June 21, 1927. 1,633,251

N. L. HEINZ

INTERNAL COMBUSTION ENGINE

Filed Sept. 29, 1922

FIG. 1

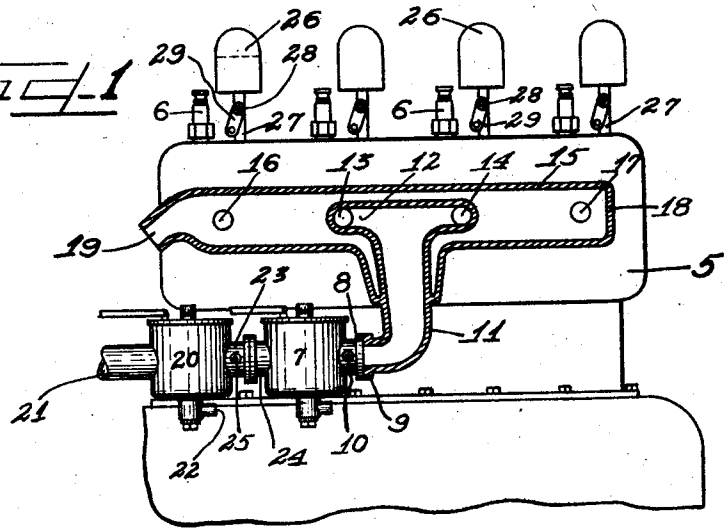
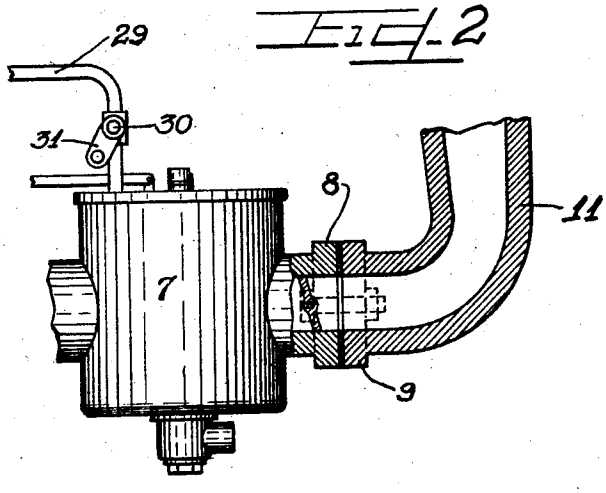


FIG. 2



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By Sprinkle, Hopkins & McNair Attys

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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

Application filed September 29, 1922. Serial No. 591,404.

My invention relates to internal combustion engines and more particularly to elimination of excess air present in the carbureted fuels as the same are admitted to the cylinders of such engines.

My invention relates more specifically to the utilization of a hydrocarbon fuel in which excessive air is eliminated and the surplus amount of liquid fuel particles is reduced and removed from the fuel which is delivered into the engine cylinders.

Another object of the invention is to provide a fuel for internal combustion engines having substantially but little excess air, and of greater initial heat as the same is admitted to the engine cylinders.

A further object of the invention is to provide a fuel for internal combustion engines in which intimate molecular contact of oxygen and hydrocarbon is effected.

A yet further object of the invention is to provide a fuel for internal combustion engines which is admitted to the engine cylinders at a greater temperature than at present and providing variable compression spaces to compensate for the increased temperature of the fuel.

A still further object of the invention is to provide a method for eliminating excessive air from hydrocarbon fuels, for use in internal combustion engines.

Generally speaking, I carry out the preferred embodiment of my invention by introducing water in controllable amounts preferably, atomizing the water and conducting the same under suction to the engine together with the atomized hydrocarbon and in its passage to the engine subjecting the mixture to heat thereby increasing the volume of the mixture and delivering the heated mixture to the engine.

The above recited and other objects of the invention will be apparent from the following description and drawings and will be particularly pointed out in the appended claim.

