

UNITED STATES PATENT OFFICE

VERNON LANTZ, OF BERKELEY, CALIFORNIA, ASSIGNOR TO STANDARD OIL COMPANY OF CALIFORNIA, OF SAN FRANCISCO, CALIFORNIA, A CORPORATION OF DELAWARE

MOTOR FUEL

No Drawing.

Application filed September 6, 1927. Serial No. 217,888.

This invention relates to a motor fuel and process of making the same, and relates particularly to a blended fuel comprising a petroleum distillate such as gasoline, alcohol and a blending agent for these two substances.

An object of this invention is to disclose a mixture of commercial alcohol and petroleum distillates suitable for use as a motor fuel.

Another object is to disclose the use of strong organic bases in motor fuels containing a mixture of alcohol and petroleum distillate.

Another object is to prepare a motor fuel containing alcohol and petroleum distillates, such fuel not separating at atmospheric temperatures.

Another object is to prepare a fuel for use in high compression internal combustion engines from mixtures of alcohol and petroleum distillates by using strong organic bases as blending agents.

Both gasoline and alcohol have been used separately as motor fuels and blends of gasoline and alcohol have been used but with certain undesirable limitations as to temperature requirements or economically undesirable proportions of alcohol to gasoline. Much of the gasoline produced today, particularly from paraffine crudes has so low non-detonating value that motors of the present day type having compression ratios of approximately 5.0 to 1.0 are inclined to knock when operating at or near full throttle. This knocking, evidenced by a pinking sound in the motor combustion chamber, is accompanied by loss of power, overheating, and eventually by pre-ignition which may stop the motor.

Alcohol has long been recognized as a possible substitute for gasoline but although many alcohols will operate as motor fuels at compression ratios higher than 5.0 to 1.0 they have not found favor where gasoline is plentiful, owing to alcohol's higher cost, lower volatility, lower calorific value and heat of combustion and because it is difficult to carburetor.

Blends of alcohol and gasoline provide motor fuels which can be used with compression ratios higher than 5.0 to 1.0, but the principal objection to straight alcohol-gasoline

blends (except absolute alcohol) is that they separate into two liquid phases at temperatures which are well within the range under which motor fuels are commonly employed. Absolute alcohol and gasoline are miscible in all proportions at ordinary temperatures, but absolute alcohol is too expensive to be used commercially in the quantities or proportions required for the production of a satisfactory fuel, and, moreover, such blends are decidedly hygroscopic and unless kept in tight containers soon absorb enough water from moist air to cause separation. Commercial alcohols (containing water) have the disadvantage of separating from the gasoline at low temperatures. For instance, attempts have been made to use a blend of 25% to 95% ethyl alcohol and 75% of a gasoline such as that known as U. S. motor gasoline, but such a blended fuel separates into alcohol and gasoline at about 15° C. (59° F.) whereas the Navy Department specifications for a blended fuel require that no separation shall take place at temperatures as low as -40° F. These specifications can be met only by using absolute alcohol.

I am aware that commercial alcohol has been added or blended with petroleum distillates by using benzol, ether, or unsaturated hydrocarbons, but large proportions of these blending agents are required in order to obtain an appreciable lowering of the separating temperature.

I have discovered that commercial alcohols and gasoline may be blended at low temperatures by the use of blending agents which are strong organic bases. While it has not been verified it is believed that there is a chemical reaction between the base and the water forming a compound which is soluble both in alcohol and in gasoline. Among the strong organic bases which I have found advantageous are the amines, particularly the lower aliphatic amines, benzylamine and piperidine. Among the lower aliphatic amines which may be used are methylamine, dimethylamine, trimethylamine, ethylamine, diethylamine, triethylamine, propylamine, dipropylamine, tripropylamine, butylamine, dibutylamine and tributylamine.

The invention is not limited to aliphatic amines only, inasmuch as such heterocyclic amines as piperidine and carbocyclic amines such as benzyl amine may be used. Benzyl amine has a dissociation constant of about 2.4×10^{-5} . This compound may be said to represent one of the weakest blending agents which can be used successfully. Piperidine, on the other hand, is very strongly basic, having a dissociation constant of 1.6×10^{-3} . Of the aliphatic amines, mentioned hereinabove, triethylamine has a dissociation constant of 6.4×10^{-5} , while diethylamine has a dissociation constant of 126×10^{-5} .

