Sept. 25, 1934. B. M. GOLDOFT ET AL 1,974,865

FUEL ECONOMIZER

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Fig. 1.

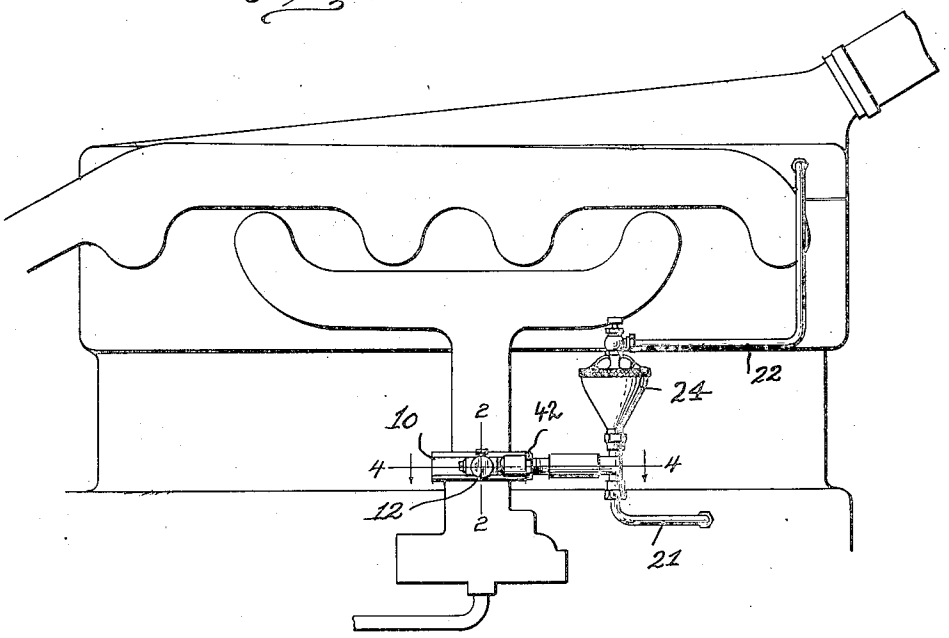


Fig. 2.

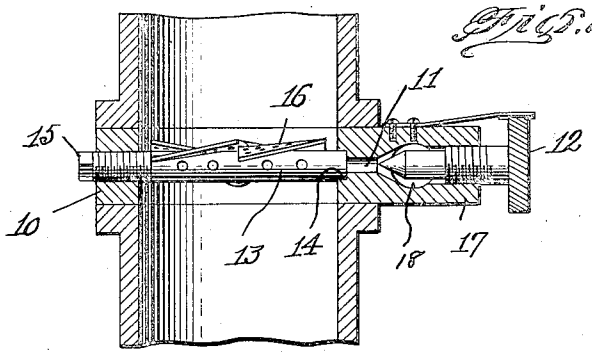
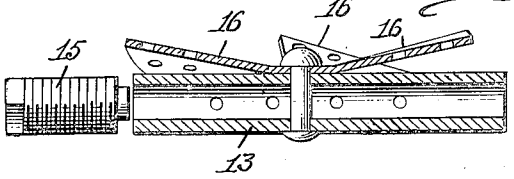


Fig. 3.



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Fig. 4.

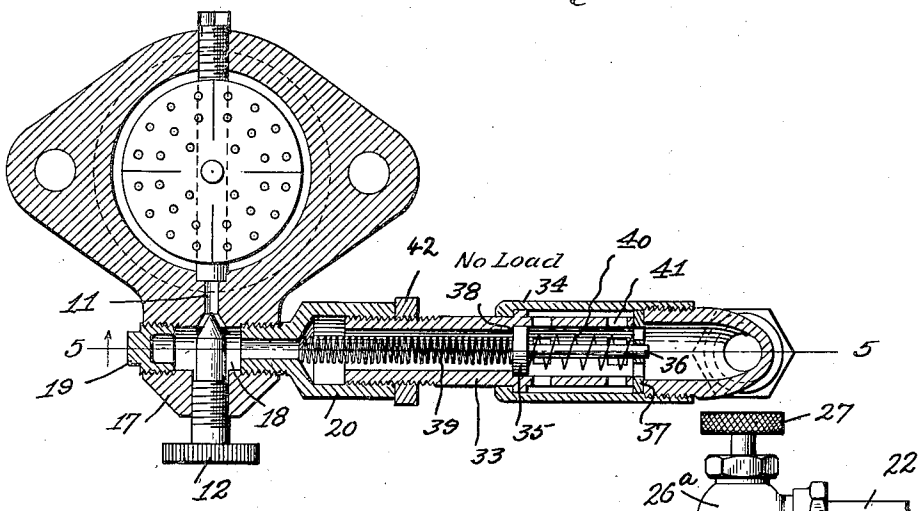


Fig. 5.

