C. C. BRADBURY.

ELECTROMAGNETIC FUEL PUMP AND CIRCUIT THEREFOR.

APPLICATION FILED MAY 19, 1916.

1,337,388.

Patented Apr. 20, 1920.

2 SHEETS—SHEET 1.

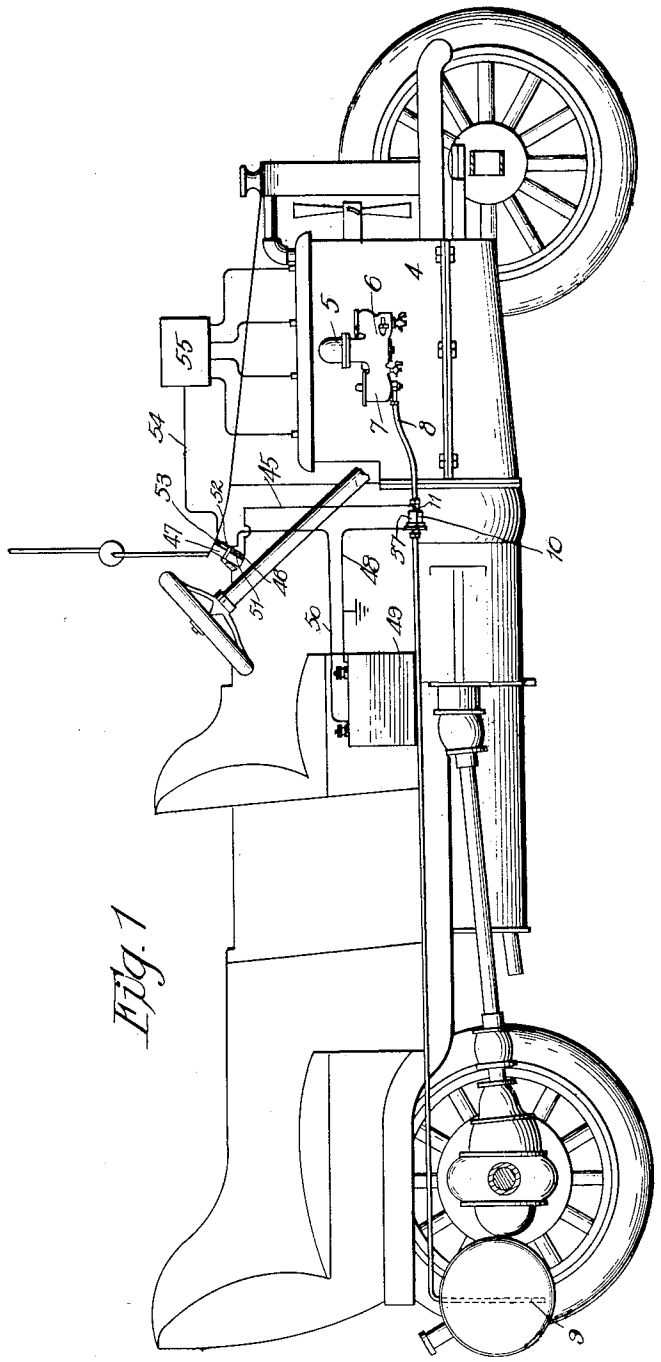

Fig. 1

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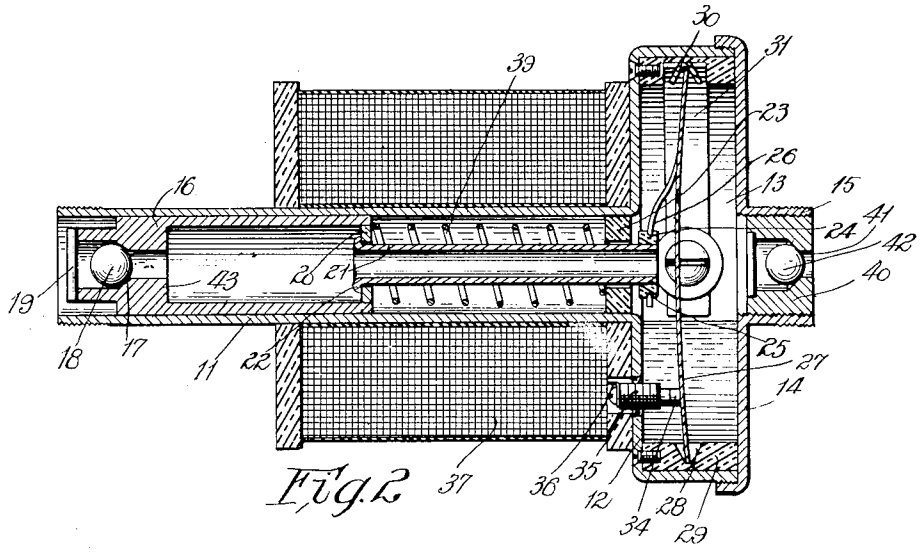

Fig. 2

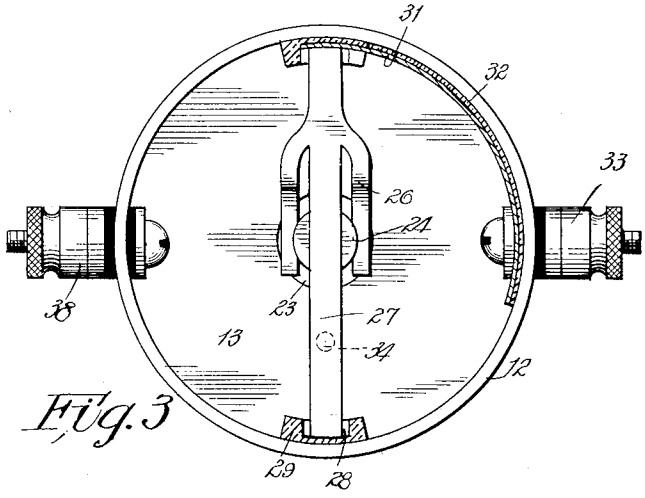

Fig. 3

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UNITED STATES PATENT OFFICE.

CLIFFORD C. BRADBURY, OF CHICAGO, ILLINOIS.

ELECTROMAGNETIC FUEL-PUMP AND CIRCUIT THEREFOR.

1,337,388. Specification of Letters Patent. **Patented Apr. 20, 1920.**

Application filed May 19, 1916. Serial No. 98,560.

To all whom it may concern:

Be it known that I, CLIFFORD C. BRADBURY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electromagnetic Fuel-Pumps and Circuits Therefor, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to electro-magnetic fuel pumps and circuit therefor. The object of the invention is to provide simple and positive means for pumping gasolene from a tank at a lower level to the float chamber of a carbureter, which means is not dependent upon the rotation of the engine itself.

Systems for raising fuel from a lower level to that of the carbureter have been proposed and used in the past, but so far as I am aware they either depend upon some manual operation to start the initial flow, or else depend upon some operation produced by the rotation of the engine itself; thus, when the gasolene has become exhausted from the main supply tank and no fuel is left for the rotation of the engine it often becomes difficult to secure the first quantity of gasolene for propelling the engine to cause the continued flow of fuel to the carbureter.

My invention is illustrated in connection with a simple electric circuit controlled by the main starting switch for the engine, the arrangement preferably being such that when the switch is moved to its operating position, that is, to the position in which the ignition circuit is closed, the electro-magnetic pump circuit is simultaneously closed. The details of construction and the particular arrangement of parts of a preferred form of my invention are described in the following specification, and are illustrated in the accompanying drawings in which,

Figure 1 is a side elevational view of an automobile provided with the electro-magnetic fuel pump of my invention, some of the parts of the automobile being broken away to more clearly illustrate the construction and positions of the various parts associated with the fuel pump;

Fig. 2 is a cross sectional view of the fuel pump; and

Fig. 3 is an end elevational view of the pump with the end cap removed.

Similar characters of reference refer to similar parts throughout the several views.

