Nov. 11, 1930. P. F. WEST 1,781,356

VAPOR SUPPLYING ATTACHMENT

Filed March 7, 1929

Fig. 1.

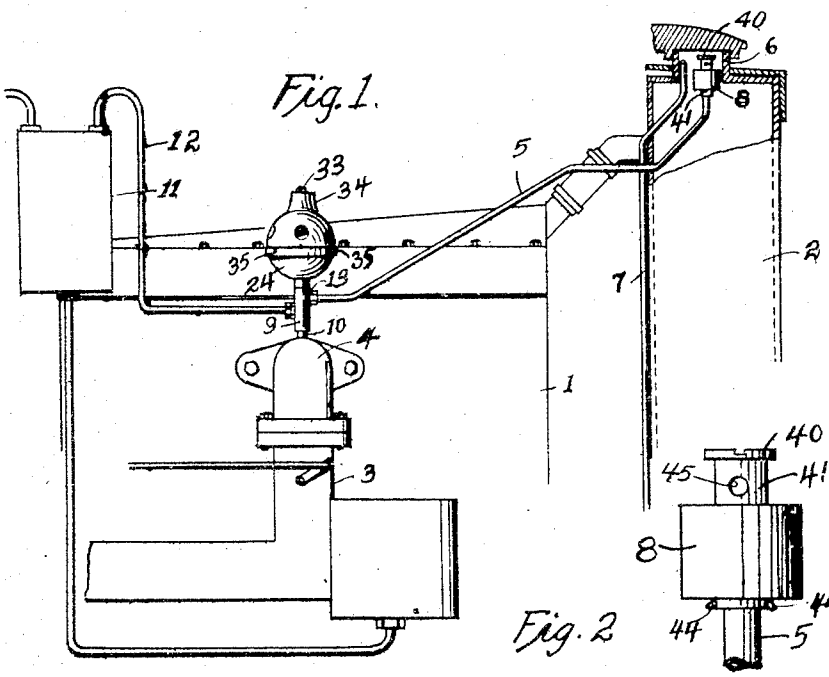


Fig. 2

Fig. 3

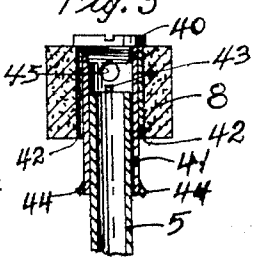


Fig. 4

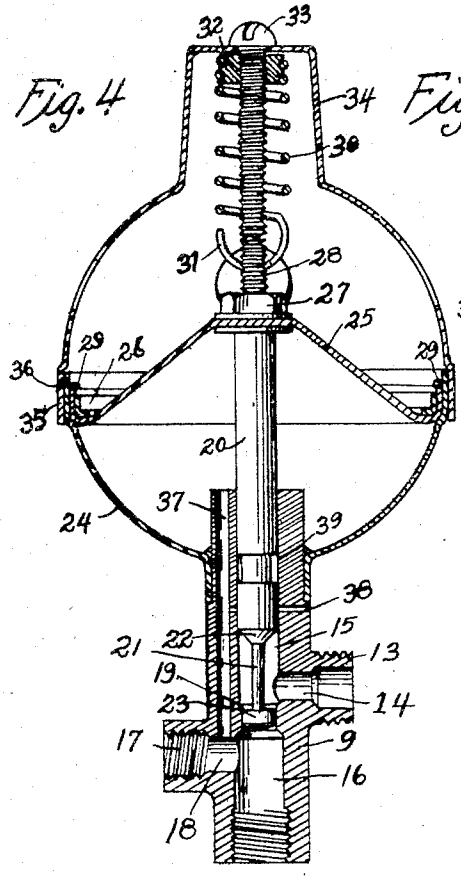


Fig. 5

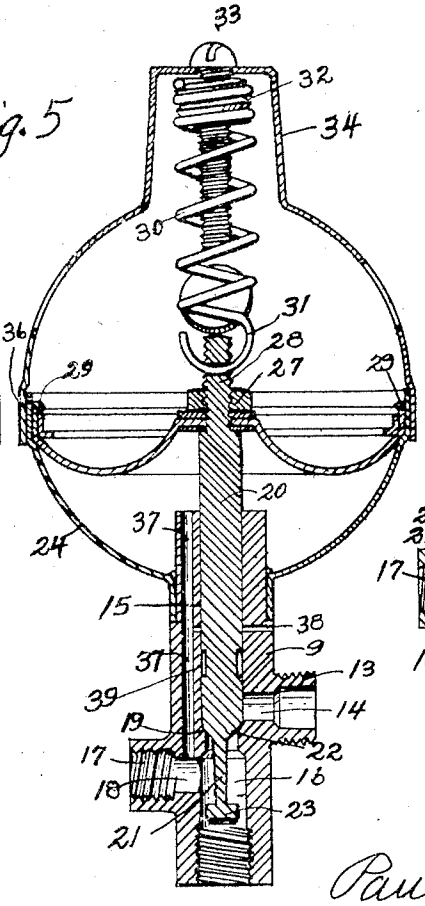
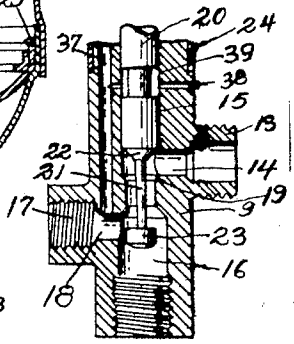


Fig. 6



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VAPOR-SUPPLYING ATTACHMENT

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This invention relates to vapor supplying attachments for internal combustion engines, and, among other objects, aims to provide an improved automatic valve adapted to be operated by the suction in the intake manifold to admit moist air to commingle with the combustible mixture when it is most needed and insure more perfect combustion, eliminating to a large extent the formation of carbon, with a resultant increase in the efficiency of the engine under normal running conditions.

Other objects and advantages of the invention will become apparent upon a reading of the following specification, taken in connection with the accompanying drawings, wherein there is shown a preferred embodiment of the invention, and in which:—

Fig. 1, is a side elevation showing an attachment embodying the invention applied to an automobile engine, which is shown diagrammatically;

Fig. 2, is a float valved sleeve to close in case of too high water level, showing valve open;

Fig. 3, is a sectional view of Fig. 2, showing valve closed;

Fig. 4, is a vertical sectional view of the attachment with the parts shown in their position when the engine is not running and while cranking;

Fig. 5, is a similar view, showing the parts in the position they occupy when the engine is idling; and

Fig. 6, is a fragmentary sectional view, showing the parts in the position they occupy under normal running conditions.

Referring more particularly to the drawings, there is shown an automobile engine 1, in outline, which may be indicative of any internal combustion engine having a cooling system including a radiator 2 and having the usual carbureter 3. The improved attachment is adapted to be mounted on the usual intake manifold 4, above the carbureter throttle valve to automatically control the amount of moisture admitted to the intake manifold for mixing with the vaporized fuel. In this instance, the moisture present in the atmosphere above the surface of the water in the radiator is utilized, suitable connection being made between the radiator and the attachment by a tube or conduit 5. However, some other source of moisture may be employed. The conduit 5, is preferably formed of suitable copper tubing of relatively small size and which may be readily bent to extend through the rear wall of the radiator and up into the filling neck 6 thereof. The upper end of the conduit 6, is provided with float valve assembly Figs. 2 and 3, so that, when filling the radiator to overflowing, the water may not enter the inlet end of the conduit 5, and to prevent excess water from entering the latter while driving the automobile.

