F. V. RISINGER.

VACUUM FEED APPARATUS.

APPLICATION FILED MAR 1, 1920.

1,377,277. Patented May 10, 1921.

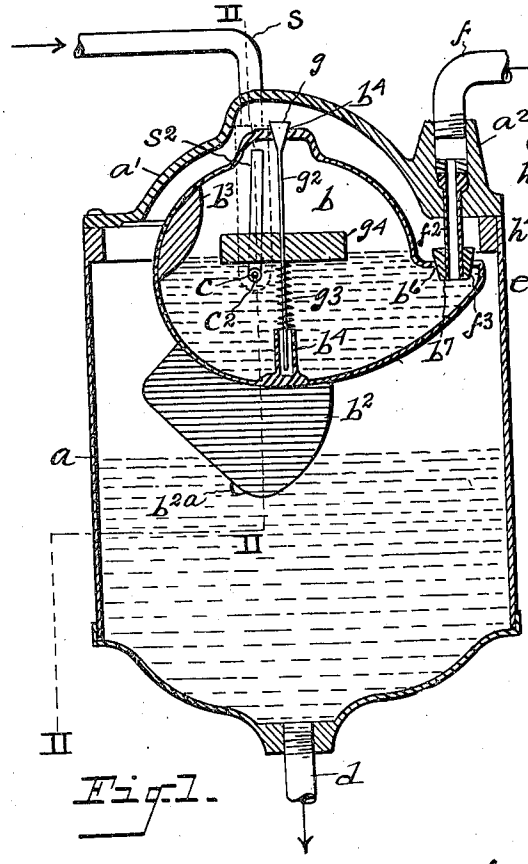


Fig. 1.

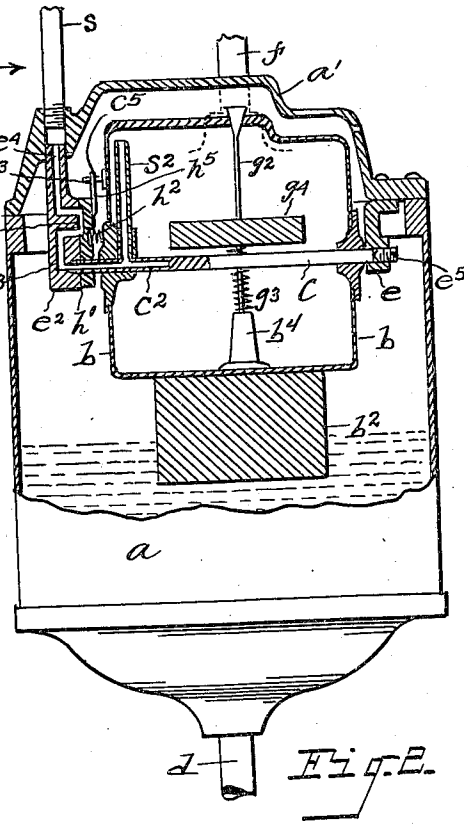


Fig. 2.

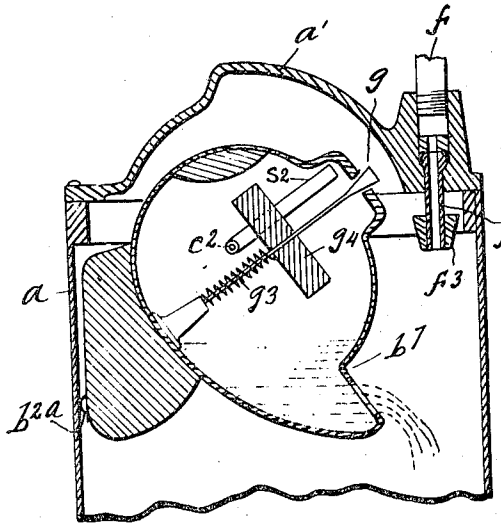


Fig. 3.

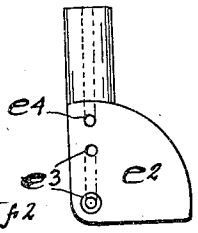


Fig. 4.

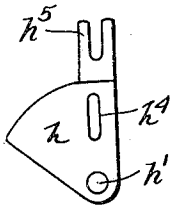


Fig. 5.

