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ANTIKNOCK GASOLINE

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This invention relates to improvements in the production of liquid motor fuel.

It is an object of the invention to provide a fuel particularly adapted to use in high compression internal combustion engines. More specifically it is an object of the invention to provide a liquid fuel which, when used in high compression engines, exhibits less tendency to cause knocking of the engines than the fuels which heretofore have been available.

It has been a primary objective of the present invention to provide a motor fuel containing iron pentacarbonyl in staple combination with the combustible liquid.

In the past it has been demonstrated that ordinary straight run gasoline containing a relatively small amount of iron carbonyl exhibits much less tendency to knock or detonate in an internal combustion engine operating with relatively high compression, than the ordinary straight run gasoline itself exhibits. In view of the fact that the iron carbonyl is relatively inexpensive to manufacture, it fundamentally seems to possess many of the characteristics which are particularly useful in the production of so-called anti-knock fuels. On the other hand, however, the serious disadvantage which attends the use of iron carbonyl in gasoline and similar fuel substances is that the substances decompose rapidly, in the presence of light, into a compound which is practically insoluble and which usually appears as heavy precipitate. This precipitate tends to settle relatively quickly from the gasoline or fuel in which the carbonyl was present, and the fuel not only loses the anti-knock value which was imparted to it, but in addition becomes dangerous to use in that the precipitate tends to clog the various fine orifices, jets, tubes and more delicate mechanisms in the carburetion apparatus.

For a good many years the virtues and advantages of iron carbonyl as an anti-knock agent, as well as its disadvantageous characteristic of instability have been relatively fully understood. Many proposals directed to the solution of the problem of instability have been suggested. Still, this material has never found commercial usage despite the virtues and advantages with which it has seemed to be endowed

Briefly, it is the concept of the present invention to provide the combination of iron carbonyl and a liquid motor fuel in which the iron carbonyl is maintained in stable relation so that the quality imparted to the fuel is not impaired during storage or in use. The invention more particularly contemplates the production of fuels which satisfy the commercial requirements of cost, as well as stability, likewise as well as the production of a series of stable compositions which contain iron carbonyl and which are adapted to use particularly in rendering liquid fuel, such as straight run gasoline, less susceptible to knocking.

In the years since iron carbonyl first was proposed as an agent for suppressing detonation, a relatively wide variety of substances have been suggested for the purpose of obviating the characteristic of stability of the carbonyl component. Perhaps, because of the unusual nature of the problem involved, the stabilizing agents which have been suggested from time to time have become more and more complex. Paradoxically the fuels of the present invention are comprised of components all of which are cheap, all of which are simple and all of which cooperate to provide results which are satisfactory from the point of view of distribution and storage, and which likewise are satisfactory from the point of view of results in the engines in which the fuels are used.

Briefly, I have discovered that ordinary fatty acids possess all of the characteristics which are essential to the stabilization and protection of iron carbonyl in commercial liquid fuel itself. More specifically, I have determined that iron carbonyl peculiarly responds to stabilization in the presence of ordinary straight run fatty acids which are split for example, from the conventional animal fats.

In the practice of the present invention, therefore, iron carbonyl is dissolved in the fuel intended to be treated. This mixture then is stabilized by the incorporation into the fuel of a small quantity of a fatty acid such as ordinary stearic acid.

A variety of liquid motor fuels are suited to use as base products susceptible to this simple treatment. Among these I may mention straight run or cracked gasoline, or blends thereof, blends of so-called "polymer" fuel and likewise blends of gasoline with benzol, alcohol and similar substances. It is, of course, most advantageous to treat the low compression gasolines, or those which have an octane value of about 60 or less. These gasolines are usually the ones which are least saleable in their natural condition, yet when they are treated according to the present invention the octane value is increased so markedly that the products demand a premium in their selling cost.

The term "fatty acids" as it is used in the present specification is intended generically to designate the acids which are derived particularly from the animal fats and is intended more specifically to designate stearic, palmitic, and oleic acids and mixtures of these as well as the less important members of the group of higher fatty acids.

In practicing the present invention I prefer to use the higher saturated acids, and in this respect I have found that ordinary commercial stearic acid is best suited to the purpose. I wish to point out, however, that it is conventional for the fat splitters to term as "fatty acids" the product which results from the splitting of ordinary animal fats. This product usually comprises stearic acid and palmitic and oleic acids. I have determined that this material is well suited to the peptization of iron carbonyl in liquid motor fuel.

On the other hand, I have determined also that the acids which are derived principally from cocoanut oil and cotton seed oil likewise are suited to the practice of the invention, though to a less marked degree than those of animal origin.