In the accompanying drawings, which are somewhat diagrammatic in form:

Figure 1 is a side elevational view of a four cylinder engine, with certain parts in section, showing the preferred embodiment of the invention, and

Figure 2 is an enlarged view of a hydrocarbon carburetor with a portion of its connection to the engine shown in section.

5 represents a cylinder block comprising four cylinders of usual type. At the top appear the usual spark plugs 6. The hydrocarbon carburetor is shown at 7 which is connected at 8 to the end 9 of the intake manifold. The usual butterfly valve 10 is provided.

The manifold which I have shown is made of a single casting and includes both the intake and exhaust elements, the intake portion is within the exhaust portion for the purpose of heating the intake portion. The intake portion 9 extends upwardly and diverges in section as at 11. At the upper portion of the part 11 the same is enlarged as at 12 for communication with inlet ports 13 and 14. The exhaust manifold 15 surrounds the part 12 and some of the diverging part 11. The exhaust manifold communicates with exhaust ports 16 and 17 and is closed at one end 18 and open at the other end 19 for communication with a suitable outlet for the exhaust gases.

In the embodiment shown in Figure 1, I employ a second carburetor 20 which is placed ahead of the hydrocarbon carburetor 7. Into inlet 21 of the carburetor 20 air is introduced and through the inlet 22 water is introduced by means of suitable connection with a water supply (not shown). Included in the water connection a valve may be interposed for regulation of the water supply. In this carburetor the water is atomized and is delivered through outlet 23 to the inlet 24 of the hydrocarbon carburetor 7. In the outlet of the first carburetor 20 a butterfly valve 25 is interposed for regulating the amount of atomized water delivered to the carburetor 7. Whenever one of the cylinders of the engine 5 by means of the usual inlet valves (not shown) is placed in communication with the hydrocarbon carburetor 7 suction occurs, drawing in the atomized water and with it some of the hydrocarbon which has been atomized in carburetor 7. The atomized water necessarily takes the place of an amount of air heretofore present in carburetted hydrocarbon fuel. The mixture leaving carburetor 7, therefore, comprises atomized water and atomized hydrocarbon fuel. As this mixture is led upwardly through the intake 11 it expands by reason of the contour of the intake 11 and when it reaches the heated portion of the intake is expanded by heat

to a greater extent. The effect of the heat is to increase the temperature of the mixture thereupon turning the globules or particles of both atomized water and hydrocarbon into a true vapor or gas i. e. hydrocarbon vapor and steam. The heat necessarily increases the temperature of the mixture, and the mixture expands in direct proportion to the amount it is heated and also by reason of the increasing volumetric size of the intake manifold. Heating the mixture prevents the suction of a greater amount of air than is contained in the atomized hydrocarbon and the amount in the atomized water. As the water is heated the water particles become water vapor; that is, steam, displacing an equal volume of air if such be present, at least preventing an equal amount of air from being carried along by the vaporized hydrocarbon fuel, thus increasing the effectiveness of such fuel. When the heated mixture is delivered into the cylinder it is then compressed by the upstroke of the piston. Compression increases the heat of the trapped gas. If the compression is too high for the space in which the gas is contained or if the heat of the gas is too high so that when compressed too great a heat is generated, preignition might occur. To prevent preignition I provide variable compression spaces in communication with the several cylinders of the engine. In the drawings these increased spaces are shown as chambers 26 communicating with the several cylinders of the engine through passages 27. In said passages valves 28 are interposed for varying the openings therethrough. The valves 28 carry handles 29 which may be connected together and manipulated from the dash board of the vehicle. I have found that the setting of the valves 28 may be readily ascertained by movement of the connections thereto and when once set may be left until operating conditions of the vehicle change.

