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FLUID FUEL AND METHOD OF PRODUCING THE SAME.

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Our invention relates to a method of stabilizing cracked residual oils to render them utilizable as fuel oils, and to the fluid fuel produced by such method.

The invention is designed particularly for the stabilization of the heavy residues or residual asphaltic oils resulting from the ordinary cracking processes used in producing gasoline from petroleum (crudes, topped crudes or residuals), and may also be applied to tank deposits resulting from decomposition of such cracked residual oils.

Cracked residual oils usually have a large content of insoluble carbonaceous matter, ordinarily being approximately 49% insoluble in ligroine and 17% insoluble in benzole, and running as high as 70% insoluble in naphtha. Cracked residual asphaltic oils contain a large percentage of asphaltenes, components of crude oil precipitated and separated by the addition of light petroleum naphtha.

Because of their large percentage of asphaltenes, cracked residual oils are usually unstable. Upon being stored or allowed to stand, particularly in a warm condition, carbonaceous matter is deposited, the residue separating into a heavy layer of coky or asphaltic mushy solid or semi-solid matter, oxidized in character and insoluble in the remainder of the oil or in gasoline, and a thinner or lighter oil floating above the solid mass. The solid or semi-solid deposit is the end product of a reaction in which the original separable asphaltenes have undergone in air and heat an extended oxidization and polymerization. It contains little oil, from 90% to 100% of the material of which it is composed being matter insoluble in ligroine. Very little free carbon (not over 10%) is present.

Because of such instability, these residual oils will not flow, and, if an attempt is made to utilize them as fuel oils, they clog the pipe lines, valves and fuel oil burners. They are consequently unsuited for use as fuel oils, and of no value as such.

The present invention has for its purpose the recovery or alteration of cracked residual oils which have lost, or have a tendency to lose, their original homogeneity and fluidity.

More particularly the principal objects of the invention are the provision of a process of treating cracked residual oils to stabilize such oils and render them suitable and valuable for use as fuel oils; the alteration of such residual oils to prevent the deposit therefrom of coky or insoluble constituents; and the stabilization of such cracked residual oils and the production of a utilizable fuel oil therefrom, by blending therewith materials capable of holding the constituents thereof in permanent solution or suspension.

Heretofore, fluid fuels have been produced by combining with a liquid fuel powdered or finely divided solid fuel particles, such as coal, coke, lignite, or similar carbonaceous matter.

The production of such fuels from these materials is troublesome and expensive, the cost of the carbonaceous matter being considerable, and the necessity of bringing it into a finely pulverized or powdered state increasing the difficulty and expense incident to the production of the resultant fluid fuel. Furthermore, the coal or coke commonly employed for this purpose is a natural product, which can be readily burned in grates or furnaces in its original solid condition, without pulverization or stabilization.

Our process, on the other hand, produces a usable fluid fuel, largely from an otherwise useless and waste product. The material we employ is an artificially produced semi-solid sludge which under no conditions can be utilized in its original state, and which, as a fluid fuel, would be a menace to any oil-burning system into which it might be introduced.

By the stabilization of the cracked residual oils or residues according to our process, these residues are retained in a fluid state and are made usable as a fluid fuel. Such stabilization is effectively accomplished by thoroughly mixing and blending with the residual oil, in the proper proportions, a quantity of a substance which we have discovered will act as a stabilizing element. The stabilizer preferably employed consists of rubber, in the form of rubber latex, rubber gum or caoutchouc, or ordinary unvulcanized rubber (milled or unmilled). The rubber is extremely effective in so altering the residual oil as to prevent the deposit

therefrom of any of its coky or insoluble constituents. It acts as an oil-soluble protective coating when it is thoroughly mixed with an oil containing insoluble solids, or is added to an oil to which a predetermined quantity of carbonaceous or coke-like material has been added.

Our process consists in combining rubber as a stabilizing element, with the residual oil, and blending the mixture by agitation, preferably with the aid of heat.

In carrying out the process we first thoroughly mix the residual oil with a pure stable fuel oil or crude oil, so as to thin the residue. The proportions of the residual oil and fuel oil used may be varied, but a good fuel oil may be produced by combining them in the volumetric proportions of 65% of petroleum fuel oil to 35% of solid cracked materials, with which mixture 0.05% to 0.5% by weight of gum rubber may be employed. As much as 50% by weight of carbonaceous solids may be used, but will require larger proportionate amounts of rubber.