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VACUUM FEED APPARATUS.

1,377,277. Specification of Letters Patent. Patented May 10, 1921.

Application filed March 1, 1920. Serial No. 362,596.

To all whom it may concern:

Be it known that I, FRANK V. RISINGER, citizen of the United States, residing at Youngstown, county of Mahoning, State of Ohio, have invented a certain new and useful Improvement in Vacuum Feed Apparatus, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

The purpose of this invention is to provide an improved device for the purpose of supplying liquid fuel to the carbureter of an internal combustion engine from a source of supply lower than the carbureter. It consists in the elements and features of construction shown and described, as indicated in the claims.

In the drawings:

Figure 1 is an axial section of a device embodying this invention.

Fig. 2 is a section at the line, 2—2, on Fig. 1.

Fig. 3 is a view similar to the upper part of Fig. 1, showing the movable parts at different positions.

Figs. 4 and 5 are details of a valve member for controlling the suction connections and atmosphere inlet.

In the construction shown in the drawings, a is a receptacle designed to be located in a position for supplying the fuel by gravity to the carbureter of an engine, and deriving its supply from a main supply tank at a lower level which is not shown. The receptacle, a, has an outlet, d, for conducting the fuel to the carbureter, and a liquid inlet, f, through which the liquid is derived from the low level main tank. Within the receptacle, a, there is pivotally mounted a vacuum chamber, b, provided with an axle member, c^2, extending through it and by means of which it is pivoted for rocking, the pivot axis being located with respect to the center of gravity of the entire vacuum chamber and fixed appurtenances hereinafter mentioned when said chamber is empty of liquid, so that it will be overbalanced toward one end, hereinafter referred to as the "heel" end,—that is, the end nearer said axis,—said chamber being extended toward the other end somewhat in spoon-like form for giving it at normal empty position a liquid capacity from the level of the axis downward, great relatively to the liquid capacity of the correspondling portion from the axis toward the heel end; so that when filled with the liquid to a level somewhat above the axis, the excess of liquid in the longer space toward the "toe" end, over that in the shorter space toward the heel end reverses the overbalancing, causing the chamber to be overbalanced toward the toe end. The overbalancing of the chamber toward the heel end when empty, notwithstanding the lesser capacity of that end portion, is effected by providing an exterior weight member, b^2, on the lower side, which may be supplemented for convenience of accurate adjustment by a weight member, b^3, mounted inside the chamber, mainly above the high liquid level thereof, so as to not materially affect the liquid capacity up to that level. The member, b^2, is adapted also to act as a buoy or float by being lighter than the liquid with which the receptacle, a, is to be supplied, operating as such buoy for a purpose hereinafter explained. For convenience of construction the receptacle is closed at the top by a cap member, a^1, having a boss, a^2, to which the liquid inlet connection, f, is made. Projecting inwardly from the cap plate in continuation of the inlet passage, there is provided a liquid discharge nozzle, f^2, terminating in a tapered valve member, b^7; and the vacuum chamber, b, is provided with a liquid inlet aperture, b^6, positioned to be entered by the valve member, b^7, and to be closed thereby as to communication of the vacuum chamber with the receptacle, a, when the vacuum chamber is swung up to what may be termed its normal empty position, at which its plane of greatest length is substantially horizontal, as seen in Fig. 1. Within the vacuum chamber, b, there is mounted a float, g^4, carried by a stem, g^2, of a valve, g, adapted to seat inwardly with respect to the vacuum chamber for closing an atmosphere port, b^4, located at substantially the highest point of said vacuum chamber. The valve stem, g^2, is loosely guided for keeping it in substantial or approximate alinement at all positions in the opening and closing movement of the valve and rising and falling movement of

the float, by means of a guide fitting, b^4, mounted in the bottom of the vacuum chamber and vertically apertured for loosely receiving the lower end of the valve and float stem; and between the upper end of said fitting and the float there is provided a light coil spring, g^3, designed to be adequate to counterbalance the weight of the valve stem and float in air, or nearly so, so that when the vacuum chamber is occupied by liquid fuel to a sufficient height to reach and partly immerse the float, g^4, comparatively slight immersion will be sufficient to cause the float thus buoyed to lift the valve and stem to open the valve and admit atmospheric pressure from the receptacle, a, into the vacuum chamber, said receptacle, a, having an atmosphere inlet at b^4, as shown in Fig. 2, by which atmospheric pressure is at all times present in said receptacle above the liquid contents thereof.

