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DIESEL FUEL

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9 Claims. (Cl. 44—9)

This invention relates to liquid fuels for internal combustion engines and has to do particularly with improvements in fuels for compression ignition engines, such as the Diesel or semi-Diesel.

The compression ignition type of engine requires for desirable operation, fuels which have a short time lag between the entrance of the first portion of the fuel into the cylinder and its subsequent auto-ignition. An object of the present invention is to reduce the time lag by lowering the minimum compression ratio necessary for auto-ignition by providing in the fuel a sufficient amount of an improved primer or ignition accelerator to accelerate the auto-ignition.

The primers contemplated according to the present invention are the nitro halogen derivatives of normally gaseous hydrocarbons. Alkyl derivatives containing only halogen substituents are substantially ineffective as Diesel fuel primers. The nitro derivatives of normally gaseous hydrocarbons are also relatively poor primers except those containing a higher number of nitro groups, but the latter are either unstable or react with the fuel constituents to produce sludge. It has been found that by substituting both halogen and nitro substituents into the normally gaseous hydrocarbons that very efficient primers may be obtained which are stable and produce little sludge in the oil to which they are added.

The nitro halogen derivatives of any of the normally gaseous hydrocarbons, such as methane, ethane, propane and butane may be used. The methane and ethane derivatives are particularly satisfactory. Compounds containing at least one chlorine and one nitro substituent may be used but better results are obtained with those containing a plurality of chlorine and nitro groups. Compounds containing chlorine and nitro substituents attached to a common carbon atom are preferred. The preparations of chloro-nitro methane, trichloro-nitro methane and dichloro-dinitro methane are described in Bielstein, fourth edition, volume 1, page 76. The preparation of chloro-nitro ethane is described in Bielstein, fourth edition, volume 1, page 101. The poly-chloro-dinitro ethanes, such as dichloro-dinitro ethane, may be prepared by chlorination of chlorodinitro ethane, by the procedure similar to that given for the preparation of dichloro-dinitro methane.

The amount of the primer used is usually not over 5%, generally between about 1 to 4%, and preferably about 3 or 4% by weight. The amount, of course, can be varied and it is intended that sufficient amount be used to lower the minimum compression ratio necessary for auto-ignition to the desired extent. It is also to be understood that mixtures of the various compounds herein disclosed may be used.

The following table shows the results obtained by adding various compounds of the present invention to petroleum hydrocarbon oil of Diesel grade. The hydrocarbon fuel alone had a cetane value of 34 and to this in each case was added 4% by weight of the indicated compound:

Primer used	Cetane numbers
Tri-chloro-nitro-methane	52
Di-chloro di-nitro-methane	59
Di-chloro-tetra nitro-ethane	53
Tetra-chloro-di-nitro-ethane	51

The above results were obtained with a standard Diesel testing engine on which the ignition delay was measured. The cetane numbers designate the percentage by volume of cetane in a mixture of cetane and alphamethyl naphthalene which gives the same ignition lag as the fuel under test.

Obviously many modifications and variations of the invention, as hereinbefore set forth, may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. A liquid fuel for compression ignition engines containing a small quantity of trichloro-nitro methane.

2. An improved Diesel fuel comprising a hydrocarbon fuel oil containing about 1.0% by weight of chloropicrin.

3. An improved Diesel fuel comprising a hydrocarbon fuel oil containing a minor proportion of chloropicrin, sufficient to decrease the ignition delay period of the fuel, improve its cold starting ability and decrease its tendency to deposit carbon and carbonaceous material in the motor combustion chamber.

4. The method of accelerating the ignition of Diesel cycle internal combustion engines which comprises admixing with the fuel, prior to ignition, a minor proportion of chloropicrin.

5. The method of accelerating the ignition of a Diesel cycle internal combustion engine which comprises introducing chloropicrin to the combustion chamber of the engine, simultaneously

with the introduction thereto of a hydrocarbon Diesel fuel.

6. An improved fuel for compression ignition engines comprising a fuel oil containing a minor proportion of a chloro-nitro substituted normally gaseous paraffin hydrocarbon in which the chloro and nitro substituents are attached to a common carbon atom.

7. An improved fuel for compression ignition engines comprising a hydrocarbon fuel oil containing about 1 to 4% by weight of a chloro-nitro substituted normally gaseous paraffin hydrocarbon in which the chloro and nitro substituents are attached to a common carbon atom.

8. The method of accelerating the ignition of Diesel cycle internal combustion engines which comprises admixing with the fuel, prior to ignition, a minor proportion of a chloro-nitro substituted normally gaseous paraffin hydrocarbon in which the chloro and nitro substituents are attached to a common carbon atom.

9. The method of accelerating the ignition of a Diesel cycle internal combustion engine which comprises introducing, in minor proportion, a chloro-nitro substituted normally gaseous paraffin hydrocarbon, in which the chloro and nitro substituents are attached to a common carbon atom, to the combustion chamber of the engine simultaneously with the introduction thereto of a hydrocarbon Diesel fuel.

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