UNITED STATES PATENT OFFICE.

BURNELL R. TUNISON, OF NEW YORK, N. Y., ASSIGNOR TO U. S. INDUSTRIAL ALCOHOL CO., A CORPORATION OF WEST VIRGINIA.

LIQUID FUEL.

1,423,050. Specification of Letters Patent. Patented July 18, 1922.

No Drawing. Application filed April 12, 1920. Serial No. 373,308.

To all whom it may concern:

Be it known that I, BURNELL R. TUNISON, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new and useful Improvement in Liquid Fuels, of which the following is a specification.

My invention relates particularly to fuels designed to be used in any desired manner. It has application especially to fuels adapted to be used alternatively for a wide variety of purposes, as for example, fuels to be used for burners under steam boilers, as well as for internal combustion engines of various kinds, Diesel engines, or the like.

An object of my invention is to provide an efficient fuel for various uses, which fuel, although ordinarily containing a preponderating proportion of a comparatively heavy hydrocarbon shall nevertheless contain such additional substance or substances as to enable the fuel to be used, alternatively or optionally, in the same manner as the light hydrocarbon fuels heretofore employed in internal combustion engines, or the like, said additional substances to be other than mere paraffin hydrocarbons.

Another object of my invention is to provide a fuel, or type of fuel, containing a relatively heavy hydrocarbon together with an additional lighter combustible ingredient of such a character that it will blend effectually with the relatively heavy hydrocarbon and notably modify the properties thereof.

In one of its broader aspects, my present invention may be said to aim at a wider availability, in the production of motive power, on the part of relatively heavy hydrocarbons, such as heavy distillates which may be derived from crude oil, and which may have a Baumé gravity heavier than 40°, such wider availability resulting from the employment therewith of an ingredient or ingredients which shall contribute so notably to readiness of ignition that satisfactory ignition may be obtained without raising the Baumé gravity of the product even to the level of ordinary kerosene, and contribute to producing an improved combustion, and in one of its more restricted aspects my present invention may be said to aim at the production, from hydrocarbons that have already been deprived of their gasoline and kerosene fractions, of a product, presumably less costly than either of the mentioned fractions, which shall at the same time rival gasoline in its suitability for use in, for example, automobile engines.

In one aspect, the present invention may be said to proceed from a recognition of progress made and to be made in the design of engines and other devices for the utilization of the energy of fuels and, in so far as it aims at a complemental advance in the perfecting of supposedly inferior fuels for more exacting and important uses than those to which such fuels have heretofore been put, it may be said to aim at the obviating of a shortage in one of the prime necessities of modern manufacture and commerce, fuels for automobile engines and the like.

The fuels herein referred to being essentially mere mixtures or solutions of one organic substance within another, it will be apparent that the sequence of operations by which they are produced may be varied, but the following will serve as typical examples.

Beginning with any ordinary mineral oil, such as a typical Pennsylvania crude oil, which I may distill off for direct use in commerce the usual quantities of lighter products including gasoline and kerosene, proceeding with such distillation preferably until substantially all the gasoline and kerosene have been distilled off and until the residuum left in the still shall have a Baumé gravity less than 40°. I may then associate with this residual material, or with a fraction distilled therefrom, and in any convenient manner, as by pouring and agitating, or by distilling one ingredient into a body of another ingredient, one or more relatively volatile combustible constituents containing an aryl radicle and satisfactorily miscible therewith, such as:

Aromatic hydrorcarbons (e. g. benzol, toluol, xylol, or mixtures thereof).

Nitro-hydrocarbons (e. g. nitrobenzol, nitrotoluol, or mixtures thereof.).