Herein, the attachment includes a valve casing 9, of elongated tubular form and adapted to be located in any position upon the intake conduit or manifold 4, by means of a nipple 10, or other suitable fitting communicating with the intake passage, conveniently, through the hole for the usual vacuum conduit for the vacuum tank or a new opening. This casing is shown as being connected to the usual vacuum tank 11, by means of a pipe 12, the arrangement being such that the intake suction always communicates with the vacuum tank. However, when no vacuum tank is employed or if the vacuum line is connected to one end of the intake manifold the opening in the casing to accommodate the tube 12, may be plugged or otherwise closed.

The conduit 5 is shown as being detachably connected to the valve casing by a suitable threaded extension 13, and the inner end of the bore of the extension 13 is preferably reduced, as at 14, to provide an abutment for the end of the tube and thereby prevent it from being pushed into the longitudinal bore or passageway 15, extending substantially the full length of the valve casing 9. The lower end of the bore extends below the reduced inlet 14, and communicates with an enlarged bore 16, threaded at its lower end to receive the aforesaid nipple 10. This nipple may be of such length as to insure the proper location of the device on the manifold. The pipe 12, which connects the vacuum tank with the

valve casing is also detachably connected to the latter by means of a suitable fitting in a threaded extension 17, having a reduced bore communicating with the chamber 16. The extension preferably has internal threads, the same size as the threaded opening in the intake manifold so that the original fitting on the vacuum line may be used.

The longitudinal bore 15, is provided between the inlet 14, and chamber 16, with a reduced portion to provide an upper, annular shoulder having a beveled wall constituting a valve seat 19, with which a reciprocating valve stem or plunger 20 is adapted to coact. The valve stem has its lower end portion reduced to provide an extension 21, so that it will leave an annular passage between it and the restricted bore 15, when valve is open to admit moisture. A beveled shoulder 22, formed at the upper end of the reduced extension, constitutes a valve to coact with the aforesaid seat 19. The lower end of the extension 21, is provided with a head 23, of a diameter to fit snugly and close the reduced lower end of the bore 15, below the valve seat 19, as shown in Fig. 4.

The movements of the valve stem are designed to be automatically controlled in response to varying suction conditions in the intake manifold. Secured on the upper end of the casing, there is shown a diaphragm casing 24, preferably made of spun or stamped metal in the form of a half sphere, and having a flexible diaphragm 25, marginally held therein by means of a ring 26. This casing preferably has an integral collar which telescopes over a slightly reduced end portion of the valve casing and they may be soldered together on the inside of the diaphragm casing to make an air-tight joint. This diaphragm is shown as being connected at its center to the upper portion of the valve stem 20, by a pair of washers clamped on the diaphragm and a nut 27, on a threaded end 28, of the stem which projects through a hole in the diaphragm.

As shown in Fig. 4, projections 29, may be punched inwardly from the casing and bent over the marginal edge of the diaphragm to prevent upward displacement. To hold the diaphragm normally in the position shown in Fig. 4, there is shown a tension spring 30, having a lower hooked end 31, inserted in a hole in the end 28, of the stem, the other end carrying a nut 32, which receives an adjusting screw 33, passing through the crown plate of a dome-shaped cover 34, of the casing 24. The lower end of the screw also acts as a stop for the valve stem 20, when it is in its uppermost position.

The cover 34, is also preferably substantially hemispherical and has an enlarged flange 35, around its lower end for securing the same to the casing. It is shown as being perforated to provide air vents or ports and also sight openings through which the diaphragm may be observed while adjusting the spring tension for proper action on different engines. This flange also preferably has punched-in projections 36, which are adapted to snap into one or more holes made by punching the projections 29, to hold it in place.

The diaphragm chamber which is formed by 24, and 25 communicates with the intake passage by means of a longitudinal bore 37, through the valve casing so that the suction in the intake manifold will act on the diaphragm. It must be understood that the suction in the intake manifold is greatest when the carbureter throttle valve is closed and the engine is running idle; consequently the diaphragm will be pulled to its lowest position and the valve will be seated as shown in Fig. 5. The strength of the spring 30, is such as to permit this to take place. However, when the engine is laboring the suction in the intake manifold is so reduced that the diaphragm will return to a central position by means of spring 30, moving the valve to the position shown in Fig. 6. Lack of suction beneath the diaphragm, when the engine is not running, allows the spring 30, to pull the diaphragm and plunger to the position shown in Fig. 4, closing valve for starting engine position.

