

## UNITED STATES PATENT OFFICE.

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## FUEL COMPOSITION FOR INTERNAL-COMBUSTION ENGINES.

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*To all whom it may concern:*

Be it known that we, GEORGE H. TABER and HARRY ESSEX, citizens of the United States, residing at Pittsburgh, in the county of Allegheny, State of Pennsylvania, have invented certain new and useful Improvements in Fuel Compositions for Internal-Combustion Engines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a new fuel composition for internal combustion engines which is available for use in place of gasoline and which possesses distinguishing and characteristic advantages in its use as compared with gasoline.

The invention is based upon the discovery that when solvent naphtha and gasoline are combined and intermixed with each other these different ingredients blend and intermix to form a homogeneous mixture, and that the resulting mixture offers many advantages in its use in internal combustion engines, as compared with gasoline alone, or solvent naphtha alone. The new fuel composition enables the engine to operate in an improved manner and with materially increased flexibility and with both increased power and increased thermal efficiency, while the engine still retains, in its operation, the characteristic advantages which are obtained when gasoline alone is used. An engine on the block will develop with this mixture much greater maximum power than with solvent naphtha alone, and slightly greater maximum power than with gasoline alone, while the power developed by an engine as measured in horse power hours per gallon is much greater than for gasoline used alone. Road tests prove that automobiles using this mixture develop more horse power in climbing hills, and show greater flexibility than when using the constituents of this mixture separately.

The solvent naphtha which is utilized in the new fuel composition is a fraction of coal tar "light oil." Its boiling point limits vary somewhat but it seldom begins to distill below 135° C. and the distillation is usually completed below 190° C. It consists principally of xylenes together with ethyl benzol, mesitylene and analogous benzol derivatives. The solvent naphtha is

available as a by-product in the production of the more valuable benzol and toluol, and, preferably after the usual purification processes, is available for use in the new fuel composition of the present invention. The solvent naphtha which we have utilized to advantage in the new fuel composition distills completely between 140° C. and 180° C.

The gasoline which is utilized in the new fuel composition is the familiar gasoline of commerce which varies somewhat in its composition, within well recognized limits. A typical gasoline will thus contain constituents of boiling points ranging from about 70° to 200° C. and will have a specific gravity of about 0.727 at 19° C. or about 62° Baumé. We have used to advantage in the new composition, and for the purposes of comparison therewith, the gasoline known as "Good Gulf."

The proportions of the solvent naphtha and of the gasoline may vary considerably, for example, from thirty to ninety parts of the solvent naphtha to from seventy to ten parts of the gasoline. Relatively larger proportions of the solvent naphtha can be used to advantage with gasoline rich in the more volatile constituents, such as casing-head gasoline, owing to the advantages possessed by such a mixture.

The gasoline of commerce contains a very considerable proportion of the more volatile constituents, and it is important that the gasoline when used alone, should contain a considerable proportion of such constituents, particularly where it also contains constituents of relatively high boiling point, in order that it may act reliably in the starting and operation of the internal combustion engines at different temperatures and under varying conditions. The new fuel composition of the present invention contains a materially lessened and comparatively small amount of these more volatile constituents; but the combined effects of the different ingredients is such that the new composition possesses equal and even in many respects materially improved properties and qualities so far as its utilization is concerned. That is to say, even with the comparatively small amount of more volatile constituents, it still retains the characteristic advantages of gasoline and even possesses improved qualities which

make it more valuable as a fuel and which enable a materially wider range and increased flexibility of operation of the internal combustion engine to be obtained.

5 We have found, as the result of comparative tests in an automobile and its internal combustion engine, that it is possible to obtain materially increased power and a materially increased number of miles per gallon  
10 of fuel, with the new fuel composition, as compared with gasoline. For example, in 40 mile comparative tests in an eight cylinder automobile, conducted under like conditions of speed and of road traveled, it was  
15 found that a difference of as much as 10% in the lesser amount of fuel required, and an increase of about 10% in the number of miles per gallon of fuel, was obtained in favor of the new fuel composition as compared with gasoline. So also, with the new  
20 fuel composition, it was found possible to accelerate the machine from 3 miles per hour to 25 miles per hour as compared with an acceleration of 3 miles per hour to 22  
25 miles per hour, in a like time interval, 12 seconds, and on the same stretch of road, when using gasoline.

It is found also that the internal combustion engine can be readily started cold on  
30 the new fuel composition and that the starting and operation of the engine did not require any adjustments of the carburetor from that commonly used for gasoline. In fact, the comparative tests above referred  
35 to were carried out with the carburetor set to the ideal adjustment for gasoline.

Comparative dynamometer tests, carried out with a stationary automobile engine, mounted for laboratory tests, showed very  
40 material increases in the number of horsepower hours, per gallon of fuel, obtainable with the new fuel composition as compared with gasoline; and these improved results were also accompanied by materially increased  
45 thermal efficiency in the case of the new fuel composition. Thus both the power obtained from a given amount of fuel, corresponding to the mileage per gallon of fuel in an automobile, and the thermal efficiency  
50 of the fuel, were materially increased in the case of the new fuel composition, as compared with gasoline; and these results were obtained with carburetor adjustments set ideally for gasoline and kept unchanged for  
55 the new fuel compositions. The new fuel composition is thus adapted for use, and with materially improved results, in the same automobile engines now in use with gasoline and without requiring any changing  
60 of the design of the engines or the carburetor adjustments.

Throttling tests made with the six cylinder

engine of an automobile and with the new fuel composition of the present invention showed very remarkable results as compared with similar tests made with gasoline. With the new fuel composition it was found possible to run steadily on level stretches of road, and on high gear, at the remarkably low speed of one mile per hour; where-  
70 as the best that could be done with gasoline was 3 miles per hour under the same conditions. The new fuel composition, accordingly, very materially increases the flexibility in speed of an internal combustion engine, so that it is possible both to obtain very materially increased speed and power from the engine and also a very materially decreased speed due to throttling, as compared with gasoline, and without modification of  
80 the carburetor adjustment set for gasoline.

The increased flexibility in speed is one of the principal reasons given by manufacturers for complicating the engines of automobiles by increasing the number of cylinders; so that the increased flexibility in speed obtainable with the new fuel composition makes it possible to obtain with a lesser number of engine cylinders, a flexibility such as it has heretofore been considered  
90 necessary to obtain by an increased number of cylinders.

It has been above pointed out that the new fuel composition retains the characteristic advantages of gasoline, in that it is available for use the same as gasoline. Among these advantages, and in addition to its own characteristic advantages, it retains that of the easy starting properties of gasoline, even with its materially decreased amount of  
100 more volatile constituents. The solubility of these more volatile constituents in the solvent naphtha of the composition of the present invention, and the combined effect of these more volatile constituents and of  
105 the solvent naphtha in the composition, distinguish the new composition in this respect also from gasoline itself.

We claim:

1. A fuel composition for internal combustion engines consisting of gasoline and solvent naphtha of boiling point between about 135° and 190° C.

2. A fuel composition for internal combustion engines consisting of gasoline and solvent naphtha of boiling point between about 135° and 190° C., said fuel composition comprising from 30 to 90 parts of said naphtha and from 70 to 10 parts of said  
120 gasoline.

In testimony whereof we affix our signatures.

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