The following table illustrates the relative efficiencies of the fatty acids which are of commercial significance at the present time.

Material used	Fatty acids present in this material	Stability in hours
Stearic acid	Stearic and palmitic	308
Fatty acids	Stearic, palmitic, and oleic	270
Oleic acid	Oleic	240
Cocoanut oil fatty acids	Caproic, caprylic, lauric, myristic.	250
Cotton seed oil fatty acids	Linolic	137
Linseed oil fatty acids	Linolenic	78
Cod liver oil fatty acids	Palmitoleic, jecoleic, gadoleic, erucic.	55
Castor oil fatty acids	Ricinoleic	8

In this data, the hours of stability are the hours during which the iron carbonyl remained in perfectly stable condition in gasoline in an unprotected glass container. The iron carbonyl in the gasoline was subject to exposure to ordinary sunlight, to moisture and to air, all of which conditions are known to be unfavorable to iron carbonyl stability.

Under test conditions and in actual commercial practice the liquid fuels treated in accordance with the present invention are found to exhibit the characteristics which are requisite to commercial usage.

From the method point of view it is recommended that the iron carbonyl first be added to the gasoline in the quantity appropriate to accomplish the results desired. Usually, about 2 cubic centimeters per gallon to 5 cubic centimeters per gallon are ample to increase the octane rating above the point at which detonation and knocking tend to occur at normal working pressure. Next, the fatty acid quota appropriate to peptize and maintain the iron carbonyl dissolved in the fuel is added to the fuel and incorporated therewith. I have determined that for each part of iron carbonyl approximately 1 part of fatty acid is all that is needed. Thus, if for example, 3 c. c. of iron carbonyl per gallon of gasoline is to be used, then likewise, 3 c. c. per gallon of fatty acid also should be used for stabilization.

On the other hand, if it is desired to provide a compound which is stable during extended periods of storage and which is adapted to be added directly to the liquid motor fuel, then I prefer to use approximately one part of iron carbonyl and one part of fatty acid dissolved in approximately one part of ordinary kerosene, to constitute a mixture having an iron carbonyl content of about 33%. In a mixture of this nature the iron carbonyl comprises approximately 33% of the total composition. Thus, if a hundred gallons of a low grade motor fuel are to be treated with .1% of iron carbonyl, then .3 gallon of the compound are dissolved in the fuel. A rather extensive series of experiments has led to the conclusion, paradoxically, that the incorporation in a given liquid motor fuel of a relatively small quota of fatty acids improves rather than detracts from the operation of the motor itself. While the fatty acids are soluble in gasoline, still they are completely volatile at the operating temperature in the cylinder of an internal combustion engine, they decompose and ignite rapidly and leave no extraneous residue to clog the engine valves or contaminate the working surfaces.

Having described my invention, I claim:

1. As a new composition of matter, a stable motor fuel having a high octane value comprising, low octane gasoline, iron carbonyl and a substantial quantity of higher fatty acid sufficient in amount to stabilize the iron carbonyl in the gasoline.

2. As a new composition of matter, a stable motor fuel comprising a liquid motor fuel, iron carbonyl, and substantial quantity of stearic acid sufficient in amount to stabilize the iron carbonyl in the gasoline.

3. As a new composition of matter, a stable motor fuel comprising, gasoline, iron carbonyl, and a substantial quantity of a mixture of stearic and palmitic acids sufficient in amount to stabilize the iron carbonyl in the gasoline.

4. As a new composition of matter, a solution of iron carbonyl in gasoline, in which the iron carbonyl is decomposable by light, and a saturated higher fatty acid, the amount of iron carbonyl and the amount of fatty acid being approximately equal.

5. As a new composition of matter, a solution of approximately 2–5 c. c. per gallon of iron carbonyl in a hydrocarbon, in which the iron carbonyl is decomposable by light, and a substantially equal quantity of a high fatty acid derived from animal fat.

6. An improved motor fuel comprising a low compression fuel, an anti-knock substance comprising, approximately 2–5 c. c. per gallon of iron carbonyl and a substantially equal amount of commercial stearic acid.

7. An improved motor fuel comprising a solution of light hydrocarbon fuel adapted to be used in an internal combustion engine containing about 2 to 5 c. c. per gallon of iron carbonyl to increase the octane value of the fuel, and a substantial quantity of higher fatty acid which is sufficient to stabilize the iron carbonyl in the solution.

8. A new composition of matter comprising gasoline, about 2 to 5 c. c. of iron carbonyl per gallon of gasoline, and a substantial quantity of higher fatty acid dissolved in the gasoline for the purpose of stabilizing the iron carbonyl which is about equal in amount to the quantity of iron carbonyl.

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