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UNITED STATES PATENT OFFICE

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FUEL ECONOMIZER

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Application January 25, 1932, Serial No. 588,786

1 Claim. (Cl. 137—152)

The object of this invention is to provide an internal-combustion engine with a simple attachment whereby the fuel that is taken in through the carburetor will be augmented by hydrocarbon vapors sucked out of the crank casing and by damp air derived from the atmosphere and the water jacket or other part of the water system of the engine, so that fuel from the usual fuel supply will be economized and further that the valves in the engine-head will be lubricated by the vapors taken from the crank-case, as more fully hereinafter set forth. A special feature of the invention is a valve which will automatically cut off the aforesaid auxiliary supply of fuel during idling and starting of the engine but will bring the supply back into use when the engine is running under load, as more fully hereinafter set forth.

Referring to the drawings annexed;

Fig. 1 is a side elevation of a common form of water cooled internal combustion engine having my attachment connected thereto.

Fig. 2 is a vertical sectional view on the line 2—2 of Fig. 1.

Fig. 3 is a vertical longitudinal sectional view in detail of the atomizer.

Fig. 4 is a horizontal sectional view taken on the line 4—4 of Fig. 1; and

Fig. 5 is a vertical sectional view taken on the line 5—5 of Fig. 4.

Referring to the drawings by reference characters, 10 designates a ring or block clamped between the outlet of the usual carburetor and the lower end of the vertical member of the intake manifold. Formed radially in this ring is a fuel passage 11 which is controlled by a manually adjustable needle valve 12. Communicating with the inner end of the passage 11 and lying wholly within the ring 10 is a perforated tube 13 which receives the mixture of fuel as it leaves the aforesaid passage 11. This tube has one end set in a recess 14 formed in the inner wall of the ring and its other end supported on a screw plug 15 tapped into the ring 10 at the opposite side. Affixed to the upper side of the perforated tube 13 is a series of blades 16 annularly arranged in the manner of propeller blades and provided with numerous perforations. This propeller-like fixed perforated diaphragm is circular in shape and approximately fits the internal diameter of the ring 10.

In a boss 17 formed on the ring 10 is a lateral passage 18 which communicates with the passage 11. One end of this passage is closed by a removable plug 19 and the other end is tapped to receive the aforesaid plug 19 or the threaded end of a nipple 20. This nipple 20 receives a mixed stream of fuel and dampened air through the medium of the following devices:

A small bore tube 21 is connected to the crank-case of the engine at a point above the oil level therein, and a similar tube 22 is connected to the water jacket or other part of the water system of the engine at a point below the normal level of the water therein so that this pipe 22 shall always be filled with water. The water pipe 22 discharges a minute quantity of water onto a sponge 23 enclosed in an upright conical casing 24, the tube 22 being connected to the cover 25 of this casing by means of a valve casing 26a in which is mounted a manually operable needle valve 27, the purpose of this valve being to govern the amount of water delivered onto the sponge. The cover is provided with one or more air holes 26. The lower, discharge end of the conical cup 24 is threaded onto the upper end of a T-coupling 28. The sponge 23 rests on a perforated diaphragm 29, and the bottom of the conical cup is provided with a drain-hole 30 adapted to drain off any surplus water that may drip past the diaphragm 29. To prevent water, as water running down into the T-coupling 28, should there be a surplus feed of water from the pipe 22, we provide an upstanding pipe 31 within the sponge cup, this pipe 31 being desirably extended upwardly to a point near the diaphragm to thereby insure nothing but dampened air entering the upper open end of this tube 31.

The tube 21 is connected to the other, depending end of the T-coupling 28, and the lateral branch 32 of this T-coupling is connected to the aforesaid nipple 20 through the medium of an automatic valve which is so constructed that when the intake manifold is subjected to a high vacuum, (as in idling and in starting) this valve will be completely closed to thus put out of commission entirely the auxiliary source of fuel and thus permit the idling and starting adjustments to be more accurately made and maintained than would be possible if the auxiliary fuel supply were in commission all the time. As soon as the engine is running under load and the vacuum in the intake is therefore reduced by the opening of the usual throttle, the valve automatically opens to permit the auxiliary devices to go into operation.

