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H. W. BELL ET AL

AUTOMATIC MOISTENING VALVE

Filed June 16, 1921

Fig. 1.

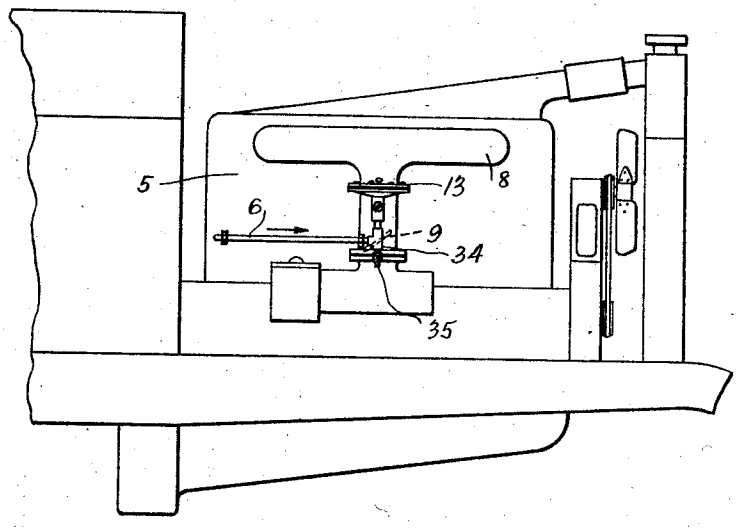


Fig. 2.

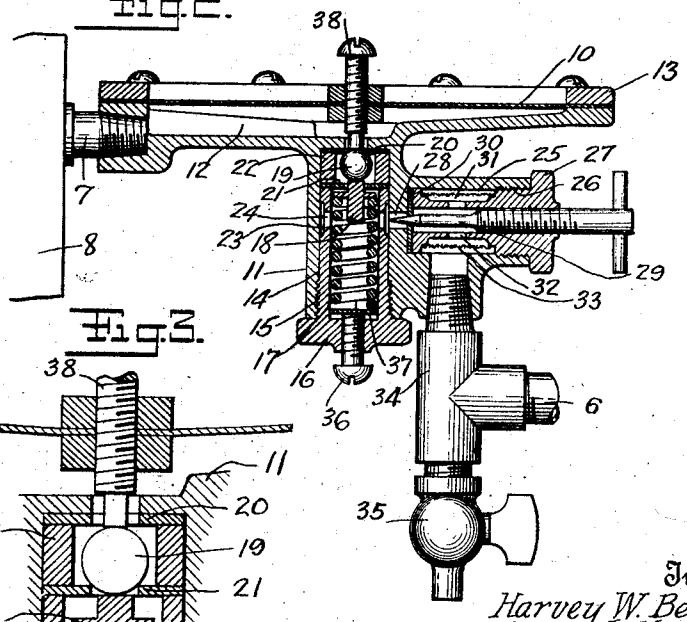


Fig. 3.

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UNITED STATES PATENT OFFICE.

HARVEY W. BELL, OF YONKERS, AND HAZEN L. HOYT, JR., OF GREAT NECK, NEW YORK, ASSIGNORS TO THE BELOYT CORPORATION, OF DOVER, DELAWARE, A CORPORATION OF DELAWARE.

AUTOMATIC MOISTENING VALVE.

Application filed June 16, 1921. Serial No. 477,924.

To all whom it may concern:

Be it known that we, HARVEY W. BELL, a citizen of the United States, and a resident of Yonkers, Westchester County, and State of New York, and HAZEN L. HOYT, Jr., a resident of Great Neck, Long Island, county of Nassau, and State of New York, have invented new and useful Improvements in Automatic Moistening Valves, of which the following is a specification.

The present invention relates to internal combustion engines and particularly to a means for introducing water or other carbon-eliminating fluid into the combustion chamber.

Special objects of the invention are to provide apparatus for this purpose which will be relatively simple and inexpensive and which can be readily applied to motors now in use.

A further particular object of the invention is to provide apparatus of the character set forth which will operate automatically to supply the fluid at the most effective rate and at the times only when it is most needed.

These and other objects we have attained by means of certain novel features of construction, combination and arrangement of parts, an example of which is illustrated in the accompanying drawing, to which attention is now directed.

Figure 1 in this drawing is a side view of the invention as applied to an ordinary automobile engine.

Figure 2 is an enlarged cross sectional view of the control mechanism.

Figure 3 is a broken sectional view on a further enlarged scale illustrating operation of the automatic valve.

In the present disclosure water is used as a carbon-destroying or consuming element and this is taken directly from the water-jacket 5 of the motor by means of a pipe connection 6. This water is fed into the combustion chamber by way of a pipe connection 7 which is entered into the intake manifold 8 at a point above the throttle 9.

