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MOTOR FUEL

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The invention relates to motor fuels having so low a tendency to detonate or "knock" that they can be advantageously used in internal combustion engines which highly compress the mixture of fuel and air before igniting it.

In an application filed January 6, 1928, Serial No. 245,057, I have described and claimed non-detonating fuel blends comprising paraffin hydrocarbon material, for example petroleum distillates, and plural carbon atom side chain alkyl benzenes, such as the ethyl and isopropyl benzenes. As there explained, one or more of the six hydrogen atoms of the benzene nucleus can be replaced by plural carbon atom alkyl groups, and the groups so substituted in a single molecule may be identical or different. The blends proposed in my prior application contain a substantial quantity of an alkyl benzene of which the molecule contains at least one plural-carbon-atom side-chain.

The present invention contemplates the blending of an alkyl benzene containing a plural-carbon-atom side-chain and a paraffine hydrocarbon liquid having a distillation end-point not above about 330° F. The paraffine hydrocarbon liquid used is preferably a material of the type known to the gasoline industry as natural gasoline, natural gas gasoline, or casing-head gasoline.

Natural gasolines, as a rule, show but little tendency to detonate in internal combustion engines. This is partially due to the low average molecular weight of the compounds present, but it also seems to be a fact that where isomeric compounds (e. g. octanes) are involved, the isomers which are principally present in natural gasoline have a lower tendency to detonate than the isomers principally present in petroleum gasoline.

Natural gasolines are not well adapted to be used as motor fuel without blending with les volatile liquids. Unblended, they evaporate excessively in storage, and when used in aeronautical motors the craft may climb so rapidly that the barometric pressure falls below the vapor pressure of the fuel, whereupon the latter boils in the fuel tanks, giving rise to operating difficulties. If, to overcome these defects, the natural gasoline is blended with less volatile paraffine hydrocarbon distillates, the tendency to detonate is increased, and lower compressions must be used. Natural gasoline may be blended with plural carbon atom side chain alkyl benzene material to produce a fuel which is not volatile, which properly combines constituents of various boiling points, and which may be used at very high compressions without detonation.

Natural gasolines may be combined with the plural carbon atom side chain alkyl benzenes in various proportions, according to the type of boiling curve desired, and the choice of the alkyl benzene used may be controlled by the same consideration. I prefer to use mixtures of the alkyl benzene to obtain smoother boiling curves, and because mixtures can be produced more cheaply than the pure compounds. The boiling points of typical plural carbon side chain alkyl benzenes are approximately as follows:

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Monoethyl benzene	274°
Monoisopropyl benzene	304°
Monopropyl benzene	315°
Monobutyl benzene	362°

In the series of compounds containing from one to six ethyl groups, the boiling point increases with the degree of alkylation, and so with the isopropyl and higher alkyl benzenes. By way of illustrating the invention, I refer to a blend containing 80% of natural gasoline and 20% of a mixture of ethyl benzenes consisting principally of the monoethyl compound. The gasoline conformed to the following specifications when distilled by the Association of Natural Gasoline Manufacturers' method:

Gravity	76°–80° A. P. I.
Initial B. P	90°–95° F.
End-point	Under 330° F.
Over at 100° F	Not more than 8%
Over at 212° F	Not less than 85%

The mixture of ethyl benzenes had an initial boiling point of about 250° F., and about 80% distilled between 260° F. and 290° F.

It will be apparent that in compounding

a fuel in accordance with the invention, there are available two series of chemical compounds, the boiling points of the plural carbon atom side chain alkyl benzenes increasing by small increments from about 274° F., and the boiling points of the paraffin hydrocarbons in the natural gasoline diminishing by small increments from a figure in the vicinity of 330° F. All of the compounds are characteristically non-detonating, so that a non-detonating blend of any desired boiling curve and distillation end-point can be readily prepared. Other substances, for example other hydrocarbons, or compounds which act to suppress detonation, can of course be incorporated in appropriate quantities without destroying the desirable properties of the blend, and the scope of the invention is not to be limited except by the terms of the appended claims.

I claim:—

1. A motor fuel consisting of a blend of casing head gasoline having a distillation end-point not higher than about 330° F. and another liquid acting to diminish spontaneous evaporation thereof without substantially raising the distillation end-point or increasing detonation, said other liquid consisting essentially of plural-carbon-atom side chain alkyl benzenes.

2. A motor fuel consisting of a blend of natural gas gasoline having a distillation end-point not higher than about 330° F. with an agent acting to diminish spontaneous evaporation thereof without substantially raising the distillation end-point or increasing detonation, said agent comprising about 20% of the whole fuel and consisting substantially of ethyl benzenes.

In testimony whereof, I affix my signature.

JOSEPH G. DAVIDSON.