When the valve plunger is at its extreme upper and lower positions, as just described, little or no moisture is admitted. Now, under normal running conditions, the intake suction and spring tension are such as to tend to maintain the diaphragm in an intermediate position so that the valve will admit moisture as shown in Fig. 6. However, the suction varies slightly due to changes in conditions such as changes in speed, climbing hills and changes in throttle setting. To insure that the vapor valve will remain open notwithstanding such changes, an air relief passage 38, is shown as being drilled through the casing on the side opposite the suction passage 37, and communicates with the suction passage when a grooved portion of the stem shown at 39, reaches the position shown in Fig. 6, with the vapor valve open. The air admitted through the relief opening tends to destroy the suction in the diaphragm chamber, causing plunger 20, to hover in the position shown in Fig. 6. Thus, it causes the valve to remain open under all normal running conditions. Otherwise, it would close due to the variations in suction.

The operation is as follows:—

Assuming that the motor is not running, the valve stem 20, assumes the position shown in Fig. 4. There being no suction in the intake manifold 4, and through the bore 16, the diaphragm is maintained in its uppermost position by means of the retractile spring 30. The valve head 23, closes the bore

below the seat 19, and the valve stem proper closes the relief passage 38, thus sealing all openings that would permit vaporized air or dry air to enter the intake manifold, so that the motor may be started with the usual very rich mixture of fuel. By the described arrangement, the fuel mixture is carried through the carbureter without the addition of moisture. The suction in the intake manifold, while cranking, is not sufficient to draw the diaphragm 25, downwardly to the position shown in Fig. 5, until the engine has actually started. It can readily be seen that the head 23, will remain in the restricted portion of the bore 15, below seat 19, as shown in Fig. 4, while starting. Then, when the engine is actually started, the greater suction in the intake manifold, while the engine is idling, communicates with the diaphragm chamber by means of the by-pass 37, and overcomes the spring tension of 30, causing the plunger 20, to come down on seat 19, as shown in Fig. 5. When the throttle is opened, the vacuum in the intake manifold and diaphragm chamber decreases and the plunger 20, is brought up to position shown in Fig. 6. It will not close unless the engine is brought to an idling position by closing the throttle valve.

From the foregoing, it will be seen that the improved attachment can be easily manufactured at relatively low cost; that there are no delicate parts that cannot be replaced; that it is dependable in operation after it is once properly adjusted on an engine; and that it provides moisture when it is most needed. Moreover, it enables automobiles to use low grade fuel.

To insure that only moist air or vapor enters the intake manifold, we have provided a float valve assembly Figs. 2 and 3, comprising a sleeve 14, having openings 45, in the side therein, and the top of said sleeve being closed by plug 40, being provided with a head or flange, projecting beyond the sleeve 41, to prevent float 8, from being lifted entirely off, of sleeve 41. The float 8, is provided with a metal sleeve lining, preferably of brass or copper, and is adapted to slide up and down on sleeve 41, and is stopped by 40, at the top and by bent-up projections 44, at the bottom. To prevent the sleeve 41, from being slipped too far down on moisture conduit 5, we have provided a punched-in projection 43, to act as a stop. It can readily be seen that under normal conditions the float 8, will rest on projections 44, as shown in Fig. 2, and allow moist air or vapor, to enter ports 45, but should water rise to a sufficient height to enter ports 45, the buoyancy of float 8, will cause it to rise to position shown in Fig. 3, closing ports 45, and prohibiting excessive water from entering the moisture conduit.

