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MOTOR FUEL.

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The present invention relates to a motor fuel suitable for use in ordinary internal combustion engines such as the engines of automobiles, which product shall be free from many of the objections of ordinary gasoline and of the substitutes for gasoline, which have heretofore been employed.

The engines of ordinary automobiles are usually adjusted for employing ordinary gasoline as the fuel. Many attempts have heretofore been made to utilize mixtures containing certain light oils, by-products of coke and gas manufacture, mixtures of petroleum hydrocarbons with various other products, mixtures of petroleum hydrocarbons and aromatic hydrocarbons and mixtures of either or both of these materials with various other substances, some of which have fuel value, and some of which have not. These mixtures have not, so far as we have been advised, come into commercial use, largely on account of some or all of the following objections:

(*a*) The use of such compounds usually requires a change of the carburetor or a delicate adjustment of the carburetor to produce a satisfactory charge mixture;

(*b*) Many of the mixtures heretofore proposed have a comparatively high freezing point so that they cannot be successfully used in the winter time, where automobiles are kept in unheated garages.

(*c*) Carbon deposits are formed in the engine to a much greater extent and of a much greater density and more difficult to remove than when using ordinary gasoline.

(*d*) Many of the mixtures heretofore proposed have contained such an amount of sulfur, that continued use thereof would cause lasting injury to the motor, due to the formation of sulfur dioxid gas in the products of combustion, or due to the formation of other compounds which are capable of acting upon iron and steel and other metals employed in the construction of the engines.

(*e*) Lower volatility per degree than commercial gasoline, produced either with or without cracking.

(*f*) Difficulty in starting the motor, particularly in cold weather, without preheating.

(*g*) Greater solvent power than gasoline, thereby attacking various parts of the engine or of the vehicle such as parts made of rubber, parts coated with shellac (particularly cork floats found in many carburetors, and paint or varnish on the vehicle when such fuels are used for cleaning purposes or accidentally spilled on the painted or varnished surfaces).

(*h*) Leakage past the piston walls due to non-volatility of the heavier constituents resulting in a loss of fuel and the dilution of the lubricating oil, thereby decreasing the efficiency of the lubricating system (this latter fault is also possessed by many of the commercial gasolines on the market).

It is the object of the present invention to minimize or to overcome the above, and other objections, to many of the commercial fuels heretofore proposed, to provide a fuel of greater efficiency in mileage and power without substantially increasing the cost.

For convenience in describing the invention, we divide the raw materials entering the manufacture of our fuel into five classes as follows:

I. Aromatic or ring compounds, such as (A) benzol and its lower homologues, toluol and xylol, and (B) the distillate of light oils produced by distilling coal tar and having a boiling point between 200 and 300° F., and preferably between 231 and 284° F.

II. Petroleum distillates, and in this class we call attention particularly to (A) the more volatile distillate coming over between the initial boiling point of the petroleum and 220° F., and preferably the portion distilling between 104 and 220° F., and (B) the heavier or less volatile distillate coming over between 220° F., and 375 to 400° F., and preferably between 220° F., and 350° F.

III. A hydrocarbon derivative which is a good solvent for water or which is readily miscible with water in all proportions, and which is capable to some extent of dissolving in a mixture of the bodies of above classes I and II. Denatured alcohol and acetone are mentioned as examples of this class of material. The term "a monohydric alcohol" is hereinafter used, in the claims, to include any of the substances in this group.

IV. Terpenes including ordinary turpentine, wood turpentine and derivatives thereof, such as camphor oil and camphor.

V. Pure water.

VI. Naphthalene.

The materials of the first class mentioned and those of the second class also, if necessary, are preferably purified by the removal of substantially the entire sulfur content. In any event, it is extremely important to remove the sulfur content from the materials of class I, so that not more than 0.5% of sulfur shall be contained therein. In case the petroleum distillates contain considerable quantities of sulfur, then it is necessary to reduce the sulfur content of these distillates. The desulfurization can be carried out by any of the approved methods.

Of the materials of class I, we employ two groups, namely (A) the group consisting of benzol, toluol, xylol, etc., with boiling points ranging from 177 to 284° F., and (B) distillates of the light oil of coal tar, boiling between 231 and 284° F. These two groups may be referred to as I^A and I^B, respectively.

Ordinary petroleum distillates, the two referred to above as (A) and (B) may be employed.