Referring first to Fig. 1, 4 illustrates an internal combustion engine provided with an intake manifold 5. Secured to the intake manifold is a carbureter 6 provided with a fuel or float chamber 7. This fuel chamber communicates with a conduit 8 extending downwardly into the fuel supply reservoir 9. This reservoir is located at a level lower than the level of the fuel within the fuel chamber 7 of the carbureter and is provided with a vent opening to subject the fuel contained therein to atmospheric pressure. Located within the conduit 8 so as to form a part thereof is an electro-magnetic fuel pump 10 which serves when caused to operate to pump fuel from a lower level, that is, from the fuel supply reservoir, up to the float chamber 7 of the carbureter.

The detailed construction of the electro-magnetic fuel pump is illustrated in Figs. 2 and 3 wherein 11 illustrates a pipe or conduit, preferably made of non-magnetic material, having one end 12 flared outwardly to form a chamber 13. Secured to the portion 12 of the pipe 11 in any suitable manner is a cap 14 having an outwardly extending collar 15. This collar is externally threaded to permit connection of that portion of the conduit 8 which extends between the pump and the fuel reservoir 9. The narrow end of the pipe 11 is also externally threaded to permit connection with that portion of the conduit 8 which communicates with the float chamber 7 of the carbureter. Mounted within the pipe 11 and arranged to reciprocate longitudinally therein is an armature pump piston 16 made of magnetic material. This piston, as illustrated, contains a valve seat 17 against which is arranged to seat a ball valve 18. Means may be provided such as a rod 19 to keep the ball valve in position within the armature pump piston. The inner end of the piston 16 carries a collar 20 into which loosely extends a pipe 21, preferably made of non-magnetic material. This pipe has its end, which terminates within

the piston 16, flared outwardly at 22 so as to prevent the removal of the pipe from the interior of the piston. The right hand end (Fig. 2) of the pipe 21 extends loosely through an insulating collar 23 rigidly carried by the pipe 11, and carries within the chamber 13 an insulating collar 24 grooved at 25 to receive the bifurcated extension 26 of a switch spring 27. This switch spring 27 extends vertically within the chamber 13 and has its lower end extending into a V notch 28 provided in an insulating piece 29 carried by the portion 12 of the pipe 11. The upper end of the switch spring 27 extends into the V 30 formed of the conductor strip 31 insulated from the portion 12 by means of an insulating strip 32. A binding post is provided at 33 which has electrical engagement with the conductor strip 31, but which is insulated from the portion 12 of the pipe 11.

As most clearly illustrated in Fig. 2, the spring switch 27 has a length which is greater than the distance between the V notches 28 and 30 so that the spring 27 will at all times assume a position either on one side or the other of a straight line connecting the V notches, or, in other words, the spring will always assume a position somewhat like the arc of a circle. Carried by the spring at the lower end of the chamber 13 is a contact 34 arranged to coöperate with a stationary contact 35 rigidly carried by and insulated from the portion 12 of the pipe 11. This stationary contact is connected by means of a conductor 36 with an electro-magnetic coil 37 disposed around the pipe 11. The opposite end of the coil 37 is connected with the binding post 38.

Disposed around the pipe 21 and extending between the insulating collar 23 and the armature pump piston 16 is a compression spring 39 tending to at all times move the piston to the left (Fig. 2). A valve member 40 is provided within the collar 15 which contains a valve seat 41 coöperating with a ball valve 42.

In the operation of the device the battery is connected with the binding posts 33 and 38 and the pump held in a position such that the spring 27 extends vertically within the chamber 13. Since the contacts 34 and 35 are closed current will be supplied to the coil 37 and a magnetic field will be produced to attract the armature 16. The armature 16 therefore responds to the attraction and moves against the tension of the spring 39 until the shoulder 43 engages the flared end 22 of the pipe 21. When this takes place the pipe 21 will be given a slight longitudinal movement to the right (Fig. 2) to cause the separation of the contacts 34 and 35. As soon as the contacts are thus separated the electric circuit for the coil 37 is suddenly interrupted and the magnetic attraction discontinued whereby the spring 39 serves to move the piston 16 again to the position illustrated in Fig. 2. Upon again returning to this position the collar 20 of the piston strikes the flared end 22 of the pipe 21 again closing the contacts 34 and 35 to repeat the operation just described. It will be apparent, therefore, when the valves 18 and 42 are taken into consideration that upon reciprocation of the piston 16 fuel will be pumped from the supply reservoir 9 up into the fuel chamber 7 of the carbureter.

