

UNITED STATES PATENT OFFICE

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LIQUID FUEL

No Drawing.

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This invention relates to a liquid fuel that is suitable for use in internal combustion engines and that comprises an alcohol of calorific value that is relatively high in proportion to its boiling point.

Alcohols have been suggested and used for some time as an addition to gasoline for automobile and other internal combustion engines. Ethyl alcohol has been the most used.

There are a number of objections to the use of alcohol in such fuels. If the alcohol is low boiling and, therefore, most suitable in vapor pressure for use in gasoline mixtures for motors, then the alcohol has a much lower calorific value than the gasoline. This is particularly true of the methyl and ethyl alcohols. Further, there is difficulty of blending gasoline with low boiling alcohols, unless the alcohols are nearly anhydrous or unless there is used a blending agent. Numerous blending agents are disclosed in the patent literature.

In the series of monohydric, aliphatic alcohols, the heat of combustion per mole and also per gram increases with the molecular weight of the alcohol. Also, the distribution coefficient of the alcohol in gasoline and water solutions indicates a higher solubility of the alcohol in the hydrocarbon layer, the higher the molecular weight of the alcohol. While the higher alcohols are preferable to ethyl alcohol in these regards, many of the higher alcohols have vapor pressures that are lower than desired for certain motor fuels. Thus propyl and butyl alcohols—by these terms I mean the primary alcohols—have lower vapor pressures than ethyl alcohol at atmospheric temperatures.

By using secondary or tertiary alcohols in mixed motor fuels, I combine the desirable, relatively high vapor pressure with other desirable properties of alcohols of higher molecular weight. Particularly suitable alcohols for use in liquid fuels are isopropyl, secondary or tertiary butyl, and tertiary amyl. Thus, tertiary butyl alcohol has nearly the same calorific value as butyl alcohol (primary butanol) on the one hand

and, on the other, nearly the same evaporation rate as ethyl alcohol.

The secondary or tertiary alcohols may be mixed with petroleum distillate, as, for example, naphtha, gasoline, or kerosene, in various proportions. I have used to advantage 10 to 40 volumes of the secondary or tertiary alcohol, say 30, with sufficient petroleum distillate to make a total of 100 volumes.

Examples of motor fuel compositions follow. All proportions, here and elsewhere in this application, are expressed as parts by volume.

1. Gasoline, 60-90 parts; isopropyl alcohol, 40-10 parts.

2. Gasoline, 60-90 parts; tertiary butyl alcohol, 40-10 parts.

3. Gasoline, 60-90 parts; secondary butyl alcohol, 40-10 parts.

4. Gasoline, 60-90 parts; ethyl dimethyl carbinol, 40-10 parts.

The gasoline used may be of an average density of 58 to 60° Bé. Or it may be of a lower density, say of an average of approximately 64° Bé. Petroleum distillate that is more volatile than the usual motor gasoline is particularly desirable when the alcohol used is secondary butyl, tertiary amyl (ethyl dimethyl carbinol), or a less volatile secondary or tertiary alcohol.

In view of the readiness with which most of the water may be separated from aqueous secondary and tertiary alcohols, I suitably use these alcohols in a partly dried condition for blending with the motor fuel. I prefer to dry the alcohol so thoroughly that it will withstand, without forming a cloud of precipitated water, dilution with gasoline in a proportion somewhat larger than the proportion that is to be used in the finished liquid fuel. I may dry alcohol until it contains, for example, less than 2%, say 1%, of water.

As an alternative to this drying of the alcohols before use, I may use aqueous alcohols containing, for example, up to 12% of water. When these are mixed with a petroleum distillate there is used a blending agent, such as ether, a ketone, or benzol. Or,

the moisture which separates on mixing the wet alcohol with the petroleum distillate without a blending agent may be separated, in whole or in part, as, by centrifugal action, settling, passing through a layer of a salt, such as anhydrous sodium sulfate; the resulting oil layer may then serve as a liquid fuel without a blending agent.

- Blends of secondary and/or tertiary alcohols with petroleum distillates have desirable and useful properties. They are good motor fuels. As such they decrease knocking in the motor. Thus, a motor which could be made to knock with either so-called "ethyl gasoline" or with a blend of 30 volumes of benzol to 70 of gasoline did not knock with a fuel comprising 30 volumes of tertiary butyl alcohol and 70 of U. S. motor gasoline. Likewise, a fuel comprising 10 volumes of tertiary butyl alcohol and 90 of gasoline knocked less than the same gasoline without the addition of tertiary butyl alcohol. Another composition suitable for use as a fuel consisted of 20 or 25 volumes of secondary and/or tertiary aliphatic alcohols to 80 or 75 of gasoline or other petroleum distillate. Further, the blends of secondary and/or tertiary alcohols, particularly of tertiary butyl alcohol, with a petroleum distillate are useful as solvents for certain oils and waxes.

It is to be understood that the various examples and proportions given are for the purpose of illustration, not limitation, of the invention and that many variations may be made therefrom without departing from the spirit of my invention.

I claim:—

1. A liquid fuel consisting of a petroleum distillate and a tertiary aliphatic alcohol.
2. A liquid fuel consisting of gasoline and tertiary butyl alcohol.
3. A motor fuel consisting of approximately 75 volumes of gasoline and 25 of tertiary butyl alcohol.

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