For producing the motor fuel, we first mix together from 50 to 75 parts of I^A, that is to say, benzol etc., and 25 to 50 parts of I^B, together with a much smaller quantity, say, 2% or so of a terpene compound as described under IV. We also mix together 25 to 50 parts of the light distillate of petroleum II^A and 50 to 75 parts of the heavier petroleum distillate II^B, together with the naphthalene which is used in amount equal to between one-half of one percent and three percent (preferably about 2%) of the combined quantities of II^A and II^B.

In some cases we find that we can replace all or a part of the naphthalene by other aromatic somewhat volatile bodies, such as methyl naphthalene, anthracene or the picrates which are soluble in gasoline or kerosene. Naphthalene, however, is the preferable material to employ. Where we have used the term "naphthalene" in the claims we desire to be understood as including its equivalents.

Having made the two liquids above referred to, about 50 to 70 volumes of the aromatic liquid (I+IV) are mixed with 30 to 50 volumes of the petroleum base liquid (II+VI) and a mixture of water and an organic hydrocarbon derivative (III) which is readily volatile and which is readily miscible with water (such as ordinary acetone, wood alcohol, denatured alcohol, ethyl alcohol and equivalent) is added. This mixture is preferably made by diluting from 2 to 5 parts of acetone or denatured alcohol with 1 part of water. The entire mixture is then thoroughly agitated, allowed to stand for a while and then preferably filtered. This produces a product containing the stated amount of water in perfect solution, and this water will not separate from the product under service conditions, even if the temperature is lowered to much below the freezing point of water.

Preferred procedure, however, is to distil the mixture either after adding the alcohol-water mixture or during the time this is being added. The distillation seems to have the effect of driving the molecules of the semi-finished fuel further apart, whereby the same is able to take up and hold in complete solution, the amount of water stated.

The material is introduced into the still, and heated to above the boiling point of water, preferably while the alcohol and water mixture is sprayed into the vapor space above the liquid in the still. Sufficient room is allowed for expansion and by the combined action of the heat, pressure and blending agents, the fuel will absorb more water than by ordinary mixing, but the water will be more completely distributed and dissolved so that a somewhat greater quantity of water can be introduced in this manner.

The distillation is preferably conducted until substantially the entire mass of liquid has distilled over, or if desired, the distilling operation can be stopped when the temperature reaches 380° F., or 400° F., if desired.

We have found, as the result of careful investigation that the water in the fuel is of great value since it prevents the deposition of hard carbon deposits in the cylinders. When the water is present, there is considerably less free carbon produced in the cylinders by the explosions, and the carbon which is produced is in a lighter and more fluffy condition and does not attach itself to the cylinder walls or to the piston head, but remains suspended in the gases and is blown out of the cylinder with the exhaust.

The relative amounts of I^A and I^B and the relative amounts of II^A and II^B can be varied between the limits above stated, depending on conditions (temperature, volatility desired, etc.). Thus we may use 30 parts of I^B, 70 parts of I^A, 25 parts of II^A, 70 parts of II^B. These may be blended with 3 parts of denatured alcohol or acetone, 1 part of water, 2 parts of turpentine oil, and 2 parts of naphthalene. While the above specific fuel will be very good for ordinary warm weather, it is advisable in the winter time to cut down the I^B and II^B and water, to about three-fourths of these quantities, or to increase the constituents I^A and II^A, by a third or a half.

This example is given purely for illustration and not as restricting the scope of the patent.

Careful tests have been made with the

fuel forming the present invention. One sample of this fuel may be described as follows: The sample was colorless or water-white and in reflected light showed the characteristic yellowish hue of gasoline. The sample was entirely free from undissolved water. There was no sediment or foreign matter and the sample evaporated completely when allowed to stand in an open dish at room temperature of 70° F. A portion of the sample was shaken with distilled water, and allowed to stand, and the resulting aqueous liquid was tested with litmus and found to be entirely neutral. The sample was tested for unsaturated hydrocarbons, by intimately mixing the liquid with cold concentrated sulfuric acid and the mixture subjected to centrifugation. There was no diminution in volume which indicated the absence of unsaturated compounds. The fuel had an odor which is characteristic of the aromatic hydrocarbons resembling German petrol, but it possessed no odor which would be characterized as disagreeable by the automobile user. The specific gravity at 50° F., was .8072. The calorific value determined in a Colaz bomb calorimeter was shown to be 6321 calories per gram.