Obviously, the present invention is not restricted to the particular embodiment thereof herein shown and described. Moreover, it is not indispensable that all the features of the invention be used conjointly, since they may be employed advantageously in various combinations and subcombinations.

What is claimed is:—

1. A vapor supplying attachment for internal combustion engines comprising, in combination, a conduit connected to a source of water vapor, and to the intake passage of the engine; and a sleeve with the upper end closed and having vents in side of said sleeve, and a metal lined float adapted to slide up and down on said sleeve to close or open said vents in said sleeve, and said sleeve adapted to be slipped over the upper end of said conduit to prevent liquid or water from entering said conduit, which leads from said source of moisture to a valve casing; said sleeve having an upper and a lower stop for said metal-lined float, and also a projection on the inner wall of said sleeve to prevent said sleeve from being slipped far enough over said conduit to close said ports in the side of said sleeve; and a suction operated valve interposed in said conduit, said valve being constructed and arranged to admit moisture to the intake passage only when the engine is operating at all speeds other than idling speed.

2. A vapor supplying attachment for internal combustion engines comprising, in combination, a conduit connecting a source of moist air with the intake manifold of the engine; a sleeve with the upper end closed and having vents in side of said sleeve, and a float adapted to slide up and down on said sleeve, to close or open said vents in said sleeve, and said sleeve adapted to be slipped over the upper end of said conduit to prevent liquid from entering said conduit which leads from said source of moisture to a valve casing; said sleeve having an upper and a lower stop for said float, and also a projection on the inner wall of said sleeve to prevent said sleeve from being slipped far enough over said conduit to close said ports in the side of said sleeve, a valve arranged to control the passage in the conduit and to admit vapor to the intake manifold; and means responsive to the suction in the intake manifold to automatically actuate the valve so that vapor is admitted during all engine speeds other than idling.

3. In an attachment for supplying moist air to the fuel mixture in the intake manifolds of internal combustion engines, the combination of a valve casing adapted to be mounted on and in communication with the intake manifold; a conduit connecting the casing to the filling neck of the automobile radiator; a means for closing inlet of said conduit within the radiator neck when water

interferes; a valve plunger mounted in the casing to control the flow of moist air from the radiator to the manifold; and means mounted on the casing operable by the suction in the manifold to cut off the moisture from the latter during engine idling speed and when the engine is not running.

4. In a humidifying device for supplying moisture to the fuel mixture in the intake manifold of an internal combustion engine; the combination of a valve casing adapted to be mounted on and in communication with the intake manifold; a conduit connecting the casing to the filling neck of an automobile radiator; a means to close the inlet of said conduit within the radiator neck when water interferes; a valve plunger mounted for reciprocation in the casing and having an upper and a lower valve closure; a diaphragm casing mounted on the valve casing; a diaphragm secured in the said casing and to the valve plunger; said casing and diaphragm defining a vacuum chamber in communication with the manifold, whereby suction in the latter will actuate the plunger to close the valve at one end of the plunger movement, and a spring normally resisting the movement of the diaphragm and adapted to hold the valve in an intermediate open position when the engine is operating at any speed other than idling, said spring normally holding the valve closed at the other end of the plunger movement when the engine is not operating.

5. In a humidifying device comprising in combination a valve casing adapted to be removably mounted on the intake manifold of an internal combustion engine, said casing having a central longitudinal bore provided with a valve seat and having side passages connected to the bore, thereby presenting lateral ports; a valve plunger slidably mounted in the central bore and having an upper seat closure and a lower seat closure; a diaphragm chamber mounted on the valve casing and communicating with the intake manifold; a diaphragm mounted in said casing and centrally connected to the plunger; a conduit connected at one end to the valve casing above the valve seat and at the other end with the filling neck of the engine radiator; a float valve assembly within the radiator neck to close the inlet of said conduit when water interferes, said plunger being adapted to be moved by the diaphragm when the latter is actuated by suction within the manifold, to cause the plunger to close the valve and cut off the flow of moisture when the engine is idling; and a spring to open said valve when the engine is running at normal working speeds, said spring also to close valve when engine is not running.