Since the chamber 13 extends below the pipe 11 fuel will be trapped in the lower end of the chamber which forms a pocket to at all times submerge the contacts 34 and 35 within the fuel. By thus submerging the contacts the explosion of a gaseous mixture within the pump or within the conduit 8 is prevented.

I shall now describe the mechanism for causing the operation of the electro-magnetic pump when a main switch, such as an ignition circuit switch, for controlling the operation of the engine, is operated so that upon placing the internal combustion engine in operative condition the pump will simultaneously be provided with an energizing circuit and when the ignition circuit is interrupted the pump circuit is also interrupted. The binding post 33 is connected by means of a conductor 45 with the contact 46 of the main switch 47. The binding post 38 is connected through the conductor 48 with the negative terminal of the battery 49. The positive terminal of the battery connects through the conductor 50 with the arms 51 and 52 of the switch. Connected with the contact 53 is the conductor 54 extending to the ignition mechanism diagrammatically illustrated at 55. The arms 51 and 52 are arranged so that when the arm 52 engages the contact 53 the arm 51 will at the same time electrically engage the contact 46 and the disengagement of one of the arms from its contact will cause similar disengagement of the other arm from its contact. When, therefore, the switch is moved to operating position a circuit is provided from the positive pole of the battery through conductor 50, switch arm 51, contact 46, conductor 45, coil 37 of the electro-magnetic pump, and conductor 48 back to the negative pole of the battery, the energizing circuit of the pump being thus completed. When the switch is in this position a second circuit is also provided which extends from the positive pole of the battery through the switch arm 52, contact 53, ignition mechanism 55, and back to the negative pole of the battery through ground as shown.

Having thus described my invention what

I claim as new and desire to secure by United States Letters Patent is:

1. A fuel pump for feeding fuel from a supply reservoir to a carbureter at a higher level than the reservoir comprising a fuel conduit, an electro-magnetic coil disposed around the conduit, an armature pump piston reciprocable longitudinally within the conduit, a fuel pocket communicating with the conduit, and automatic switching means submerged in the fuel contained in the pocket, said means being in circuit with the coil to cause energization or deënergization of the electro-magnetic coil.

2. A fuel pump for feeding fuel from a supply reservoir to a carbureter at a higher level than the reservoir comprising a fuel conduit, an electro-magnetic coil disposed around the conduit, an armature pump piston reciprocable longitudinally within the conduit, a fuel pocket communicating with the conduit, and automatic switching means operated by the piston submerged in the fuel contained in the pocket, said means being in circuit with the coil to cause energization or deënergization of the electro-magnetic coil.

3. A fuel pump comprising a conduit, an electro-magnetic coil disposed around the conduit, an armature pump piston reciprocably mounted within the conduit, a switch for controlling the circuit of the electro-magnetic coil, said switch comprising a stationary contact and a snap switch spring fixed at both ends and arranged to bulge intermediate its ends, and means whereby the spring is operated at the completion of each stroke of the armature piston to close or open the coil circuit, as the case may be.

4. A fuel pump comprising a conduit, an electro-magnetic coil disposed around the conduit, an armature pump piston reciprocably mounted within the conduit, a fuel pocket extending downwardly from the conduit, a switch for controlling the circuit of the electro-magnetic coil, said switch comprising a stationary contact submerged in the fuel contained in the pocket, and a snap switch spring fixed at both ends and arranged to bulge intermediate its ends, and means whereby the spring is operated at the completion of each stroke of the armature piston to close or open the coil circuit.

In witness whereof, I hereunto subscribe my name this 16th day of May, A. D. 1916.

CLIFFORD C. BRADBURY.

Witnesses:
MARY A. COOK,
FRANK F. A. ANDERSEN.