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FUEL FOR INTERNAL-COMBUSTION ENGINES.

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To all whom it may concern:

Be it known that I, JEAN FELIX PAUL DE LA RIBOISIERE, a citizen of the French Republic, and residing at Bregenzerstrasse 15, Berlin, Germany, have invented certain new and useful Improvements in and Relating to Fuels for Internal-Combustion Engines, of which the following is a specification.

This invention relates to fuels for internal combustion engines, by which expression is meant all engines in which combustion gases are employed as the working fluid.

Generally speaking, combustion materials of high boiling point or high flash point are unsuitable for use as fuels for the operation of engines of the kind in question and particularly those to the combustion chamber of which a mixture of a fuel proper and a comburent (usually air) is admitted.

It is true that in certain engines, for instance in Diesel engines and semi-Diesel engines, liquid fuel of high boiling point can be used, but even with such engines it is not possible to employ materials whose imflammability falls below a certain limit.

With the internal combustion engines of automobile vehicles, in particlar, difficulties arise if it be attempted to use liquid fuels of relatively high boiling point. For instance, with them, owing to incomplete combustion sooting of the sparking plugs takes place and the valves are liable to stick.

Numerous compositions comprising liquids of varying degree of volatility have been proposed to be employed as fuels, some of which have included ether and like highly inflammable bodies for promoting the combustion of constituents of relatively high boiling point or of a low degree of inflammability contained in the mixtures.

Thus for instance, mixtures of petroleum hydrocarbons of relatively high boiling point with hydrocarbons of lower boiling point containing ether have been proposed to be so used. Such mixtures are open to the objection that the material which is intended to facilitate the combustion of the other constituents, being highly volatile, may evaporate from the mixture during storage or use.

The object of the present invention is to provide an improved fuel for internal combustion engines including constituents of relatively high boiling point and ether.

The invention is based upon the observation that the presence of phenol bodies in the fuel mixture enables highly inflammable constituents, such as ethers, to be retained in the fuel mixture.

A fuel according to the present invention therefore comprises in addition to a considerable proportion of constituents of relatively high or high boiling point, and optionally a proportion of constituents of lower boiling point, a small proportion of an ether adapted to promote the combustion or ignition of such constituents together with a proportion of a phenolic body adapted to retain the ether in the fuel mixture.

Normally, ethyl ether or methyl ether will be employed in accordance with the invention.

The materials of relatively high boiling point derived from crude petroleum, coal tar, brown coal tar, shale oil, shale tar, peat tar, wood tar and similar materials, and in particular such materials as consists of or contain considerable proportions of constituents boiling above 160° C. and usually from 180° or 200° C. upwards, may be comprised in the compositions in accordance with the invention.

The invention is more particularly concerned with fuels comprising bodies derived from the materials indicated which are of, or contain, relatively large proportions of constituents of a lower degree of inflammability or have a higher flash point than illuminating oil derived from petroleum or shale oil.

In certain instances, fuels in accordance with the invention may comprise relatively viscous and impure products derived from crude petroleum and the other materials above referred to.

When the product is intended for use in the engines of automobile vehicles, in accordance with the invention the composition may comprise, as indicated above, bodies of relatively low boiling point such, for instance, as those commonly used in the operation of internal combustion engines in addition to constituents of relatively high boiling point.

In particular, petrol, benzine, benzol, alcohol, hydrogenated hydrocarbons, such as the material sold under the registered trade marks "Tetraline", "Dekaline", hydrogenated naphthols and the like may be mentioned.

The employment of bodies such as petrol, benzine, benzol, methyl or ethyl alcohol, or the other hydrogenated bodies above men-

tioned, is particularly desirable when the materials of higher boiling point are of relatively viscous character. The proportions in which the constituents are present in the mixture may be varied within very wide limits, the heavy oils or constituents of high or relatively high boiling point being, for instance, about 30 to 80 per cent of the whole.

Phenolic bodies such, for instance, as phenol or cresol apparently form molecular or addition compounds with ether and if desired such compounds may be first formed and added as such to the other constituents of the mixture.

The formation of these molecular or addition compounds can, for instance, be secured by the introduction of ethers into oils the like already containing bodies comprising hydroxyl groups. In other words, if the oil of high boiling point used contain such bodies the addition of further quantities thereof may be unnecessary, or the proportion added will be correspondingly reduced.

Alternatively, the compounds in question may be formed separately and added to the other constituents of the fuel mixture.

The phenolic bodies may be added to the mixture of heavy oil and the body adapted to promote the combustion of the same, for example ether, or to the mixture of heavy oil, the body adapted to promote its combustion and the material of relatively low boiling point in a proportion usually below 5 per cent.