The aforesaid automatic valve consists of an open-ended tube 33 having one end tapped into the outer end of the nipple 20 and its other end clamped against the nipple 32 by means of a swivel-sleeve 34 screwed onto said nipple 32, the shouldered outer end of this sleeve 33 engaging

an outwardly extending shoulder 34a on the tube 33. Within the tube 33, at the outer end thereof, works a piston valve 35 having an outwardly extending stem 36 which is guided in a spider 37 clamped between the tube 33 and the nipple 32. This piston valve 35 is adapted to seat, when closed, against valve seat 38 in the form of an internal ledge facing outwardly. A long coil spring 39 tends to press the piston outwardly to open position, and a short coil spring 40 tends to press the piston into closed position. Normally the spring 39 overcomes the spring 40 and thus holds the valve in open position. One or more slots or perforations 41 are formed in the tube 33, within the sleeve to permit the incoming stream of fuel to pass around the valve when the same is in open position.

When the engine is running under load conditions, the suction will not be sufficient to close the valve 35 and the suction of the engine therefore will draw into the perforated tube 13 a mixed stream of damp air and vapors from the crank-case and thus insure the same being mixed with the stream of fuel coming up through the carburetor. In this way, we not only get rid of the crank-case odors, but make use of the same as a part of the fuel charge of the engine. The mixing of a stream of dampened air with this auxiliary supply of fuel increases the mileage with a given quantity of fuel coming up through the carburetor. The needle valve 27 is kept adjusted to virtually a bleed position, so that water will pass this valve only under suction, and even then only a minute quantity is drawn down through the supply pipe 22, so that at no time will the air carry enough water vapor to interfere with the proper operation of the engine. The function of the long coil spring 39 is to hold the valve 35 open except under the excessive suction in the intake manifold which occurs while idling and starting. The function of the lighter coil spring 40 is virtually to start the piston valve on its closing movement, to insure against sticking; without this starting spring 40 the valve would be pushed against the spider 37 with the result that it might not promptly respond to heavy suction and would therefore remain open all the time.

A feature of importance is the atomizer mounted in the uptake of the intake manifold. The perforations in the tube 13 insure a mixed stream of fuel entering the manifold in a plurality of jets underneath the perforated blades, and the perforated blades insure a thorough mixture of the two streams of fuel (one coming up from the carburetor and the other coming in through passage 11) and also a thorough and very fine comminution of the water particles to the end that in the engine cylinders under the intense heat of the explosions these particles will perform their usual function efficiently, and therefore augment the hydrocarbon fuel.

It will be observed that the inner end of the long spring 39 bears against an outwardly facing shoulder in the nipple 20, and that therefore by screwing the valve-tube into and out of the nipple the strength of the spring may be varied to suit the particular engine in which the device is applied; and this adjustment may be maintained by a lock-nut 42 adapted to jam against the outer end of the nipple 20. The adjustment of this spring 39 is all that is sufficient; that is to say, it is not necessary to also adjust the anti-sticking spring 40.

In accordance with the provisions of the patent statutes, we have herein described the principle of operation of our invention, together with the apparatus which we now consider to represent the best embodiments thereof, but we desire to have it understood that the apparatus disclosed is only illustrative and that the invention can be carried out by other means. Also, while it is designed to use the various features and elements in the combinations and relations described, some of these may be altered and others omitted and some of the features of each modification may be embodied in the others without interfering with the more general results outlined, and the invention extends to such use. In addition to the foregoing new results it will be observed that we literally burn as fuel the crank-case odors and are thus enabled to do away with the necessity of a special appliance for getting rid of said odors. Also we reduce carbon formation, first by a more complete burning of the gasoline because of our atomizer and also because the water vapor carried in with the air keeps the carbon that is formed in a soft condition and thus precludes or minimizes carbon formations. Also because of the thorough manner in which we remove the gasoline from the crank-case, dilution of the crank-case oil is reduced to a bare minimum. Because of the heat of the engine most of the gasoline coming down from the cylinders is vaporized before it gets into the oil so that by reason of the constant suction action we withdraw and make use of all this gasoline vapor. It will be understood also that valve 12 is adjusted so as to allow the oil vapor and the damped air to enter the manifold in proper proportions and this additional fuel so enriches the carburetor mixture that it makes it necessary to re-adjust the carburetor to meet the new condition, with consequent cutting down of gasoline and air adjustments on the carburetor.

We claim:

A valve of the class described embodying a tube through which gaseous fuel may pass, said tube having an integral ledge constituting a seat, an imperforate piston-valve slidable in said tube and adapted to seat air-tightly against said seat, said valve having an outwardly-extending guide-pin, a guide in the tube for said pin, two opposing springs, one tending to close said piston-valve, and the other tending to open the same, the one tending to close the valve being weaker than the other spring, this weaker spring being arranged to surround said guide-pin and press at one end against the piston-valve and at the other end against said guide, conduit means being provided whereby the gaseous fuel may pass around said piston-valve when the same is open.

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