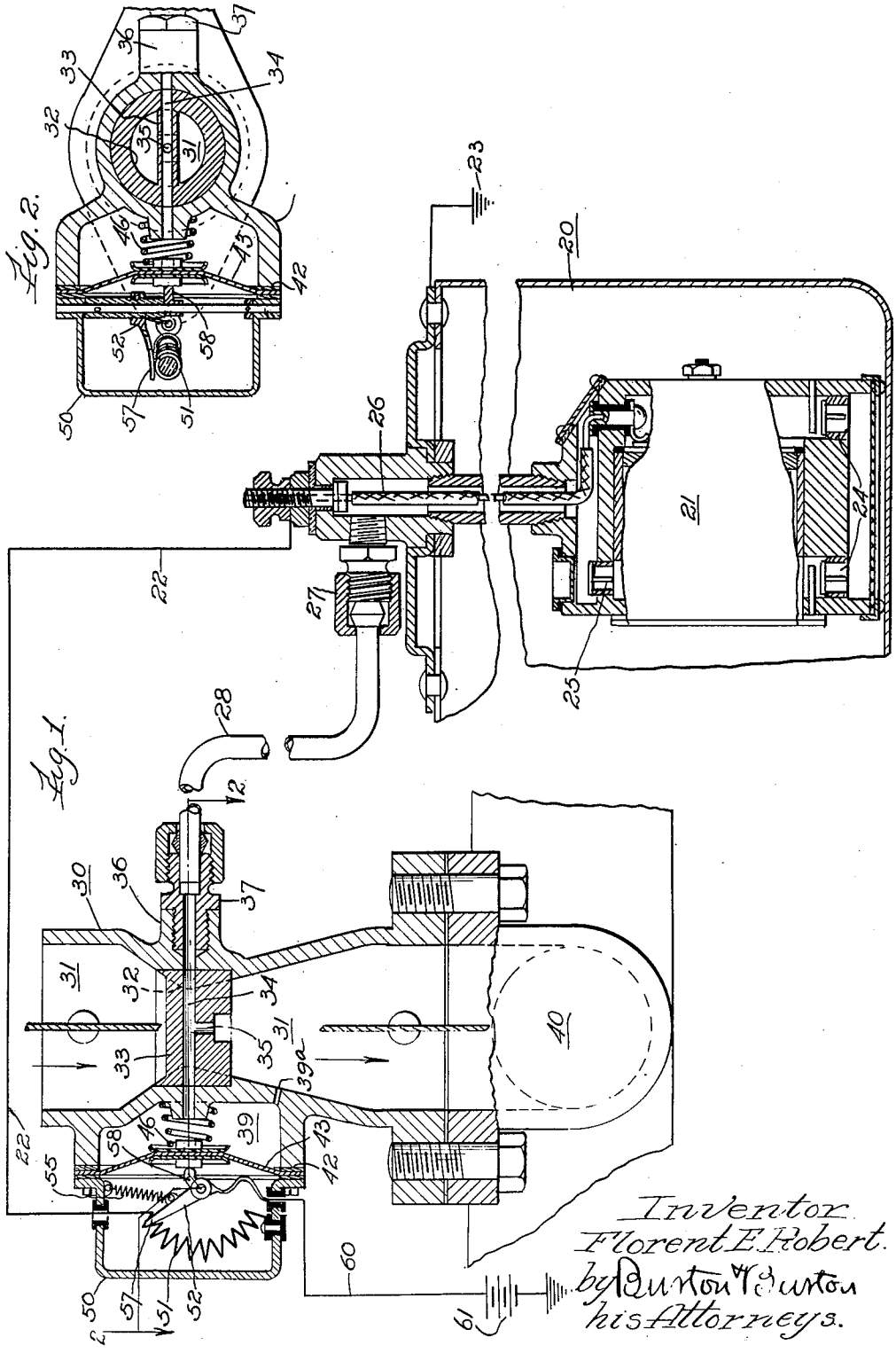
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ELECTRICALLY GOVERNED CARBURETOR

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ELECTRICALLY GOVERNED CARBURETOR

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The purpose of this invention is to provide an improved construction for supplying fuel to an internal combustion engine, said construction comprising an electrically operated pumping device whose operation shall be controlled according to the fuel requirements of the engine by regulating the energizing current automatically by means of current-governing devices in the circuit arranged to be operated in accordance with the engine speed and load. The invention consists in the elements and features of construction shown and described as indicated in the claims.

In the drawings:

Figure 1 is a partly diagrammatic view showing the electric pump and fuel tank diagrammatically connected as to circuit wiring and fuel line with the carburetor, the latter being shown in section axial with respect to the discharge conduit to the engine.

Figure 2 is a section at the line 2—2 on Figure 1.