The vacuum chamber is pivotally mounted by means of its axle, c, in a hanger, e, at one end depending from the cap plate, a^1, and a hanger, e^2, at the other end, also depending from the cap plate, and connected thereto at an aperture therethrough at which at the outer end there is connected a suction pipe, s, leading from any suitable source of suction, as for example, and as will usually be the case, the intake manifold of the engine to be served by the device. The stem of the hanger, e^2, is apertured as shown at e^4, in continuation of the suction outlet passage through the suction connection pipe, s. This duct, e^4, turns at a right angle so as to emerge in a direction parallel to the axis at the inner face of the hanger, and spaced a very short distance below this paraxially-extending branch, there is provided a duct, e^3, extending in from the same face, and turning at right angles to extend downwardly in line with the downwardly-extending portion of the duct, e^4, to a point in line with the axis of the axle, c, and thence turning inward in line with said axis, terminating at the inner face of the hanger; and into this lower terminal the axle, c, is entered, and thereby obtains its pivot bearing at that end, being held accurately positioned by a pointed screw, e^5, set through the opposite hanger, e, and adjustable at that end of the axle. The inner face of the hanger, e^2, through which the angled duct, e^3, enters, constitutes the valve seat, for a valve member, h, of sectoral disk form, which is mounted upon the axle by means of an aperture, h^1, in the lower end and engaged with the vacuum chamber by means of a stud, e^5, projecting from the proximate end of that chamber, and engaging the slot, h^3, in the upwardly-extending radial arm, h^5, of said sectoral valve member and spring-pressed toward said seat by a spring, h^2. On the face of said valve member toward the hanger seat it has an elongated recess, h^4, of such length as to lap the mouths of the parallel portions, of the ducts, e^3 and e^4, in the hanger, e^2, said sectoral valve member being mounted on the axle, c, rigid with the vacuum chamber at such position that at the normal empty position of the vacuum chamber, said recess is registered with said duct mouths, e^3 and e^4, and constitutes a connection between them, thereby making the suction inlet passage from the pipe, s, continuous to the end of the axle, c; and said axle is bored from the end for registering with the alined terminal of the duct, c^3, in the hanger, as seen at c^2. The vacuum chamber which is shown as made of sheet metal, is provided with hubs, c^5 and c^6, at its opposite ends, and the hub, c^6, at the axially bored end of the axle and the axle itself is radially bored for connection of an upstanding duct member, s^2, whose duct constitutes a continuation of the axial duct, c^2, of the axle, said duct member, s^2, opening at the upper part of the cavity of the vacuum chamber as seen in Fig. 1. Thus at the normal or empty position of the vacuum chamber it is in communication at the upper part with the suction connection through the pipe, s; and upon suction produced by the operation of the engine, partial vacuum is produced in the vacuum chamber, so long as the atmosphere port, b^4, is closed, such suction, producing such partial vacuum, causing the liquid to be lifted from the main low level supply tank to the inlet supply pipe, f, and discharged through the duct, f^2, into the vacuum chamber until the same becomes filled to a point at which the liquid lifts the float, g^4, and opens the atmosphere inlet valve, g. The parts are proportioned to cause the opening of the atmosphere valve in this manner when the the liquid level has arisen substantially to the height at which the liquid contents will overbalance the vacuum chamber toward the toe end and cause it to descend and open the port, b^6. The vacuum chamber and its supported parts are also so proportioned and relatively positioned that at its liquid-filled position,—that is, when occupied with liquid up to the level for operating the float, g^4, the center of gravity of the chamber and its contents is above as well as slightly at the right of the vertical plane of the axis, so that upon the slightest movement in the overbalanced direction, the center of gravity is carried still further over to the right,—that is, toward the toe end. This circumstance, together with the fact that the liquid immediately starts to flow toward that end, causes the dumping to be abrupt so as to be completed with certainty when it is once begun; and thereby the liquid contents of the vacuum chamber are discharged through the port, b^6 into the receptacle, a. By this

discharge the overbalancing of the vacuum chamber is reversed and it tends immediately to return to its normal empty position, the valve, b^7, closing the port, b^6, and the atmosphere valve, g, being closed, being no longer supported by the float, g^4, in the absence of liquid in the vacuum chamber; and the suction connection, which is cut off by the initial movement of the vacuum chamber from its empty position in dumping, being restored by the restoration of the chamber to said normal empty position, the suction operates to fill the vacuum chamber and cause a repetition of the cycle of movement above described.