The flow is automatically governed according to operating conditions of the engine by a pressure controlled element consisting in the present disclosure of a spring diaphragm 10 which is under control of the suction exerted by the pipe 7 and which operates as a controller for a valve in the feed line.

As shown in the sectional views, the control apparatus preferably consists of a body member 11 having an enlarged top providing a chamber 12 closed by the diaphragm which is shown as removably held in place by a clamping ring 13. At the bottom of this body member, which may be in the form of a simple die casting, is provided a central vertical passage 14 screwthreaded at its lower end at 15 to take the similarly screwthreaded portion of a plug 16 which is entered in this passage. This plug is hollow to provide a chamber for the spring 17 which operates on a plunger 18 loosely guided in the inner end of the plug and engaging a ball valve 19.

This ball valve operates between and is adapted to engage either of the valve seats 20 and 21.

A simple method of manufacture and assemblage is to provide the valve seats 20 and 21 by means of discs, such as we have illustrated, spaced apart in the desired relation by a spacing collar 22, these valve discs and the spacing collar being held in place at the inner end of the bore 14 by means of the screw plug 16 whose inner end is shown as engaging the outer valve disc so as to force the same, with the interposed spacing collar and the inner valve disc, against or toward the inner end of the bore 14.

The outer surface of the plug 16 is shown as relieved or cut away at 23 to provide an annular passage and an opening or openings 24 serve to establish communication from this passage to the interior of the hollow or tubular portion of the plug.

The body member 11 in our present construction is also provided with a bore 25 threaded at its outer end at 26 to receive the correspondingly threaded portion of a plug 27 and having a passage 28 at its inner end opening to the annular channel 24.

The plug 27 carries a needle valve 29 which co-operates with a suitable valve seat provided in this instance by a valve seat

disc 30 held in position at the inner end of the bore 25 by the valve-carrying plug 27.

The plug 27 is also shown as of hollow construction to freely admit the inner end of the needle valve and as having a surrounding annular channel 31 communicating by a passage or passages 32 with the hollow interior of the plug. About the channel 31 we may place a strainer 33. This feature is particularly important when the water is taken from the circulating system of the engine.

The water inlet pipe 6 is shown as entered into the lower part of the annular channel 31 by way of a T-coupling 34 which is shown as provided with a drain cock 35 for carrying off rust or other material collecting outside the screen.

With the mechanism constructed as described, it will be seen that all the valve parts can be assembled and secured in place by simply dropping them in their seats in the bores 14 and 25, and then tightening up the plugs which serve as the closures for such bores.

The tension of the valve-closing spring 17 is such that the ball valve is normally held closed against its upper seat 20 when the engine is not running. This tension is adjusted in the illustration by a screw 36 entered through the bottom of the plug 16 and bearing against an abutment washer 37 for the lower end of the spring, which washer operates with an easy sliding fit within the cavity of the plug.

The diaphragm, as pressure is reduced beneath the same by means of suction pipe 7, is actuated by external atmospheric pressure to open the valve and, under certain conditions, to force the valve closed against its lower seat. For this purpose we have shown the diaphragm as equipped with a valve actuating stud in the form of an abutment screw 38 which is adjustable toward and away from the valve for the purpose of determining the point or the conditions under which the valve will open. The needle valve and the adjusting screws may be provided with lock nuts or other suitable devices for securing them in their adjusted relations.

The needle valve is set so as to admit only that amount of water which will properly combine with the mixture, this of course depending upon the size of the engine, the carbureter adjustment and other factors. The valve tension screw 36 and the valve opening screw 38 are set so that when the engine is not running, the valve will be closed against its upper seat as shown in Figure 2 and the water will thus be shut off. This tension also is preferably such that the water will not be immediately admitted to the engine and will not in fact be supplied until the engine is operating under load. Under normal driving conditions, with the engine operating under relatively light loads and with the throttle approximately half way open or more, the suction exerted on the under side of the diaphragm becomes effective to shift the valve from its upper seat into an intermediate position, so that water will then flow past the needle valve and about the two seats of the ball valve, into the suction pipe 7 and thence to the combustion chamber, where it combines, in a manner unnecessary to describe here, to remove or prevent the formation of carbon deposits.

At excessive engine speeds, as with the throttle wide open, the suction increases and the adjustment of the parts is such that under these conditions, the diaphragm or pressure actuated member will operate to force the valve down against its lower seat. Hence the water flow will be cut off when the engine is operating at high speeds. When the engine is under no-load or "idling," similar conditions exist because of the fact that at such times the throttle will be almost entirely closed and this will create a relatively high vacuum so as to effect closure of the valve against the lower valve seat.