Referring to the drawings: There is shown at 20 a main fuel supply tank in which there is shown submerged an electrically operated pump indicated in its entirety at 21, and which may be of any usual and suitable construction not requiring specific illustration or description, and which is accordingly shown in detail only to the extent of the inleading electric circuit wire, 22, shown grounded at 23, and leading to the pump structure from a circuit governing device mounted at the carburetor and hereinafter more particularly described; the submerged fuel inlet valves and passages seen at 24; the fuel discharge valve seen at 25, and the fuel discharge conduit seen at 26, leading to a connection, 27, for the fuel pipe line, 28, which is shown leading to the carburetor.

The carburetor body, 30, is shown as arranged for down-draft, that is, for discharge entrance of the air supply and delivery of fuel mixture, downwardly to the engine intake, and for discharge of the fuel downwardly into the air stream for forming the fuel mixture.

In this construction the main air supply passage is seen at 31, preferably having a flow accelerating constriction at 32 at which there is located a nozzle member which is in the form of a bridge, 33, hollow from end to end, its cavity, 34, constituting the fuel discharge passage and having midway in its length, that is, at the axis of the main air supply passage, 31, a discharge aperture, 35. This bridge member, which may be hereafter referred to as the fuel discharge nozzle or nozzle bridge, is thus arranged for discharge of fuel axially with respect to the air supply passage, 31. The carburetor body is formed with a nipple, 36, apertured in alignment with the axial cavity, 34, of the bridge nozzle, 33; and the fuel supply line, 28, is coupled, as seen at 37, to the nipple, 36, for delivery of fuel to the nozzle member, 33, for discharge of the fuel downwardly through the discharge port, 35, toward the engine intake, the carburetor body being mounted at its lower end on the engine body for discharge at the engine intake indicated at 40.

At the opposite side of the carburetor body, 30, from that of the nipple, 36, there is formed on the outside of said carburetor body a chamber, 39, of which the circumscribing wall is formed by an annular flange, 42, integral with the carburetor body, 30, the outer wall of said chamber being formed by a flexible diaphragm, 43, marginally clamped onto the edge of the annular flange, 42. As shown, this marginal clamping is effected by means of the casing, 50, of a device of the nature of a rheostat for governing the pump-energizing circuit, as hereinafter more particularly described and explained.

The rheostat comprises a casing, 50, in which there is insulatedly mounted a resistance coil, 51, flexed in the arc of a circle about a pivot of the switch member, 52, which is pivotally mounted in the casing, 50. The energizing circuit is indicated at 60, leading from a source of current shown conventionally at 61, the circuit leading from said source, extending insulatedly into the casing, 50, and connected to the switch member, 52, which is insulated at its pivotal mounting in the casing and provided with a spring, 55, also insulatedly attached to the casing and reacting on the switch lever for holding it with its resistance-coil-contacting terminal, 57, in

contact with said coil near the end of the latter which extends insulatedly out through the casing wall for connection with the circuit wire, 22, leading to the electrically operated pump, as hereinabove mentioned. The switch, 52, has a short arm, 58, extending in contact with the center of the diaphragm, 43; and the diaphragm is provided at the opposite side with a spring, 46, reacting upon the diaphragm in the direction for enlargement of the variable capacity chamber, that is, for forcing the diaphragm outwardly against the short arm of the switch lever, thereby causing the longer arm of the lever to be swung in the arc of the resistance coil for increasing the portion of said coil which is involved in the circuit, as the diaphragm is thus moved in chamber-enlarging direction.

It may be understood from the foregoing description that the diaphragm constituting the movable wall of the variable capacity chamber, 39, will be normally held by the spring, 46, in the position of maximum enlargement of the chamber, and will thereby hold the rheostat switch 52 in the position for involving the maximum portion of the resistance coil in the pump-energizing circuit, under which conditions the pump will be operated to minimum capacity for delivering the fuel to the carburetor. And it may be further understood that when the throttle valve is open and the engine is thereby operating for inflow of the air supply, the resulting reduction of pressure at the fuel nozzle discharge port, 35, operating for taking the fuel from the fuel line for discharge in the air stream to form the fuel mixture, also operates for producing partial vacuum in the variable capacity chamber, causing the diaphragm constituting the movable wall member of said chamber to be flexed inwardly with respect to the chamber by exterior atmospheric pressure which will permit the spring, 55, to react upon the switch member, 52, to cause its terminal to swing over the arc of the resistance coil in the direction for reducing the portion of the resistance coil which is included in the circuit, and thereby increasing the amount of the current which will be transmitted for energizing the pump in accordance with the pressure reduction at the nozzle discharge, 35, due to the velocity of the air stream flowing to the engine, which corresponds to the engine speed and load and therefore to the engine fuel requirement.

It will be seen, therefore, that the construction is adapted to govern the fuel supply automatically in accordance with the fuel requirement of the engine by governing the pump-energizing current in accordance with the engine speed and load.

The chamber, 39, is provided at the lower side with a restricted drainage port, 39ª, not large enough to defeat the suction action for contracting the chamber, 39, but to provide for drainage of any liquid which may under any circumstances be caused to enter the chamber, 39, as for example, if the rheostat and associated springs should become adjusted so that the electric pump would be energized so as to lift the liquid to the level of the passage, 34, independently of the suction, under which circumstances some liquid might flow into the chamber, 39, and escape through the drain port.