As an example of the action of a strong organic base upon a blend of 24.9% of 95% alcohol and 75.1% of U. S. Motor grade gasoline, it should be noted that the straight alcohol-gasoline blend separates into two liquid phases at 13.4° C. (56.1° F.) whereas the same mixture will not separate at -42° C. (-43.6° F.) if 5.5% of triethylamine, $(C_2H_5)_3N$, is added to it in accordance with my invention.

The results of some measurements of the separation temperatures of mixtures of 24.9% of 95.8% ethyl alcohol and 75.1% of U. S. Motor grade gasoline with various aliphatic amines as blending agents are given below:

Blending agent	Per cent amine in mixture	Separation Temperature	
		Degree C.	Degree F.
1. Triethylamine.....	0	13.5	56.3
	3.05	-8.0	17.6
	5.99	Below -45.0	Below -49.0
2. Normal dibutylamine.....	0	13.5	56.3
	2.99	-5.0	23.0
	6.1	-36.0	-32.8
	6.98	Below -47.0	Below -52.6
3. Normal tributylamine.....	0	13.5	56.3
	3.3	11.0	51.8
	5.57	8.0	46.4

It will be observed from the foregoing table that triethylamine and normal dibutylamine permit the use of temperatures as low as -49° F. and -52.6° F., respectively, for the amounts of blending agent used, whereas normal tributylamine to the amount of 5.57% can not be used at temperatures lower than 46.4° F. If extremely low temperatures will not be encountered normal dibutylamine may be used as a blending agent.

A motor fuel composed of a petroleum distillate, for example, gasoline, and a strong organic base such as piperidine or any of the amines, particularly the lower aliphatic amines mentioned above, has greater non-detonating value or anti-knock properties than commercial gasolines now on the market. The resulting fuel is not poisonous, is water white, and stable to moisture and low tem-

peratures. The blending agent is volatile and will not separate out from the gasoline in or during storage or in the fuel feed lines or carburetor of internal combustion motors. By using the blending agents disclosed by me, commercial grades of alcohol containing appreciable quantities of water may be used without causing stratification or separation of the fuel. The term "strong organic base" as used by me refers to such organic bases as the aliphatic amines and piperidine or benzylamine. For example, aniline, an aromatic amine, is not embraced in my invention as I have found that the aliphatic amines are better blending agents and stronger bases. The strength as a base of the blending compound plays an important function in the efficiency of amines as blending agents.

While I have described motor fuels prepared by blending 95% ethyl alcohol and gasoline in the presence of any one of three specific blending agents (triethylamine, normal dibutylamine and normal tributylamine) it should be understood that my invention is not restricted to the use of these three blending agents separately or together, but includes the use of other strong organic bases stated above, not only with gasoline but with other petroleum distillates also. In actual practice it is sometimes difficult to separate the various aliphatic amines from each other and since the various members of this group of blending agents can be used I sometimes employ a mixture of them. In fact, the preferred blending agent is a mixture of triethylamine and diethylamine. Of these two compounds, I would prefer to use triethylamine alone if it were not for the difficulty of separating the two.

I claim:

1. A motor fuel comprising a mixture of petroleum distillate and commercial alcohol and containing an aliphatic amine of strongly basic characteristics, said amine being present in insufficient quantity to materially affect the anti-knock properties of the fuel but in sufficient quantity to prevent separation of the mixture into its component parts at low temperatures.

2. A motor fuel comprising a mixture of petroleum distillate and commercial alcohol, and containing an aliphatic amine of strongly basic characteristics.

3. A motor fuel comprising a mixture of petroleum distillate and commercial alcohol and containing an aliphatic amine of strongly basic characteristics capable of preventing separation of the mixture at low temperatures.

4. A motor fuel comprising a mixture of petroleum distillate and commercial alcohol and containing a strongly basic amine selected from a group consisting of aliphatic amine, benzyl amine and piperidine.

5. A motor fuel comprising a mixture of petroleum distillate and commercial alcohol and containing benzyl amine.

6. A motor fuel comprising a mixture of petroleum distillate and commercial alcohol and containing piperidine.

7. A motor fuel comprising a mixture of petroleum distillate and commercial alcohol and containing triethylamine as a blending agent.

8. A non-detonating motor fuel comprising a mixture of gasoline and commercial alcohol and containing triethylamine.

Signed at Richmond, Cal. this 24th day of August, 1927.

VERNON LANTZ.