June 30, 1931. J. H. GRAVELL 1,812,092

FUEL ADJUNCT DEVICE FOR GAS ENGINES

Filed Nov. 12, 1926

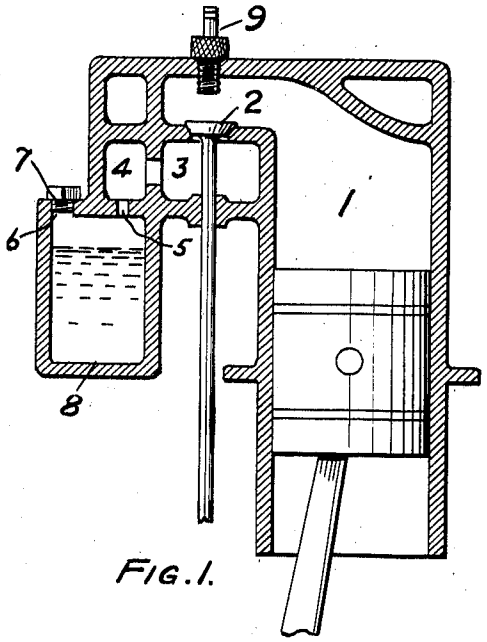


FIG. 1.

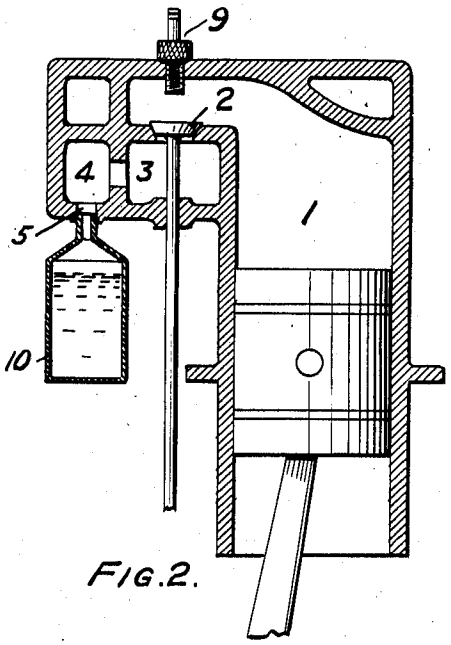


FIG. 2.

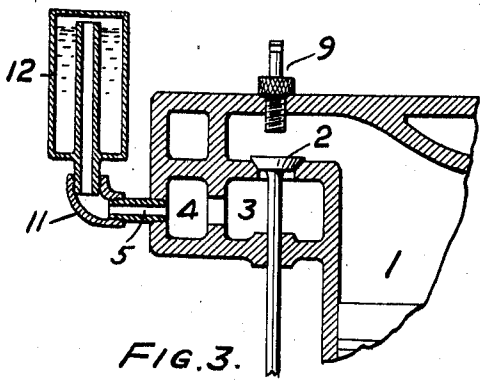


FIG. 3.

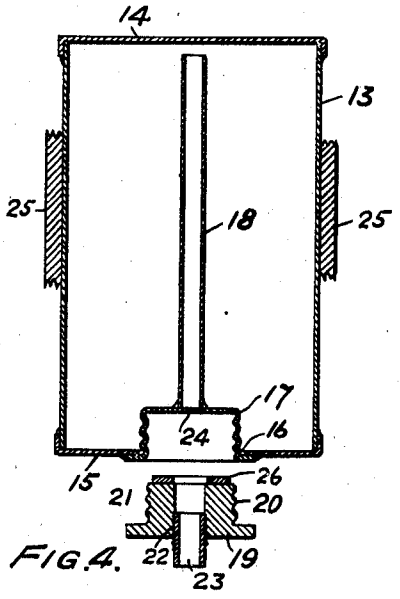


FIG. 4.