The proportion of volatile or highly inflammable material present in the mixture will depend to some extent upon its intended application; generally speaking, however, with ether the proportion is usually below 10 per cent and most frequently between 2 per cent and 5 per cent.

The additions to the heavy oils or oils of high boiling point may cause the separation of asphaltic or resinous bodies and it may be found advantageous in some cases where more than one body is added to mix the bodies with the heavy oils in a definite sequence and to filter the final product or the mixtures obtained after each of the additions has been effected.

For instance, when preparing a mixture from heavy coal tar oil, ether and benzine, it will be found desirable first to add the ether to the coal tar oil, then to introduce the benzine and finally to filter the resulting mixture.

As an example of a composition in accordance with the invention the following particulars are given:—

Coal tar oil of a specific gravity of 1.05 to 1.1, which contains about 25 per cent of a material boiling above 350° C. is mixed with an equal proportion of benzine or benzol, and to the mixture is added ethyl ether in the proportion of, say, 3 per cent and a proportion of phenol or cresol usually less than 5 per cent of the whole.

The fuel thus obtained will be found to ignite satisfactorily and burn completely without any difficulties in all internal combustion engines to which a combustible mixture, that is to say, a mixture of fuel and material for supporting combustion of the material is supplied.

As a further example the following may be given:—50 parts of a hydrocarbon of relatively low boiling point are mixed with 47 parts of a hydrocarbon oil of high boiling point and 3 parts of ethyl ether and usually 5 parts or less of phenol or cresol.

Another example is the following:—60 parts brown coal tar oil, 40 parts benzine and 5 parts ether and usually 5 parts or less of phenol or cresol.

The proportion of phenol or cresol or oils containing the same added will depend as above indicated upon the proportion of these bodies present in the major constituents of the mixture. In the above examples it is assumed that the hydrocarbon material is free from phenols.

With regard to fuels in accordance with the invention for semi-Diesel or Diesel engines it is merely necessary to indicate that they will mainly consist of oils of high boiling point or low inflammability, such as are ordinarily used as fuels for such engines or even higher boiling point or lower inflammability and will contain 1 to 2 per cent of ether, for instance, and contain no, or but little, other material of a higher degree of inflammability than the material forming their main constituent.

Phenols or other bodies will as such or as molecular or addition compounds with ether, be added to or included in these mixtures.

As will be understood, when the plural is employed herein in reference to the constituents of the mixture or the sources of such constituents, the singular is included and similarly when the singular is used in like connection the plural also is included.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. An improved fuel for internal combustion engines comprising a considerable proportion of liquid hydrocarbons boiling above 160° C., a small proportion of an aliphatic ether of low boiling point adapted to promote the ignition thereof and a proportion of a monohydroxy phenol adapted to retain the ether in the mixture.

2. An improved fuel for internal combustion engines comprising a considerable proportion of liquid hydrocarbons boiling above 160° C., a small proportion of diethyl ether adapted to promote the ignition there-

of and a proportion of a monohydroxy phenol adapted to retain the ether in the mixture.

3. An improved fuel for internal combustion engines comprising a considerable proportion of liquid hydrocarbons boiling above 160° C., a proportion of a liquid fuel of high volatility, a small proportion of a dialkyl ether of low boiling point and a proportion of a monohydroxy phenol adapted to retain the ether in the mixture.

4. An improved fuel for internal combustion engines comprising at least 30 per cent of liquid hydrocarbons boiling above 160° C., a small proportion of an ether of low boiling point, a small proportion of a monohydroxy phenol adapted to retain the ether in the mixture, and a proportion of liquid hydrocarbons of low boiling point forming the balance of the mixture.

5. An improved fuel for internal combustion engines comprising at least 30 per cent of liquid hydrocarbons boiling above 160° C., 3 per cent of diethyl ether, 52 per cent of liquid hydrocarbons of low boiling point, and five parts of phenol.

6. An improved fuel for internal combustion engines, comprising at least 30 per cent of liquid hydrocarbons boiling above 160° C., 3 per cent of diethyl ether, 52 per cent of liquid hydrocarbons of low boiling point, and five parts of phenol in the form of a molecular compound with the ether.

7. An improved fuel for internal combustion engines, comprising a considerable proportion of liquid hydrocarbons boiling above 160° C., a small proportion of an ether adapted to promote the combustion or ignition thereof, and a proportion of a phenolic body adapted to retain the ether in the mixture.

In testimony whereof I have signed my name to this specification.

JEAN FELIX PAUL de LA RIBOISIERE.