The proportions in which the respective volatile combustible ingredients referred to (or any analogous ingredients that may fall within the claims hereinafter presented) may advantageously be incorporated with the heavier hydrocarbon or hydrocarbon mixture will, of course, depend not alone

upon the exact character of the heavy hydrocarbon and upon the selection made among the volatile ingredients, but also upon whether it is intended to produce, in one product, what might be termed a "versatile" or "universal" liquid fuel capable of a great variety of uses, or whether the manufacturing intent is rather to produce a fuel possessing, in the highest practicable degree, certain advantages or peculiarities adapting it to some specific use (such as use in vehicle engines, in stationary engines, in injection oil engines, or in oil burners), and an extremely wide range of variations will accordingly be understood to be included within the intended scope of the claims appended hereto. The following are offered merely as specific examples of compositions within the scope of my present invention, it being understood that wherever the expression "heavy oil" is employed in the said examples, this expression may refer to a petroleum distillate or residue which may consist of paraffin oils and which may be heavier than 40° Bé., and may, for example, be as heavy as 28° Bé. By the term, "petroleum distillates heavier than kerosene," I mean those petroleum distillates which have densities lying above the generally-accepted upper limit of the range of kerosene densities, which, as already mentioned, lies at about 40° Bé., or about .82 absolute density. The parts referred to are parts by volume:

Example 1.

Heavy oil	75 parts
Benzol	25 parts

Example 2.

Heavy oil	75 parts
Benzol	20 parts
Nitrobenzol	5 parts

It should be understood that in the above examples the benzol may be supplanted in whole or in part by nitrobenzol, and that nitrotoluol or nitroxylol might be used instead of nitrobenzol. Also, that the nitro radicle (NO_2) in the mentioned equivalents contains oxygen and nitrogen in forms capable of contributing to the promptitude of reactions which, when occurring under suitable conditions, proceed with explosive violence.

As already mentioned, and as will be apparent from the foregoing, while I have described in detail a few specific embodiments of my invention in synthetic "universal" liquid fuels, each of which comprises a preponderating quantity of a heavy hydrocarbon, and each of which is suitable for uses as widely separated as are, on the one hand, employment (under suitable conditions of temperature and pressure and in due admixture with air or with oxygen) in explosion motors and, on the other hand, employment in direct generation of heat under steam boilers, many additional changes may be made without departing from the spirit of my invention, as indicated in the foregoing description and in the appended claims.

I claim:

1. A liquid fuel consisting of a petroleum distillate heavier than kerosene, and an aromatic hydrocarbon.

2. A liquid fuel consisting of a petroleum distillate heavier than kerosene, and benzol.

3. A liquid fuel consisting of a petroleum distillate heavier than kerosene, and an aromatic nitro-hydrocarbon.

4. A liquid fuel consisting of a petroleum distillate heavier than kerosene, and nitrobenzol.

5. A liquid fuel comprising a petroleum distillate heavier than kerosene, an aromatic hydrocarbon, and an aromatic nitro-hydrocarbon.

6. A liquid fuel comprising a petroleum distillate heavier than kerosene, benzol, and nitro-benzol.

7. A liquid fuel comprising a petroleum distillate heavier than kerosene, and an aromatic hydrocarbon, the distillate being present in the proportion of about three-fourths of the mixture.

8. A liquid fuel comprising a petroleum distillate heavier than kerosene, and benzol, the distillate being present in the proportion of about three-fourths of the mixture.

9. A liquid fuel comprising a petroleum distillate heavier than kerosene, an aromatic hydrocarbon and an aromatic nitro-hydrocarbon, the distillate being present in the proportion of about three-fourths of the mixture.

10. A liquid fuel comprising a petroleum distillate heavier than kerosene, and a nitrobenzol, the distillate being present in the proportion of about three-fourths of the mixture.

11. A liquid fuel comprising a petroleum distillate heavier than kerosene, benzol and nitro-benzol, in the proportions of: petroleum distillate, about 75%; benzol, about 20%, and nitro-benzol, about 5%.

In testimony that I claim the foregoing, I have hereunto set my hand this 16th day of March, 1920.

BURNELL R. TUNISON.