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LIQUID FUEL

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Our present invention relates to methods of preparing liquid fuels and to the resulting fuel products themselves, and aims to devise methods of the general character specified which are simple, which are easy and economical to practice, and which result in liquid fuels characterized by their increased thermal and combustion efficiency, their freedom from carbon deposit on combustion, and their ease of fabrication, the resulting fuels themselves constituting a part of the present invention. Other objects and advantages of the methods and resulting products of the present invention will in part be pointed out in detail hereinafter and will in part be obvious to those skilled in the art to which the present invention relates.

In the accompanying specification we shall describe several illustrative embodiments of the methods of the present invention. In the accompanying specification we shall also describe several illustrative embodiments of the resulting fuel products of the present invention. It is, however, to be clearly understood that our invention is not limited to the specific embodiments thereof herein described for purposes of illustration only. It is also to be clearly understood that the methods of the present invention are not restricted in their use to the production of the aforesaid resulting products of the present invention, nor are such products restricted to their manufacture by the aforesaid illustrative embodiments of the methods of the present invention, such methods being of general application and such products being capable in certain instances of being prepared by other methods.

Before describing the aforesaid illustrative embodiments of the methods and resulting products of the present invention, it may be desirable briefly to refer to the prior art to which the present invention relates. Hitherto it has been proposed to add certain metallic compounds to liquid fuels in order to permit an increase in the degree of compression to which the fuel might be subjected on combustion, as in an internal combustion engine, without producing undesirable effects. In each instance the amount of the metallic compound, such as a compound of lead, for example a lead soap, has been substantial, that is, about one part in a thousand, or about one-tenth ($\frac{1}{10}$) of one per cent. (1%). It has also been proposed for the same general purpose to add to a liquid fuel a mixture of a resinous substance, such as a gum resin or resinous gum, and an oxide of a metallic substance, such as lead oxide. Here also the substance has been added in substantial amounts, such as one part in one thousand (1,000) or about one-tenth ($\frac{1}{10}$) of one per cent. (1%), and the purpose has been again to permit high compression of the vaporized fuel in an internal combustion engine, for example. It has further been proposed to use lead resinate or similar substances for the same general purpose and in substantially the same quantities, lead resinate being a name applied to the substance which would result, for example, from dissolving lead oxide in a solution of a gum resin or gum of general resinous character.

Of similar character and import is the use which has been made of a solution of lead oxide, such as litharge, dissolved in the substances called "sour distillate components" which are by-products of petroleum distillation. Here also the substance has been added in substantial quantities. Another instance is the addition of water and a metallic emulsifying agent, such as a metallic soap, for example, a mixture of copper oleate used as an emulsifying agent, and ammonium nitrate, together with water in such quantities as to produce a hydrocarbon emulsion of water. In this instance practically equal weights of water and hydrocarbon oil have been used so that this product can hardly be called a hydrocarbon fuel since it contains a large percentage of water, almost as much water, in fact, being used as oil itself.

Our invention is to be sharply distinguished from these prior efforts of the art in that we avoid the use of water or other diluent. We also avoid the use of any additional agent in such a quantity that it will substantially modify the chemical character of the fuel. We prefer therefore to add to the liquid fuel a catalytically small amount of a metallic

substance, such as a metallic soap. We have discovered that the addition of such a substance in catalytically small amounts to a liquid fuel greatly increases the efficiency of combustion, minimizes, in fact, almost eliminates, the deposition of carbon, and produces a fuel which will burn evenly and with higher thermal and combustion efficiency. In fact, in certain cases we have noted an increase of as much as ten per cent. (10%) in the amount of power generated by the use of the fuels of the present invention. For the addition agent, which is preferably added in an amount less than one part in ten thousand (10,000), such as one part in twenty thousand (20,000), or even less, such as about one part in thirty thousand (30,000), we may use a suitable metallic soap which is soluble in the hydrocarbon fuel itself, or in a miscible or compatible solvent of the hydrocarbon type, such as benzine, benzol, kerosene, etc.

While various liquid fuels may be used in connection with the practice of the present invention, we prefer to use either the hydrocarbons of the aliphatic series or the hydrocarbons of the aromatic series, or mixtures of the same. In certain cases we may also successfully treat in accordance with the principles of the present invention monohydric or polyhydric alcohols, or mixtures of the same. We may also successfully treat in accordance with the principles of the present invention coal tar residues or mixtures of the same.

We now add to such a liquid fuel or fuel mixture a catalytic agent adapted to exert a catalytic action on the fuel so as to facilitate combustion and perfect oxidation and to render the combustion substantially complete with little or no carbon deposition. The catalytic agent thus added must not, either in its composition or in the amount added, interfere with the general combustible qualities of the fuel, in fact, should facilitate such combustible qualities. We have discovered that catalytically small amounts, that is, amounts less than about one part in ten thousand (10,000), even less than one part in twenty thousand (20,000), such as about one part in thirty thousand (30,000), of metallic soaps which are preferably soluble in the fuel being treated, possess these desirable properties. Above the amount designated the efficiency of combustion is actually, in many cases, reduced. Below the minimum amounts mentioned, the efficiency of combustion is likewise often reduced.

An alternative method and probably the one best adapted for applicants' purpose, taking into consideration the practical side of the situation, is to mix the catalyst in the proportions above set forth with a hydrocarbon, such as benzol, kerosene, etc., which mixture may be termed a stock mixture. This mixture, in turn, is mixed with the fuel being treated such as gasoline, as will later become apparent.

