UNITED STATES PATENT OFFICE.

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FUEL.

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To all whom it may concern:

Be it known that I, CHARLES LE PETIT, a citizen of the French Republic, residing at Mombasa, British East Africa, have invented certain new and useful Improvements in Fuels, of which the following is a specification.

This invention relates to fuels and to the production thereof, and has for its object to provide an improved combustible particularly adaptable for use in internal-combustion engines.

With some fuels which, upon combustion, give rise to acidic bodies, it has been proposed to use certain basic additions for the purpose of neutralizing these acidic bodies. Thus ammonia has been so employed, one known fuel consisting of alcohol, ether and this base, together with a trace of white arsenic, presumably for denaturation. The ammonia has been introduced in the gaseous form, and alternatively in concentrated aqueous solutions, but in both cases is objectionable by reason of its action on metallic parts, such as those of copper, nickel and aluminium. To avoid the disadvantages associated with ammonia, trimethylamin has been substituted, and it has similarly been proposed to improve the qualities of liquid fuels by passing into them ammonia derivatives of hydrocarbons, such as methylamin, under pressure. The amins are for the most part very readily soluble in alcohol, and the use of pressure results in a strong solution, and the presence in the fuel in substantial proportions of these powerful bases is not only detrimental, but quite unnecessary. The odor of the fuel is objectionable, and that from the exhaust of the engine particularly so, a disadvantage which is also associated with the use of ammonia. It is the purpose of this invention to provide a fuel in which the production of acidic bodies is inhibited, and the neutralization of such as are formed readily effected, while at the same time the objectionable odor from the engine's exhaust is obviated, these advantages being attained without reduction in the explosive power of the fuel.

According to the present invention, in the production of a liquid fuel, such as a fuel for internal-combustion engines, there is employed a comparatively small proportion of one or more aliphatic amins, together with one or more esters of formic acid, such as ethyl- or methyl-formate. Preferably methylamins, for example mono- and di-methylamin, are employed. The invention is particularly adaptable to fuels which consist of or contain alcohol and ether, and according to one embodiment of the invention the improved fuel comprises ethyl alcohol, ether, an aliphatic amin, or mixture of amins, and a formyl-ester, such as ethyl- or methyl-formate.

Where more than one amin is employed, these need not belong to the same aliphatic series, for example, a mixture of methylamins and ethylamins may be utilized. A natural source of such a mixture is vinasse, a by-product in the manufacture of beet sugar. Similarly a mixture of methylamins may be obtained from herring brine. The addition of the bases may be made in any suitable way. Thus, gaseous methylamin may be dissolved in the other ingredients of the fuel, such as the mixture of alcohol and ether, or mono-methylamin in the liquid form may be added.

The proportions of amins used depend upon circumstances, such as the nature of the other constituents of the fuel and its particular composition. For many purposes these proportions will be found to be in the neighborhood of 0.5 to 2%. The esters may be used in approximately the same proportions as the amins, or sometimes in rather larger amounts. Generally it will be found that a smaller proportion of ester than of amin should be used, advantageously half as much of a 50% mixture of methyl- and ethyl-formate.

As illustrative of the invention the following examples may be cited:—

I.

	Per cent. by weight.
Ethyl alcohol	52
Ether	46
Mono-methylamin	1
Ethyl- or methyl-formate (or both)	1

II.

	Per cent. by weight.
Ethyl alcohol	65
Ether	34
Mono- or di-methylamin	0.5
Ethyl-formate	0.5

III.

	Per cent. by weight.
Ethyl alcohol	38½–39
Ether	57
Di- or tri-methylamin	3
Ethyl-formate	1–1½

It will be seen that the relative proportions of the main components of the above fuels may be comparatively widely varied. When the proportion of amin is high (*e. g.* 2 or 3%) it is advantageous to use in conjunction with it the ethyl-formate only which is, it may be mentioned, the more effective deodorizer. It has been found that the invention permits, within certain limits, the use of a much larger proportion of ether in such mixtures than would otherwise be possible. The use of formyl-esters in requisite proportions obviates any objectionable odor associated with the use of the fuels, and also inhibits the production of deleterious acidic bodies produced by combustion.

The preferred order of mixing is first to dissolve the mono-methylamin in the alcohol, then to add the ethyl- or methyl-formate, and finally to add the ether.

The proportion of ether to alcohol and consequently the proportions of amin and ester employed therewith can conveniently be varied to suit the nature of the engine (*i. e.* rotary aerial, small fixed engine, &c.) and the nature of the carbureter.

What I claim as my invention and desire to secure by Letters Patent is:—

1. The herein described fuel composition which comprises a combustible liquid containing an aliphatic amin and a formyl ester.

2. The herein described fuel composition which comprises a combustible liquid containing a methylamin and a formyl ester.

3. The herein described fuel composition which consists of a mixture of alcohol and ether containing an aliphatic amin and a formyl ester.

4. The herein described fuel composition which consists of a combustible liquid containing an aliphatic amin in the proportion of 0.5–3 per cent., and a formyl ester in the proportion of 0.5–2 per cent.

5. The herein described fuel composition which consists of 38–70 per cent. of ethyl alcohol, 60–30 per cent. of ether, 0.5–3 per cent. of a methylamin and 0.5–2 per cent. of a formyl ester, by weight.

6. The herein described fuel composition which consists of 52 per cent. ethyl alcohol, 46 per cent. ether, 1.0 per cent. of mono-methylamin and 1.0 per cent. ethyl formate, by weight.

7. The herein described fuel composition which consists of ethyl alcohol in excess of 35 per cent., ether in excess of 30 per cent., mono-methylamin in excess of 0.5 per cent., ethyl formate in excess of 0.5 per cent. by weight.

In testimony whereof I affix my signature.

CHARLES LE PETIT.