July 21, 1925. 1,546,558

W. VAN GUILDER

SOLENOID OPERATED FUEL FEEDING DEVICE

Filed April 21, 1923

Fig 1.

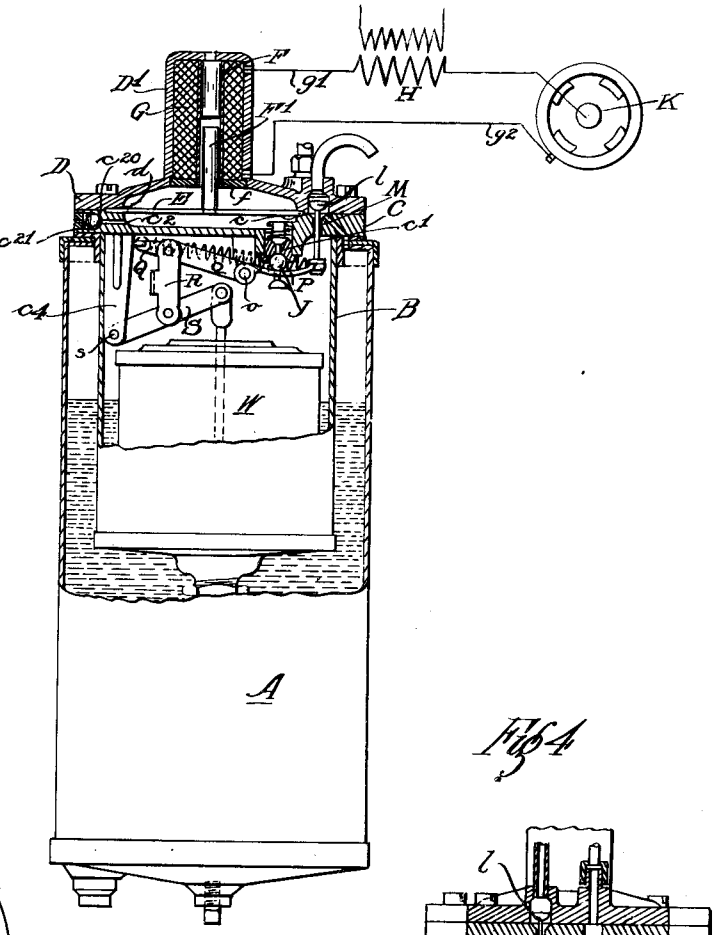


Fig 3.

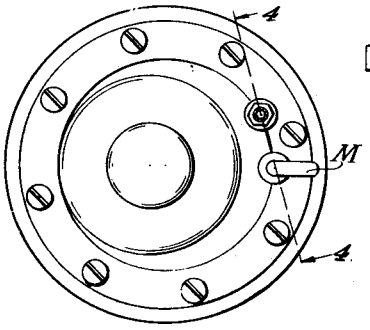


Fig 4.

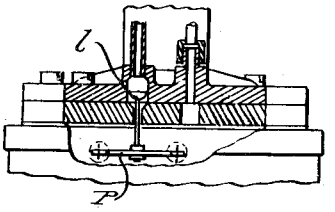
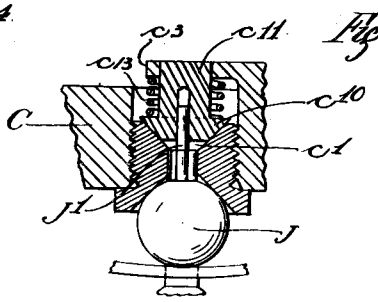


Fig 2.



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UNITED STATES PATENT OFFICE.

WALTER VAN GUILDER, OF CHICAGO, ILLINOIS, ASSIGNOR TO STEWART-WARNER SPEEDOMETER CORPORATION, OF CHICAGO, ILLINOIS, A CORPORATION OF VIRGINIA.

SOLENOID-OPERATED FUEL-FEEDING DEVICE.

Application filed April 21, 1923. Serial No. 633,750.

To all whom it may concern:

Be it known that I, WALTER VAN GUILDER, a citizen of the United States, residing in the city of Chicago, in the county of Cook and the State of Illinois, have invented certain new and useful Improvements in Solenoid-Operated Fuel-Feeding Devices, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide a means for operating a vacuum fuel feeding tank by a solenoid-operated air-exhausting device for producing a vacuum. It consists in the elements and features of construction shown and described, as indicated in the claims.

In the drawings:—

Figure 1 is a vertical axial section of a vacuum tank constructed for operation in accordance with this invention, the view also including a conventional diagram of the wiring of the solenoid from the ignition circuit of the engine.

Figure 2 is an enlarged detail sectional view of the suction connection with the vacuum chamber and the valves controlling the same.

Figure 3 is a top plan view of the tank shown in Figure 1.

Figure 4 is a section at the line, 4—4, on Figure 3.