A volatility test of the fuel was made according to the Engler method. For the purpose of comparison, this is given below compared with a sample of "Atlantic 68–70 gasoline" which is to be regarded as a very high grade of commercial gasoline:

Per cent of distillate.	Degrees centigrade.	
	Our fuel.	Atlantic.
First drop	66	56
First 5 drops	68	60
5	78	70
10	82	72
15	84	73
20	85	75
25	86	78
30	87	80
35	88	84
40	89	88
45	90	98
50	90	106
55	90	110
60	92	120
65	98	124
70	102	130
75	109	140
80	115	149
85	124	166
90	150	179
95	180	229
Dry point	200	231

Attention is called to the fact 50% of the fuel distilling over within a range of 10° C., whereas to distill over a light amount of the "Atlantic 68–70", the range of temperature needed was 48°. This clearly offsets the slightly higher initial boiling point of the fuel. Attention is also called to the fact that the fuel is completely volatile at a temperature 31° lower than is "Atlantic 68–70".

Another test of volatility was made according to the "Ladenburg distillation method" in comparison with the "Atlantic 68–70" with the following results:

Degrees centigrade.	Our fuel.	Atlantic 68–70.
	Per cent.	*Per cent.*
90	37	35
120	83	60

The sulfur content of the fuel was determined by the Carius method and the sample showed only a trace of sulfur, the amount of barium sulfate being insufficient to be collected and weighed. The sample was cooled, for determining the freezing point, to a temperature nearly down to minus 40° C., but it did not freeze at the lowest temperature available to the operator. This is sufficient to show that the freezing point of the fuel is sufficiently low so that under ordinary service conditions, there would be no danger of freezing.

We claim:

1. A blended motor fuel comprising aromatic hydrocarbon distillates substantially free from sulfur, and having boiling points not over 300° F., petroleum distillates having boiling points not over 300° F., a lower, readily volatile monohydric alcohol, a readily volatile terpene compound, naphthalene and water, the last-mentioned four being together equal to not over about 7% of the entire mixture, such product being in the form of a homogeneous stable mixture.

2. A blended motor fuel comprising, relatively large amounts aromatic hydrocarbon distillates substantially free from sulfur, and having boiling points not over 300° F., and of petroleum distillates having boiling points not over 300° F., and a lower monohydric alcohol which is readily miscible with water, and somewhat miscible with a mixture of such two just mentioned materials, a readily volatile terpene compound, naphthalene and water, such product being in the form of a homogeneous stable mixture.

3. A blended motor fuel comprising aromatic hydrocarbon distillates substantially free from sulfur, and having boiling points not over 300° F., petroleum distillates having boiling points not over 370° F., a lower monohydric alcohol, a readily volatile terpene compound, naphthalene and water, the last mentioned four materials being together equal to not over about 7% of the entire mixture, such product being in the form of a homogeneous stable mixture.

4. A blended motor fuel comprising benzol and its lower homologues, distillate of light oil of tar having an end boiling point not over 300° F., petroleum distillate having an end boiling point not over 225° F., heavier petroleum distillate having an end boiling point not over about 370° F., naph-

thalene, alcohol, a readily volatile terpene and water.

5. A blended motor fuel comprising benzol and its lower homologues, distillate of light oil of tar having an end boiling point not over 300° F., petroleum distillate having an end boiling point not over 225° F., heavier petroleum distillate having an end boiling point not over about 370° F., naphthalene, readily volatile alcohol, a readily volatile terpene and water, the last mentioned four materials being present in amount not substantially over 7%, and the sulfur content of the entire mixture being well below 0.5%.

6. A blended motor fuel, comprising from 50 to 70 volumes of a mixture including 2 to 3 parts of benzol, and its lower homologues, 1 to 2 parts of a distillate of light tar oil, distilling between about 230 and 300° F., and not over about 2% of terpene compounds; and from 30 to 50 volumes of a mixture including 1 to 2 parts of a petroleum distillate distilling between about 100 and 220° F., from 2 to 3 parts of a petroleum distillate distilling between about 220 and 350° F., and not substantially over 3% of naphthalene; and from one-half to 4 volumes of a monohydric alcohol of from about 66 to 85% strength; the sulfur content of the blended product being below 0.5%, and the product being completely homogeneous.

In testimony whereof we affix our signatures.

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