6. A device for supplying moisture to the intake passage of an internal combustion engine having a water cooling system, comprising in combination, a valve casing adapted to be mounted on and in communication with the intake passage; said casing having an elongated bore therein, a vapor supply conduit connected to one side of the casing and communicating with said bore; a plunger valve slidably mounted in said bore and projecting above said valve casing; a diaphragm chamber secured to the upper end of said valve casing and having a diaphragm connected to the upper portion of said plunger; a conduit within the valve casing communicating at one end with the intake passage of the engine and at the other end with the diaphragm chamber; a valve seat formed under the bore below the vapor supply connection to the casing; said bore, below said seat having a restricted portion; said plunger having two valve portions, one cooperating with seat, and the other being movable into the restricted portion of said bore to close the same; said casing having also an air vent passage communicating with the intake manifold when the valve is opened to admit moisture to the intake passage; and spring means to retract the plunger whereby to close one of the valves when the engine is not running and to hold the valve in an open position under normal working conditions.

7. A vapor supplying attachment for internal combustion engines comprising, in combination, a valve casing communicating with the intake passage; a plunger valve in said casing; means under the influence of the suction in said intake manifold to operate said valve; said valve adapted to close ports in both extreme positions; a source of water vapor communicating with the intake passage through said valve when the valve is in an intermediate position; and a float assembly to prevent water from coming from said source of water vapor; and means to maintain said valve in an intermediate position under normal engine working speeds.

8. A vapor supplying attachment for internal combustion engines comprising, in combination, a valve casing communicating with the intake passage of the engine; a plunger valve in said casing; means under the influence of the suction in said intake manifold to operate said valve; said valve adapted to close ports in both extreme positions of said valve; a source of water vapor communicating with the intake passage through said valve when the valve is in an intermediate position; and air vent means to maintain said valve in an intermediate position under all engine speeds other than idling.

9. A vapor supplying attachment for internal combustion engines comprising, in combination, a valve casing connected to the intake passage of the engine; a source of moist air connected by a conduit to the valve casing; a floated sleeve to prevent water from entering the conduit; a diaphragm and

spring operated valve within the casing subjected to the influence of the engine suction; said valve being arranged to open and admit moisture when the engine is running under normal throttle openings; and air vent means associated with the valve to maintain the valve open under such conditions.

10. A vapor supplying attachment for internal combustion engines comprising, in combination, a valve casing connected to the intake passage of the engine; a valve in said casing, a diaphragm chamber on the valve casing; a passage connecting the intake manifold with the diaphragm chamber; a reciprocating valve plunger in the casing; a source of moisture connected to the casing; and means for closing said moisture source connection when water interferes; said valve being arranged to control the admission of moisture to the intake passage; an air bleed opening controlled by the movement of said valve to insure that the valve will remain open under normal throttle openings; and spring means cooperating with the diaphragm normally to raise said plunger and opposing the action of the engine suction on the diaphragm.

11. A vapor supplying and controlling device for internal combustion engines comprising, in combination, a valve casing connected to the intake manifold of the engine; a source of moisture connected to the casing and means for closing connection when water interferes; a suction and spring operated plunger valve controlling the admission of moisture to the intake passage; vent means controlled by the movement of said valve to maintain it open under normal engine working conditions; and a suction conduit connection to said casing to accommodate the vacuum line from the vacuum gasoline feed system for the carburetor.

12. A vapor supplying device for internal combustion engines comprising in combination, a casing connected to the intake passage of the engine, a vapor supply conduit connected to said casing; a float valve to close said conduit when water interferes; a valve plunger within the casing; a diaphragm chamber associated with the casing; a spring cooperating with the diaphragm normally to retract the plunger; a passageway connecting said diaphragm chamber with the intake manifold; and a relief pass for maintaining the valve in an open position.