From this it will be seen that the feed of the water is dependent upon the combined effect of engine speed and throttle opening and that the de-carbonizing fluid will be supplied to the engine only throughout a predetermined range of vacuum in the manifold, as for example, when the engine is turning relatively slowly and under heavy load, with the throttle wide open. At such times the partial vacuum created is sufficient to open the water valve and supply the necessary amount of liquid to the engine.

In this way "carbon knock" is eliminated and this without wasting water at times of high engine speed and without interfering with the mixture at low engine speeds. Also, as the water is entirely cut off when the engine is stopped, there is no possibility of the water feed interfering with the starting of the engine.

What we claim is:

1. In apparatus of the character disclosed, means for introducing a carbonization preventive fluid with the combustible mixture of an internal combustion engine, comprising a fluid supplying conduit constructed for connection with the intake of an engine and provided with pressure actuated means subjected to the intake suction, oppositely faced valve seats in said conduit, a valve element movable in opposite directions to cut off the fluid flow by engagement with either one or the other of said valve seats, connecting means from the pressure actuated device for shifting the valve element

from engagement with one valve seat toward and into engagement with the other valve seat, said valve element in the absence of suction engaging the first-mentioned valve seat, whereby to automatically cut off the fluid flow on stoppage of the engine and also to automatically cut off such fluid flow when the suction exceeds a predetermined force.

2. The structure of claim 1 in which the valve element is confined between the valve seats and in which the connecting means is in the form of an extensible stud projecting from the pressure actuated device through one of the first valve seats into engagement with the valve element.

3. The structure of claim 1 in which the valve element is held closed against the first valve seat by spring means exerting its force in opposition to the pressure actuated device.

4. In apparatus of the character disclosed, a body member having a bore and a suction chamber in communication therewith, a valve seat disc in the end of said bore, a second valve seat disc in the bore, a spacing collar between said valve seat discs, a hollow plug secured in the bore, a spring-pressed plunger carried by said plug, a valve between the valve seat discs and engaged by said plunger, a water conduit in communication with the bore, a pressure actuated element in the suction chamber and having an operative connection with the valve and means for connecting the suction chamber with the intake manifold of an internal combustion engine.

5. In apparatus of the character disclosed, a body member having a bore and a suction chamber in communication therewith, a valve seat disc in the end of said bore, a second valve seat disc in the bore, a spacing collar between said valve seat discs, a hollow plug secured in the bore, a spring-pressed plunger carried by said plug, a valve between the valve seat discs and engaged by said plunger, a water conduit in communication with the bore, a pressure actuated element in the suction chamber and having an operative connection with the valve, means for connecting the suction chamber with the intake manifold of an internal combustion engine, the body member having another bore therein in connection with the first bore and forming a part of the water conduit, a valve seat disc at the inner end of said second bore, a plug engaged in said second bore and securing the valve seat disc in position therein and a needle valve carried by said plug for cooperation with said valve seat disc.

6. In apparatus of the character disclosed, a body member having a diaphragm chamber at the top, a bore extending up through the bottom of said member to said chamber and a bore extending through the side of the member to said first bore, a hollow plug engaged in the first bore, valve seat discs arranged in spaced relation at the inner end of the first bore and secured in place therein by said plug, a ball valve engaged between said discs, a spring-pressed plunger carried by the plug and engaging said valve, an adjusting screw for said spring mounted in the outer end of the plug, a diaphragm closing the diaphragm chamber, a screw adjustably mounted in the diaphragm for engagement with the ball valve, a valve seat disc in the inner end of the second bore, a plug in said bore for securing the disc in place therein, a needle valve mounted in said plug and arranged for cooperation with said valve seat disc, a water inlet passage communicating with said needle valve and a combined suction and water outlet passage extending from the diaphragm chamber and adapted for connection with the intake manifold of an internal combustion engine.

7. In apparatus of the character disclosed, a body member having a diaphragm chamber at the top, a bore extending up through the bottom of said member to said chamber and a bore extending through the side of the member to said first bore, a hollow plug engaged in the first bore, valve seat discs arranged in spaced relation at the inner end of the first bore and secured in place therein by said plug, a ball valve engaged between said discs, a spring-pressed plunger carried by the plug and engaging said valve, an adjusting screw for said spring mounted in the outer end of the plug, a diaphragm closing the diaphragm chamber, a screw adjustably mounted in the diaphragm for engagement with the ball valve, means for supplying an adjustable quantity of water to the second bore and means for connecting the diaphragm chamber with the intake manifold of an internal combustion engine.

In witness whereof, we have hereunto set our hands, this 14th day of June, 1921.

HARVEY W. BELL.
HAZEN L. HOYT, JR.