UNITED STATES PATENT OFFICE.

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MOTOR-FUEL.

1,388,531. Specification of Letters Patent. Patented Aug. 23, 1921.

No Drawing. Application filed March 9, 1920. Serial No. 364,387.

To all whom it may concern:

Be it known that I, ELBRIDGE WEBSTER STEVENS, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Motor-Fuels, of which the following is a specification.

This invention relates to motor fuels; and it comprises a motor fuel containing a petroleum oil of the nature of kerosene or other petroleum oil or distillate, ethyl alcohol, a small proportion of a light coal tar distillate, such as toluol, and methylethyl ether; all as more fully hereinafter set forth and as claimed.

Any commercial gasolene may be separated by distillation into a relatively light, highly volatile portion and a relatively heavy, non-volatile portion of the nature of kerosene. As a matter of fact, the higher boiling portion usually contains oils of even higher boiling point than kerosene; even as high boiling as lubricating oil. Without going into the niceties of the composition of gasolene, it may for the present purposes be taken as composed of two parts: the low boiling or easily volatile portion and the high boiling or difficultly volatile portion. In the engine cylinder each of these portions plays its own part: the easily volatile portion furnishing vapor which mixes with the air and gives quick ignition, while the other portion burns in the form of a mist or fog of finely divided droplets or particles, offering, together, a relatively large surface exposure to the air for explosive combustion. In the art of making motor fuels adapted for use with the same carbureting devices as gasolene, it is also common to use 2-part compositions, one part being readily volatile and the other part not so volatile. Such a composition behaves like gasolene and can be used in any engine adapted to gasolene. As the less volatile component it is customary to use kerosene while as the more volatile component, alcohol is frequently employed. Alcohol in and of itself is a good motor fuel but gives a relatively weak explosion; neither is it quite as volatile as could be desired.

Alcohol and petroleum oils, being generally immiscible, it is the custom when they are used together to employ as a blending agent something which is soluble in both. Abroad, benzol (benzene) has long been employed for this prupose.

In order to give such a mixture a quicker explosion, it is a useful expedient to add a small proportion of some other body still more volatile than alcohol. In my prior Patent, No. 1,259,053, I have recommended the use of ordinary ether $(C_2H_5)_2O$. Ether is a combustible body of extremely low boiling point and of high vapor tension and, like other volatile bodies containing oxygen, it fires quicker than bodies which are free from oxygen. Because of its high vapor tension, however, it is in practice difficult to retain it in admixture or solution in a blend of alcohol and a heavy mineral oil, as it tends to evaporate away. In the stated patent I therefore employ a little toluene (toluol), which not only acts as a blending agent but also retains the ether against evaporation.

I have found that instead of using ordinary ether or di-ethyl ether, in such a composition, many advantages are offered by employing in its lieu, methyl-ethyl ether, $C_2H_5.O.CH_3$. This body is considerably more volatile than ordinary ether, being, as a matter of fact, a vapor at the ordinary temperature of a warm day. Its boiling point is about 11° C. or 52° F. It is also even more quickly igniting than ordinary ether and a smaller proportion of it in the composition will fulfil the same purposes as the ether of my prior patent.

Methyl-ethyl ether may be readily made by subjecting a mixture of wood alcohol and grain alcohol to the ordinary etherifying processes; the processes used in making ethyl ether from grain alcohol. With the mixture of alcohols a "mixed ether", methyl ethyl ether, is obtained. The only difference in the process of manufacture is that more efficient condensing means are required because of the lower boiling point of methyl-ethyl ether.

In a typical composition under the present invention I may use any suitable grade of petroleum oil or distillate. The comparatively low grade kerosenes known in the trade as "export kerosenes" may be employed. Since the boiling point or volatility of the hydrocarbon or kerosene component of my composition is not very material, I may use even higher boiling petroleum oils than keronsene, such as gas oil, solar oil and even light lubricating oils, like the spindle oils. The proportion of petroleum oil em-

ployed depends upon the particular motor or purpose for which the new fuel is to be employed, but as a rule I use about 50 parts by volume of the mineral oil and about 30 parts of ethyl alcohol. With this I employ, as a rule, about 8 to 10 parts of toluol. Any good commercial grade of toluol may be employed. Higher boiling coal tar fractions, such as the xylenes or xylols, etc., may be used but are less satisfactory. This amount of toluene serves efficiently as a blending agent for the alcohol and mineral oil and it also serves as an efficient retainer for the methyl-ethyl ether, which, without it, would be apt to evaporate away from the mixture on long standing. In the presence of the toluol, however, the methyl-ethyl ether without forfeiting its ready ignition and quick volatilization in the gas engine cylinder, nevertheless remains permanently in the composition as stated. The amount of methyl-ethyl ether which is employed depends altogether upon the particular type of motor and the quickness of the explosion which is desired. As a rule however I find that about 5 to 10 parts of methyl-ethyl ether is a good proportion.

A composite fuel made in the way described gives a quick and powerful explosion in the motor without the production of smoke.

While I have described methyl ethyl ether as an agent for giving quick ignition in connection with composite fuels consisting of petroleum distillates and alcohol with a blending agent such as toluol, it is obvious that it may be used for the same purpose with other liquid fuels used as substitutes for gasolene, as, for instance, being used in admixture with coal tar oils. Various coal tar naphthas and distillates which can be used for internal combustion engine purposes are much improved as regards quickness of ignition by admixture of a per cent. or so of methyl ethyl ether. From such oils it does not tend to evaporate away, being retained by the toluol present. Methyl ethyl ether may also be employed for giving quick volatility with various motor fuels not containing alcohols, such as kerosenes, cracked distillates, etc. When used with petroleum distillates, however, it is ordinarily better to employ also a certain amount of toluol or coal tar naphtha in order to retain the methyl ethyl ether against evaporation.

What I claim is:—

1. As a new motor fuel adapted for the same purposes as gasolene, a mixture containing a petroleum oil, in admixture with ethyl alcohol, methyl-ethyl ether and an oily body agent serving to blend the alcohol and oil and retain the ether.

2. As a new motor fuel adapted for the same purposes as gasolene, a liquid containing high boiling combustible hydrocarbon components and also containing a modicum of methyl-ethyl ether.

In testimony whereof, I affix my signature.

ELBRIDGE W. STEVENS.