I claim:

1. In combination with a carburetor for an internal combustion engine, electrically operated means for supplying fuel thereto, and means operated by engine suction for governing the operation of said fuel supplying means.

2. In combination with a carburetor for an internal combustion engine, electrically operated means for supplying fuel thereto, and means operated by engine suction for varying correspondingly to the variation of engine suction the current by which the electrically operated fuel supplying means is energized.

3. In combination with a carburetor for an internal combustion engine, electrically operated means for supplying fuel thereto, and means operated by engine suction for varying correspondingly to the variation in engine suction the access of electric current from the current source to the electrically operated fuel supplying means.

4. In combination with a carburetor for an internal combustion engine, an electrically operated means for supplying fuel thereto, a rheostat in the circuit in which the electrically operated means is energized, and means exposed to actuation by engine suction in the carburetor discharge conduit and positively connected with the adjustable element of the rheostat for adjusting the same for current increase and decrease correspondingly to increase and decrease of engine suction in said carburetor discharge conduit.

5. In the construction defined in claim 4, the rheostat adjusting means comprising a variable-capacity chamber having its cavity in communication with the carburetor discharge conduit, and its movable wall member by whose movement the chamber is enlarged and reduced constituting the means for operating the adjustable element of the rheostat.

6. In combination with a carburetor for an internal combustion engine having a discharge passage arranged for connection with the engine intake, an electrically operated fuel pump and a fuel delivery conduit therefrom to the carburetor; a variable-capacity chamber in communication with said fuel delivery conduit and with the carburetor discharge passage to the engine, said variable

capacity chamber having a movable wall member by whose movement the capacity of the chamber is varied; an electric circuit in which the electric operating means of the pump is energized, comprising the variable resistance element of a rheostat, and operating connections from the movable wall member of the variable capacity chamber to the rheostat switch member, said parts being arranged for resistance-reducing movement of the rheostat switch member by chamber-reducing movement of the movable wall member, the latter having resilient means reacting normally for chamber-enlarging movement of said movable wall member.

7. In the construction defined in claim 6, the variable capacity chamber being formed on the carburetor exteriorly of the discharge conduit thereof which leads to the engine intake, and having the movable wall member exteriorly exposed to atmospheric pressure and interiorly exposed to the pressure in the chamber due to the communication of said chamber with the carburetor passage conduit.

8. In the construction defined in claim 6, the fuel delivery conduit comprising a duct in a bridge extending transversely through the carburetor discharge conduit and having within said conduit a fuel delivery port opening at the side of the bridge toward the engine intake, the variable capacity chamber being formed on the carburetor conduit exteriorly thereof at the opposite end of said bridge from that at which the fuel delivery conduit leads into said bridge duct, said bridge duct opening at said opposite end into the variable capacity chamber for constituting the communication of the fuel delivery conduit therewith.

9. In the construction defined in claim 6, the variable capacity chamber being formed comprising an annular flange projecting laterally from the carburetor discharge conduit with its movable wall member consisting of a flexible diaphragm marginally clamped to said annular flange, and having a spring lodged interiorly of said chamber normally reacting on the diaphragm for stressing it outwardly for enlarging the chamber, the rheostat being mounted opposite the outer side of the diaphragm for having its switch member operatively connected with said diaphragm.

10. A construction for the purpose indicated comprising in combination with an engine carburetor, electrically energized means for moving fuel to the carburetor; a rheostat having its resistance coil in the energizing circuit, the carburetor construction comprising a variable capacity chamber having a movable wall member by whose movement the capacity of the chamber is varied, and a duct through which said chamber communicates with the fuel mixture passage leading to the engine intake, the rheostat switch being operatively associated with said movable wall member for movement thereby through the range of the rheostat, and a spring reacting on the movable wall member in chamber-enlarging direction, whereby the current flowing in the energizing circuit is modified correspondingly to the suction induced by fuel inflow to the engine.

11. A construction for the purpose indicated comprising in combination with the air and fuel mixture inflow conduit of an internal combustion engine, a fuel supply duct, and electrically operated means for moving the fuel through said duct for discharge in the air and fuel mixture conduit for mixture with the air flowing therein, and a circuit in which said electrically operated means is energized; said fuel supply duct having its discharge in the conduit positioned therein suitably for the inducing of suction through the duct by air inflow through said conduit, the carburetor construction comprising an expansible and reducible chamber having suction communication with said conduit, and a wall member movable in response to the suction for varying the capacity of the chamber, and a rheostat having its resistance coil contained in said energizing circuit and its switch member operatively associated with the movable wall member for actuation thereby in the chamber-capacity-varying movement of said wall member for movement of the switch to reduce the extent of the resistance coil interposed in said energizing circuit correspondingly to the suction produced in the chamber for operating said moving wall member.

In testimony whereof, I have hereunto set my hand at Chicago, Illinois, this 27th day of August, 1929.

FLORENT E. ROBERT.