In the structure shown in the drawings there is represented a familiar form of vacuum tank comprising an outer or main fuel supply receptacle, A, and the inner and upper vacuum chamber, B. The cap or cover member of this construction, for the purpose of the present invention comprises two plates, C and D, mounted one upon the other and having their proximate faces provided with registering recesses, *c* and *d*, forming a diaphragm chamber of which the diaphragm, E, is marginally engaged between the two plates which are secured together and to the tank members, A and B, in such manner as to clamp the diaphragm securely and air-tight at said marginal engagement. The upper plate, D, is extended upwardly near its center forming the solenoid housing, D^1, in which the solenoid tube, F, and winding, G, are contained above a retaining annular bottom plate, *f*. The solenoid core, F^1, is attached fixedly to the center of the diaphragm, E, extending therefrom at normal position of the diaphragm, part way into the solenoid tube, F, subject to being drawn further thereinto when the solenoid is energized. The lower part of the diaphragm chamber below the diaphragm has a port, c^1, formed through the plate, C, for inlet from the vacuum chamber into the diaphragm chamber; and said plate has also a port, c^2, leading out radially from the diaphragm chamber below the diaphragm to the atmosphere. The last mentioned port is provided with an inwardly seating check valve, c^{20}, held normally seated by a light spring, c^{21}. The first mentioned port, c^1, is provided with a check valve, c^{10}, seating downwardly,—that is, outwardly with respect to the diaphragm chamber,—its seat being at the upper side of the plate, C. This valve is mounted and positioned suitably with respect to its seat by means of its stem, c^{11}, guided in a lug, c^3, which projects from the plate, C, immediately below the diaphragm and overhanging the port, c^1. A light spring, c^{13}, coiled around the stem of this valve, c^{10}, reacting between its head and the lug, c^3, holds it normally seated subject to be opened by suction when a partial vacuum is produced in the vacuum chamber below the diaphragm by the lifting of the diaphragm by means of the solenoid core when the solenoid is energized.

The solenoid winding, G, is designed to be in a circuit provided with means for relatively frequent interruption and re-establishment, said circuit being indicated by the in-leading wire, g^1, connected with the ignition coil, H, and the return wire, g^2, leading to one contact segment of the timer, conventionally shown at K. This connection, it will be seen, causes the solenoid to be energized concurrently with the ignition of any selected cylinder of a four-cylinder engine. It will be understood that any convenient form of commutator may be employed for providing the interrupted energizing of the solenoid circuit.

The operation of this structure as a pumping device will be readily understood to be that the diaphragm and solenoid core being normally at the position shown in Figure 1, or at such position that the solenoid core has a substantial range of movement into the solenoid tube to reach the point of longitudinal centrality of the core with the tube,

the energizing of the solenoid, causing the core to be retracted and the diaphragm lifted at its center, will produce a partial vacuum in the lower half of the diaphragm chamber and an exhaustion of air by suction from the vacuum chamber; and that the solenoid-energizing circuit being then interrupted, the return of the diaphragm and core to original position will force the air thus drawn in from the vacuum chamber out through the atmosphere port, c^2, and past the check valve, said check valve serving to prevent atmosphere inlet during the retracting movement of the diaphragm and thereby cause that movement to draw in air from the vacuum chamber only; and that the repetition of this action as frequently as the solenoid circuit is interrupted and re-established, will tend to produce a substantial vacuum in the vacuum chamber for the purpose of lifting the fuel thereinto from a lower source of supply through the fuel supply pipe, T.

In order that the vacuum chamber and its valves may function in their necessary manner for the usual operation of the vacuum tank, there is provided for the port, c^1, in addition to the check valve, c^{10}, in the diaphragm chamber seating downwardly, the regular suction controlling valve, J, in the vacuum chamber seating upwardly at the same port, c^1. The two valves may be kept in alignment throughout their several movements by the expedient shown in Figure 2, consisting in boring the valve, c^{10}, and its stem axially and extending a slender guide spindle, J^1, from the end of the valve, J, into said bore.

The vacuum chamber has the customary fuel inlet through the cap, as seen at the registering apertures, d^5 and c^5, in the plates, C and D, respectively, for a supply pipe connection which is seen at T, atmosphere vent port at M controlled by the valve, l, the two valves, l and J, being connected for their proper simultaneous and proper opposite operation in the usual manner and means of these vacuum feed devices, consisting, as shown, in the drawings of two levers, O and P, having a fulcrum in common at o, and having their opposite ends connected by snap springs, Q, the lever, P, being engaged loosely with the stems of both the valves, j and l, the lever, O, being connected by a link, R, with a lever, S, fulcrumed at s on a lug c^4, projecting downward from the plate, C, and at the other end carrying the float, W.

I claim:—

1. In a vacuum fuel feeding device, in combination with a vacuum chamber, a diaphragm pumping element consisting of a chamber in the cap of the vacuum chamber, a diaphragm partitioning said diaphragm chamber; a solenoid mounted on the upper side of the cap having its reciprocable core extending into the diaphragm chamber and operatively engaged with the diaphragm, said diaphragm chamber having below the diaphragm, inlet and outlet ports leading respectively from the vacuum chamber and to the atmosphere; one-way-seating valves at said ports opening for fluid movement through the diaphragm chamber from inlet to outlet thereof; a valve for additionally controlling the port between the diaphragm chamber and the vacuum chamber; a float in the vacuum chamber for controlling said last mentioned valve; and means for interrupting the solenoid energizing circuit to cause alternate retraction and release of the core and reaction of the diaphragm.

2. In the construction defined in claim 1, foregoing, the diaphragm chamber being formed by means of two plates mounted one upon the other, having cavities in their proximate faces which form the diaphragm chamber, and having the diaphragm marginally engaged between them outside the circle of said facing cavities; an atmosphere inlet into the vacuum chamber outside the area of the diaphragm chamber, comprising registering ports in said two diaphragm chamber members; a valve controlling said last mentioned atmosphere inlet, and means connecting said last mentioned valve and the valve mentioned for additionally controlling the diaphragm chamber inlet port, with the float for their simultaneous operation thereby.

In testimony whereof, I have hereunto set my hand at Chicago, Illinois, this 16 day of April, 1923.

WALTER VAN GUILDER.