For each type of fuel and for each specific addition agent utilized, there is a more or less definitely determinable point at which maximum efficiency of combustion is obtainable with a predetermined catalyticaly small percentage of the addition agent. We prefer that the catalytic agent, such as the metallic soaps referred to subsequently as being soluble in hydrocarbon and other fuels, shall preferably be substantially anhydrous so that the resulting fuel is substantially free from water. We have discovered that the manganese soaps, such as manganese oleate, manganese linoleate or manganese resinate, are very well suited for the intended purpose, particularly where hydrocarbon fuels are being treated. This is for the reason that these soaps are relatively readily soluble in hydrocarbon fuels and the like. In fact each of the three manganese soaps mentioned is soluble almost to the extent of twenty per cent (20%) its weight in a given weight of hydrocarbon fuel. The stearate and palmitate of manganese are less desirable since they are less soluble and more expensive.

The oleate, linoleate and resinate of cobalt are likewise suitable for the intended purpose. The similar salts of calcium, are ordinarily less desirable since they are only very slightly soluble in hydrocarbon and like fuels. In each case the metallic soap or equivalent metallic catalytic agent should preferably be relatively readily soluble in the fuel with which it is intended to be used. It may here be stated that by "soluble" or equivalent term employed in the specification and claims we mean to include also colloidal suspensions of the metallic soap or equivalent metallic catalytic agent. It should here be stated however, that since only catalytically small amounts of the catalytic agent are employed, most of the substances designated will be sufficiently soluble in the liquid fuel to permit them to be used for the designated purpose. However, a relatively high degree of solubility of the catalyst in the liquid fuel is desirable since in that way a stock solution of the catalyst and the hydrocarbon, such as benzol, which is ultimately mixed in the liquid fuel may be prepared and made for future use.

Where the manganese soap, for example, is employed, we may prepare a stock solution of the manganese oleate, linoleate or resinate in a portion of the liquid fuel with which the hydrocarbon which will later be mixed with the catalyst is to be used. For example, we may prepare a two and one-fifth per cent (2⅕%) by weight solution of manganese oleate, linoleate or resinate and add 1 ounce by volume of such a solution to five (5) gallons of the fuel. This will correspond to about one part of the manganese soap in

about thirty thousand (30,000) parts of the liquid fuel.

The preparation of such a stock solution greatly facilitates the practice of the process and the preparation of the resulting liquid fuels and facilitates also the preparation of a uniform product. For example where gasoline, kerosene, benzol, alcohol or coal tar is the fuel to be treated, we prepare a stock solution of the manganese soap in the strength indicated in gasoline, kerosene, benzol, alcohol or coal tar, respectively, or in any other desirable miscible solvent in which the catalyst employed is relatively readily soluble. We have found further that a solution of the manganese soap in such a fuel is relatively stable and thus may be kept for considerable periods of time for use in accordance with the principles of the present invention.

The catalyst, in solution form or otherwise as above indicated, is added in the catalytically small amount specified and the mixture of fuel and catalyst is thoroughly stirred. The result is a stable, harmless and highly efficient fuel, rendered highly efficient in a very simple and convenient manner. The methods of the invention are, it is noted, simple and convenient to practice and result in superior fuel liquid products.

The product itself is characterized by its high degree of thermal efficiency, amounting often to an increase of 10% over the ordinary untreated fuels. It is further characterized by its substantial freedom from carbon deposition on combustion. It is also relatively cheap, costing almost no more than the ordinary fuel except for the negligible expense of the amount of the catalyst employed and the small expense of adding the catalyst. The fuel is stable, non-poisonous, and possesses other desirable properties.

This completes the description of the products of the present invention, characterized by their containing in solution or in colloidal suspensions catalytically small amounts of a metallic soap or equivalent metallic substance, preferably soluble in the liquid fuel itself, adapted to facilitate oxidation or combustion so that the products of combustion are substantially free from carbon and combustion is more efficient than it otherwise would be. Actual exhaust gas analyses show a considerable decrease of carbon monoxide and oxygen and a corresponding increase of carbon dioxide. Such analyses illustrate the increased efficiency of the fuels of the present invention even better than the freedom of the cylinders or other combustion chambers from deposited carbon. Other superiorities and advantages of the methods and resulting products of the present invention, particularly as exemplified in the aforesaid illustrative embodiments of the same, will readily occur to those skilled in the art to which the present invention relates.

What we claim as our invention is:

1. As a composition of matter, a liquid fuel containing in solution therein a small amount of a manganese soap.

2. As a composition of matter, a liquid fuel containing in solution therein a manganese soap mixed with a hydrocarbon solvent in an amount equal to about one part, by weight, of the mixture to about ten thousand parts, by weight, of the liquid fuel.

3. As a composition of matter, a liquid fuel containing in solution therein a manganese soap mixed with a hydrocarbon solvent in an amount equal to about one part, by weight, of the mixture, to about twenty thousand parts, by weight, of the liquid fuel.

4. As a composition of matter, a liquid fuel containing in solution therein a manganese soap mixed with a hydrocarbon solvent in an amount equal to about one part, by weight, of the mixture, to about thirty thousand parts, by weight, of the liquid fuel.

In testimony, whereof, we have signed our names to this specification this 1st day of May, 1928.

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