In case of high suction tending to hold the valve, g, seated at the atmosphere inlet, b^4, against the buoyant action of the float, g^4, until the latter is deeply immersed in the liquid, the increased overbalancing of the vacuum chamber toward the toe end will by the increased liquid contents, eventually cause it to be tilted to open the fitting and discharge port, b^6, and the vacuum will be broken by air bubbling in through the outflowing liquid at said discharge port.

The applied combined weight and buoy, b^2, is positioned as shown in Fig. 1 where it is increasingly immersed in the liquid contents of the receptacle, a, as the liquid level in said receptacle rises past a certain point; and said member, b^2, is proportioned and positioned on the vacuum chamber for buoying up the heel end of the vacuum chamber at a predetermined level of liquid in the receptacle, b, so that its buoyancy when immersed beyond a certain point, holds the vacuum chamber tilted downward or away from its empty position far enough to cut off the suction connection; and thereby the operation of the device is suspended so long as the liquid level in the receptacle, a, remains at that predetermined height, thus preventing possibility of the device being flooded by the supply being more rapid than the consumption or requirements of the engine.

The weight-buoy, b^2, is conveniently utilized also for checking the down-tilting of the vacuum chamber at empty position by the collision of the said weight-buoy, b^2, or projection, b^{2a}, thereon, with the wall of the receptacle, a, at the proper limit of said down-tilting as seen in Fig. 3.

I claim:

1. In a device for the purpose indicated, in combination, a receptacle for liquid fuel having an atmosphere inlet, a liquid outflow connection for supplying a carbureter, and liquid inflow connection from a lower source of liquid fuel supply; a vacuum chamber mounted pivotally within said receptacle having connection with a source of suction exterior to said receptacle, and having a liquid inlet port positioned for registering with the liquid inlet connection of the receptacle at one position to which it may be turned about its pivot; said vacuum chamber being formed and pivoted so that when empty of liquid it is normally overbalanced in the direction for holding said liquid inlet port in registration with said liquid inlet connection, and valve means at the liquid inlet registering position of the vacuum chamber for closing the communication of the liquid inlet port of said chamber with the receptacle, whereby at said empty position of the vacuum chamber liquid is sucked thereinto from the main low level fuel supply source.

2. In the construction defined in claim 1 foregoing, the vacuum chamber having an air inlet at the upper part communicating with the receptacle; a valve for controlling the said air inlet positioned with respect to its seat for being held closed by suction in the vacuum chamber, and a float in the vacuum chamber operatively connected with said valve for opening it on predetermined rise of liquid in said vacuum chamber.

3. In the construction defined in claim 1 foregoing, the vacuum chamber having a suction duct opening at the upper part of said vacuum chamber and leading out through one head of the chamber, the bearing of the chamber of the receptacle adjacent to that head having a suction duct leading out for exterior connection and registering with the suction duct of the vacuum chamber, the vacuum chamber having a valve member carried with it in its rocking movement which cuts off the duct in the bearing upon movement of the vacuum chamber away from normal empty position.

4. In the construction defined in claim 1 foregoing, the vacuum chamber having a counterbalancing appendage lighter than the liquid to be supplied by the device, whereby it is adapted to operate as a buoy when submerged in said liquid, said appendage being positioned at the lower side of the vacuum chamber relatively to the fulcrum, so that its center of buoyancy in submergence to a predetermined degree, moves upward to the tilting of the vacuum chamber away from its normal empty position, whereby upon the filling of the receptacle to a predetermined height, the vacuum chamber is tilted away from its normal empty position regardless of its liquid contents.

In testimony whereof, I sign this specification.

FRANK V. RISINGER.