WITNESS:

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UNITED STATES PATENT OFFICE

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FUEL ADJUNCT DEVICE FOR GAS ENGINES

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Generally stated this invention relates to gas engines especially that type of engines where the decomposition of fuel or oil tends to deposit a coating of carbon.

In order to remove and prevent the carbon deposit and also to improve the internal combustion, certain materials, known as fuel adjuncts, are used.

One object of the invention is to provide a device by which the introduction of fuel adjuncts is improved. Other objects of the invention are to improve the means of introducing fuel adjuncts; to provide a receptacle for conveniently holding fuel adjuncts while in storage, transit and use, and for preventing or opposing tampering with, altering or exchanging, the contents of the said receptacle; to properly proportion the fuel addition to the fuel; and to automatically control the flow of fuel adjuncts.

I have found that those fuel adjuncts which are capable of being volatilized by reduced pressure, such as benzole, the alcohols, ether, lead tetraethyl, iron carbonyl, water, and the like, may be conveniently admixed with the fuel after the fuel has been passed through the carburetor or has been otherwise mixed with the air to form the explosive charge, by confining the fuel adjunct in a closed chamber and subjecting it to reduced pressure to volatilize it, and then while it is in the gaseous state, conducting it to the fuel-air stream and permitting or causing it to admix therewith.

Although many substances have been proposed as fuel adjuncts for preventing the accumulation of carbon and the improvement of combustion within the engine, only those which are miscible with unaerated fuel have attained any extended commercial use, due I believe to the complicated devices required to otherwise introduce them.

According to my invention, I provide simple means for introducing materials not otherwise conveniently available due to their insolubility in the fuel. My invention permits me to take advantage of the smallness of the quantity of the fuel adjunct that is required to produce the desired result, and to provide it in a relatively small amount and in concentrated form, thus eliminating the necessity of renewing it every time the fuel supply is replenished.

Although the reduced pressure to which I subject the fuel adjunct may be obtained from any source, the source automatically furnished by the engine itself during its intake stroke is preferable, due to the simplicity with which I am enabled to construct my device.

In the following description reference will be made to the accompanying drawings, forming part hereof, and in which

Figure 1 is sectional view illustrating a device embodying features of the invention.

Figures 2 and 3 are similar views illustrating modifications, and

Figure 4 is sectional view drawn to an enlarged scale.

Figures 1, 2, and 3 show various modifications of my invention as applied to an automobile gasoline engine and in those figures 1 is the compression chamber, 2 the intake valve, 3 the intake port, and 4 the intake conduit or manifold. In the practice of my invention I provide a passage, 5, leading from the intake conduit of the engine to an enlarged cavity shaped to hold any volatile fuel adjunct; when the material is a liquid, the passage should lead from the space above the high level line of the liquid so that the liquid itself will not leak into the engine. Means are provided for replenishing the material from time to time. In Fig. 1 an opening 6 is provided, and after adding the material, the stopper 7 is placed in position to seal the reservoir.

Under these conditions, during the intake stroke, when the valve 2 is open and the piston descends, the atmospheric pressure in the compression chamber 1 is reduced, and this vacuum or suction action is transmitted to the intake manifold 4 and to the closed chamber 8. This reduction in pressure permits the atmosphere to force air through the carburetor thus charging it with fuel, and into the intake manifold and thence through the port 3 into the compression chamber 1, where it is compressed and then exploded by the passage of a spark between the con-

tacts of the spark plug 9. The reduced pressure developed in the closed chamber 8 causes the material to evaporate, and as the vapor pressure of the material is greater than the partial vacuum developed in the intake manifold, it passes through the passage 5 and mixes with the engine's explosive charge and is carried into the compression chambers of the engine along with the fuel where the admixed fuel is compressed and exploded.

In Fig. 2 I have shown the closed chamber as of the form of a detachable can or bottle which may serve not only to introduce the material into the engine, but also to store and transport it. In this case the passage 5 is threaded so as to secure the threaded neck of my chamber 10, which prior to attaching to the manifold 4 is closed by a screw cap in order to prevent the loss of material in storage and transit.