The rubber is combined with and dissolved in a small proportionate quantity of a suitable oil, preferably petroleum naptha, and the solution is added to the thinned residual oil. The rubber, being soluble in both the naptha and the residual oil, acts as an oil-soluble colloid protective toward and holding in suspension any insoluble free carbon or carbonaceous matter which may be existant in the mixture. It has a similar protective action toward flocculated easily oxidizing asphaltenes.

The protective action of the rubber in the solution may also be exerted as an anti-oxidant, preventing oxidization of those components in the oil that are sensitive to or affected by air, holding them in solution or suspension and preventing precipitation of insoluble sludgy material.

The stabilizer, dissolved in naphtha, in the proportions required for the solution, according to the weight of the stabilizer found necessary, may have added to it from 10% to 20% of a pure stable fuel oil. The addition of water, up to 18%, is in some cases an aid to stabilization, but is not necessary, as the mixing and stabilizing process may be carried on effectively either with or without the addition of water.

The resulting mixture, after being well agitated in a circulating pump, is pumped or otherwise introduced into a tank containing the thinned unstable cracked residual oil, the components of which have also been thoroughly mixed by stirring or other suitable means of agitation.

The contents of the tank are then well stirred, preferably by motor-driven paddle-wheels or other suitable mechanical stirring devices. After the mixing has proceeded for approximately an hour (for a 100 barrel batch), the mixture may be recirculated back and forth through a centrifugal pump, in order to obtain a more intensive mixing and a more intimate blending. While the mixing operation is being carried on, the mixture is heated, and preferably maintained at a temperature between normal and 180° F. When the mixing has proceeded for approximately an hour, hot oil is drawn from the bottom of the tank and delivered to the top of the tank beneath the surface of the oil, care being observed to keep the hot oil out of contact with the air. The resultant intimately blended mixture may be pumped to oil burners, preferably while agitation of the oil in the mixing tank is being maintained continuously.

The invention is applicable not only to cracked residual oils which show characteristic instability, but also to the semi-solid carbonaceous material which results from the storing of such oils for long periods of time. The invention will effectively stabilize cracked residual oils ranging in Baumé specific gravity from 5° heavier than water to 18° lighter than water. It is not limited to residual products produced from any one cracking process, but is applicable to any ordinary residual waxy or asphaltic cracked oil, boiling above the gasoline boiling point range.

Our invention is, in fact, applicable to several forms of carbonaceous matter, including cracked residual oils, tank settlings, and even finely ground coke. The carbonaceous matter, mixed with a good fuel oil, is stabilized by the rubber, and a limpid liquid fuel oil high in heat value is produced, the low heat value carbonaceous material being suspended in a minutely divided condition in a petroleum oil or fuel oil already containing a substantially high heat value. The process thus allows liquid or solid or semi-solid hydro-carbon cracked mixtures to be utilized that are otherwise valueless as fuel and are a hindrance to efficient refinery operations and a severe detriment and menace to fuel burning systems.

We claim:

1. A method of forming a fluid fuel product which comprises mixing a cracked residual asphaltic oil with a fuel oil, incorporating in the mixture rubber gum, and subjecting the mixture to heat and agitation.

2. A method of forming a fluid fuel product which comprises mixing a cracked residual oil with a relatively larger quantity of fuel oil, and a relatively smaller quantity of rubber gum, and subjecting the mixture to heat and mechanical agitation to obtain a thorough blending of the gum rubber with the carbonaceous matter in the mixture.

3. A fluid fuel product comprising a

blending of fuel oil, cracked residual oil and unvulcanized rubber.

4. A fluid fuel product comprising a blending of petroleum fuel oil, cracked residual asphaltic oil, and a solution of rubber in naphtha, benzole or gasoline.

5. A fluid fuel product comprising a blending of fuel oil, cracked residual oil, rubber gum and water.

6. A fluid fuel product composed of an intimate mixture of petroleum fuel oil, 50% to 80% by volume, asphaltic residuum from gasoline cracking processes, 20% to 50% by volume, and gum rubber, 0.05% to 0.5% by weight of the suspending oil.

7. A fluid stable fuel oil composed of an intimate mixture of solid carbonaceous tank settlings, resulting from oxidation of cracked asphaltic residuums or other solid or semi-solid deposits, with crude or topped crude, and gum rubber from 0.05% to 1.0% by weight of the suspending oil.

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