent heat radiation losses, the pipe circuit may be insulated, or alternatively, the temperature maintained by means of an internal steam pipe or an external steam jacket.

The same apparatus and a similar process is employed for different grades of pitch and different fuel oils, and for blending mixtures of different proportions of pitch and oil, the only difference being that different temperatures may be employed under the different conditions.

The following examples may be cited: If the medium pitch, referred to above, obtained from mixed gas tar is used, and the same viscous black oil, but two parts by weight of the pitch being employed with one part by weight of the black oil, the critical temperature above which the blending should take place, is still 150° C. If the proportions are altered to three parts by weight of the same pitch to one part by weight of the same black oil, the critical temperature above which the blending must take place is reduced to 90° C.

In the case of a hard English pitch, obtained mainly from vertical retort tar and having a melting point slightly above 100° C, three parts by weight of this pitch may be blended with one part by weight of the same viscous black oil, but the critical temperature above which the blending must take place is then as high as 250° C. If hard pitch, similar to that just mentioned is employed, it may be blended with a light fuel oil. Such an oil may be a thin oil of petroleum origin, having a specific gravity of .855, a viscosity (Redwood at 21° C) of 50, and a flash point of approximately 93° C. With such an oil, good mixtures are obtained which have low viscosity and are consequently readily manipulated. If three parts by weight of the hard pitch, referred to above, are blended with one part of this thin oil, a critical temperature of at least 210° C. must be maintained during the blending.

According to another exampde, soft American pitch, obtained from coke oven tar and having a melting point of 60 to 65° C., may be blended with the thin petroleum oil above referred to. If three parts by weight of such soft pitch is blended with two parts by weight of the thin fuel oil, the critical temperature which must be exceeded is 120° C. If, on the other hand, four parts by weight of the soft pitch of the above quality is blended with one part of the thin fuel oil, it is only necessary to blend above a critical temperature of 80° C.

According to yet another example, a medium pitch from American coke ovens, and having a melting point from 72 to 80° C., is blended with the above-mentioned thin petroleum oil. If three parts by weight of such medium pitch be blended with two parts by weight of the thin fuel oil, blending must be carried out above a critical temperature of 110° C. In this process, free carbon is found to separate out, if the temperature of blending exceeds 300° C. and, of course, this should be avoided.

It will be understood that the above are merely examples of certain grades of pitches which may be employed, and certain fuel oils, and also of certain proportions of each of the two ingredients which are blended. It will be understood, of course, that the invention is not limited to these examples, but briefly the invention may be said to consist in producing homogeneous mixtures of pitch and petroleum residue by blending these constituents above a certain temperature, herein referred to as the critical temperature, below which a bituminous material begins to separate out and agglomerate. Generally speaking, this critical temperature may be lowered by either the use of a softer pitch or by increasing the proportion of pitch relatively to the fuel oil or finally by the addition of solid hydrocarbons of the naphthalene or anthracene series, obtained from the distillation of coal tar.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:—

1. A process for obtaining homogeneous mixtures of pitch and petroleum residue which consists in melting the pitch, raising the latter to a temperature substantially above its melting point, and gradually admitting the petroleum residue while continuously stirring.

2. A method of supplying fuel to liquid fuel burners, consisting in blending pitch and liquid petroleum residue at a temperature substantially above the melting point of the pitch, circulating said blended mixture at a rate in excess of that at which the

mixture is consumed in the burners, and returning the excess of the mixture to a vessel for reheating.

3. A method of producing a homogeneous liquid fuel which consists in raising the pitch considerably above its melting point, gradually adding liquid petroleum residue, and a hydrocarbon of the naphthalene or anthracene series, and maintaining the temperature of the molten mass by continuously heating same during blending.

In witness whereof we hereunto subscribe our names this 31st day of July, 1925.

THOMAS HOWARD BUTLER.

FREDERICK JAMES WILLIAM POPHAM.

Signed this 7th day of July, 1925.

HERBERT WILLIAM ROBINSON.

JOHN CHRISTOPHER MANN.