In the present practice of supplying fuel to internal combustion engines the suction of the engine draws in air through the carburetor which carries with it particles of the hydrocarbon fuel. These particles are all in the liquid state irrespective of size. When this mixture is received in the engine cylinder some of the hydrocarbon particles are vaporized becoming gas while some are not. Due to the fact that internal combustion engines are variable speed engines and operate usually at less than maximum speed the engine is said to operate in a throttled condition. The engine, however, must necessarily have a capacity for maximum power requirements; hence, the air and its accompanying hydrocarbon liquid particles admitted to the cylinders is less under throttled conditions than when the engine is operated at maximum. The consequence is that the air admitted to the cylinder expands to fill the volume thereof thus becoming attenuated. Expanding the air cools the same so that but little of the hydrocarbon element of the fuel charge is vaporized and actually used for power purposes. That which is not used for power purposes leaks by the piston rings into the crank case to the detriment of the lubricating oil therein while some passes out with the exhaust gases. Such a result, that is the non-utilization of all of the hydrocarbon particles, means that to use same and transfer these to vapor, an excessive amount of air is necessarily employed so that the heat generated in the engine by compression and combustion is for a large part used to heat useless air rather than to vaporize the hydrocarbon particles, resulting in a non-efficient utilization of the hydrocarbon.

My invention overcomes the objections to the above recited method in that it employs another element different from the air and hydrocarbon, which is water, for displacing a large portion of the air at the present time employed. In other words, another gas is supplied to the engine which gas itself possesses power imparting characteristics. The water vapor fills the cylinder and tends to keep down the temperature of the compressed mixture in the cylinder at the same time precluding a like amount of air. Furthermore, the expansion of the hydrocarbon and the water vapor under influence of heat keeps out an excessive amount of air. I have found from repeated experiments that the exhaust gases under present conditions contain about 60% of air, whereas the amount of air present in the exhaust gases from an engine equipped with my invention is as low as 13%, indicating that the oxygen present in the air supplied to the engine when equipped with my invention is used for gasifying the hydrocarbon particles instead of being wasted. By control of the water supplied to the carburetor 20 any proportionate mixture of air and hydrocarbon may be secured as is best suited to the particular engine and to the conditions under which the same is operating.

In Figure 2 a modification of the invention is shown. Here the second carburetor 20 is eliminated and water is delivered through a pipe 29 controlled by a valve 30 to the air chamber of the carburetor 7. The valve 30 may be provided with a handle 31 for connection by suitable means to the dash board of the vehicle for regulation as the operator may see fit. The operation of the gas mixture from the carburetor 7 is the same as described with respect to the arrangement of Figure 1.

Where the combustible fuel within the engine is at too high a temperature it may be brought or lowered to proper working

temperature by addition of the other gas such as water vapor. Where the heat is insufficient the volume within the cylinders may be filled with water vapor to cut out an excessive amount of air.

By utilizing the expansion chambers 26 the compression of the charge is reduced from what it is at the moment of entry into the cylinders. The same unit charge is drawn into the cylinders whether or not such chambers are used, so that when a portion of this charge enters the expansion chamber 26 the compression as a whole is reduced. After the power stroke any uncombusted vapor remaining in the chamber, shoots out under pressure heads, just as in a steam cylinder, and is carried away on the exhaust stroke, thus leaving the expansion chamber free to receive a portion of the next power imparting charge drawn into the cylinder.

While I have described more or less precisely the details of my invention I do not wish to be understood as limiting myself thereto as I contemplate changes in form and proportion of parts and the substitution of equivalents as circumstances may suggest or render expedient without departing from the spirit of my invention.

I claim:

In a device of the class described, in combination, means for atomizing hydrocarbon fuel, means for atomizing water, means for delivering said atomized fuel and water into a common chamber, said chamber diverging in the direction of path of travel of the mixture, means for heating said chamber to expand and gasify said atomized fuel and water, means for delivering said gasified mixture into an internal combustion engine and means for relieving the compression of a unit charge of said mixture, said means including a chamber in communication with said cylinder.

Signed at Walworth, Wisconsin, this 25th day of September, 1922.

NICHOLAS L. HEINZ.