A further form or modification is shown in Fig. 3 where standard pipe fittings 11 are employed for the passage for the vapor or gaseous material from the chamber 12 to the intake conduit, and for holding the chamber 12 in operative position. In this modification the chamber is nonrefillable thus preventing the original chemicals used from being tampered with or improper or harmful material being placed in the chamber after the original supply has become exhausted.

A nonrefillable chamber possessed of additional advantage is shown in Fig. 4. In this case a metal can of suitable shape is employed. The side wall of the can 13 is sealed to the top 14 and bottom 15 by solder. The bottom has an opening 16 through which the material to be used is inserted. A threaded depressed closed neck 17 is employed to act as a stopper for the opening. To the back of the stopper is attached a tube 18 which is long enough to extend nearly to the opposite end of the chamber after the stopper is in place. The connection between the stopper and the tube should be air tight and this may be attained by solder. After the materials are introduced into the chamber the stopper is inserted and the connection between the stopper and the chamber is made air tight which is preferably done by solder. After the stopper is soldered in place the materials are in a completely sealed container which excludes the possibility of leaks and substitutions during storage and transit.

In order to secure the chamber to the intake conduit or manifold of a gas engine, I provide the fitting shown at the lower portion of Fig. 4. This fitting 19 is provided with an external thread 20 of such size and shape as to fit into the internal thread provided in the neck 16. A hole 21 is extended through the fitting and is threaded at 22 with a standard tap in order to receive the pipe 23 leading to the intake manifold of the gas engine. In order to secure an air tight fit between the fitting and chamber a suitable compressible washer 26 may be employed.

Before connecting the sealed chamber shown at the upper part of Fig. 4 to the adapter shown at the lower part of Fig. 4, the metal seal 24 which is that portion of the depressed stopper, 17 which is surrounded by the tube 18, is punctured by driving a wire nail about $\frac{1}{16}$th inch in diameter through the metal, thus permitting the reduced pressure developed by the engine to communicate with the space above the material in the chamber, through the tube provided for that purpose.

I find that the speed with which the materials in the closed chamber evaporate depends on the temperature of the material, the extent of its evaporating surface, and the degree of reduced pressure to which it is subjected, hence by regulating these factors, I am enabled to govern the amount of the fuel adjunct used, and therefore can readily adapt my invention to various operating conditions and a variety of fuel adjuncts and can readily proportion the fuel adjunct to the fuel.

When apparatus embodying my invention is applied to an automobile it is naturally located under the hood near the engine where the temperature of the surrounding air is relatively high, and as the reduced pressure developed by the engine causes the fuel adjunct to evaporate thus reducing its temperature, the heat flow from the surrounding air to the fuel adjunct may be sufficient to cause excessive evaporation and a waste of the adjunct. Under these conditions, I regulate the heat flow by providing a proper thermal insulation to my chamber which I accomplish in a very satisfactory manner by inclosing my chamber in a paper box or carton of which a part is shown, 25, in Fig. 4.

I have found from experimenting that when my invention is applied to a 1925, eight cylinder Hupmobile a closed chamber of one pint capacity and of cylindrical shape, measuring about three inches in diameter, affords ample capacity to supply sufficient fuel adjunct such as alcohol, for operating the car approximately 1000 miles.

It will be obvious to those skilled in the art to which the invention relates that modifications may be made in details of construction and arrangement and in matters of mere form without departing from the spirit of the invention which is not limited as to such or otherwise than as the prior art and the appended claim may require.

I claim:

A device for introducing volatile fuel adjuncts into a gas engine comprising an in-

take conduit for a gas engine, a replaceable air tight chamber for holding fuel adjuncts, said chamber having an inwardly extending threaded neck provided with a seal having a puncturable spot, a tube extending inwardly from said seal, an air tight passage connecting the cavities of said conduit and said chamber, and mechanical means coacting with the said threaded neck to secure said chamber to said conduit.

JAMES H. GRAVELL.