13. A vapor supplying device, for internal combustion engines, comprising in combination, a valve casing connected to the intake passage of the engine; a valve plunger within the casing; a diaphragm chamber associated with the valve casing and communicating with the intake passage whereby the diaphragm is under the influence of the suction therein, a vapor supply connection to the valve casing; and means to close said connection when water interferes; and adjustable spring means associated with the diaphragm and said diaphragm chamber to move the valve toward its normally closed position.

14. A vapor supplying device for the intake passage of an internal combustion engine, comprising in combination, a valve casing connected to the intake passage; a vapor supplying conduit connected to the valve casing; and a float assembly surrounding said vapor supplying conduit to prevent water from entering said vapor supplying conduit; a plunger valve within the valve casing between the conduit connection and the intake manifold to open and close the conduit passageway; spring means to move the plunger valve in one direction and a suction-operated diaphragm to move the plunger valve in the other direction.

15. A vapor supplying device for the intake passage of an internal combustion engine comprising, in combination, a valve casing connected to the intake passage; a vapor supplying conduit connected to the valve casing; a float valve to close one end of said conduit when water interferes; a plunger valve within the valve casing between the conduit connection and the intake manifold; means by the influence of the suction in the intake manifold to operate the valve in one direction; a tension spring to operate the valve in the other direction; means to adjust the tension of said spring; and means associated with said valve to maintain it in open position under normal engine working operating conditions.

16. A vapor supplying device for internal combustion engines comprising, in combination, a valve casing communicating with the intake passage of the engine; a vapor supplying conduit connected to the valve casing; a float valve for closing one end of said conduit when water interferes; a plunger valve within the valve casing; a suction operated diaphragm connected to the plunger valve; a diaphragm chamber communicating with the intake passage of the engine; a coiled spring connected to the plunger valve and normally tending to prevent opening movement thereof while starting engine and to open valve when engine is laboring; a nut carried by said spring; an adjusting screw co-operating with said nut to vary the tension of said spring so that it will hold the valve in an intermediate or open position under normal working conditions; and means to insure that the valve will remain open under such conditions.

17. A vapor supplying device for internal combustion engines comprising, in combination, a valve casing communicating with the intake passage of the engine; a vapor supplying conduit connected to the valve casing; a float valve for closing said conduit when wa-

ter interferes; a plunger valve within the valve casing; suction operated means connected to the plunger valve and communicating with the intake passage of the engine to move the valve in one direction; a coiled spring connected to the plunger and normally resisting movement thereof and also tending to move the valve in the other direction; a nut carried by said spring; an adjusting screw connected to vary the tension of said spring and providing a stop for said plunger; said valve plunger having a groove around its body portion; said valve casing having a conduit so positioned and arranged that air is admitted therethrough and around the reduced or grooved portion of said plunger to vent the suction operated means and maintain the valve open under normal engine working operating conditions.

18. A vapor supplying attachment for internal combustion engines comprising, in combination, a valve casing; a source of vapor connected thereto; a float valve assembly for preventing water from entering said casing; a plunger valve having an attached plunger in the casing; a globular diaphragm casing connected to the valve casing; a diaphragm in said diaphragm casing; means connecting the diaphragm to the plunger valve; said plunger valve having a threaded end projecting above the diaphragm; a coiled spring having a hooked end connected to said projecting end of the plunger valve; a ported cover for the diaphragm casing; an adjusting screw passing through the ported cover operatively connected to the spring to adjust its tension; a pair of valve members on said valve plunger each cooperating with seats arranged between the vapor supplying conduit connection and the intake passage; said diaphragm casing communicating with the intake passage of the engine; and an air bleed passage through the valve casing communicating with the passage to the diaphragm chamber; said valve plunger having a cut-away portion adapted to register with said air bleed passage when the spring maintains the valve plunger in open position.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature.

PAUL F. WEST.