G. T. HANCHETT.

LIQUID FUEL CONTROL SYSTEM.

APPLICATION FILED JUNE 10, 1909.

991,152.

Patented May 2, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

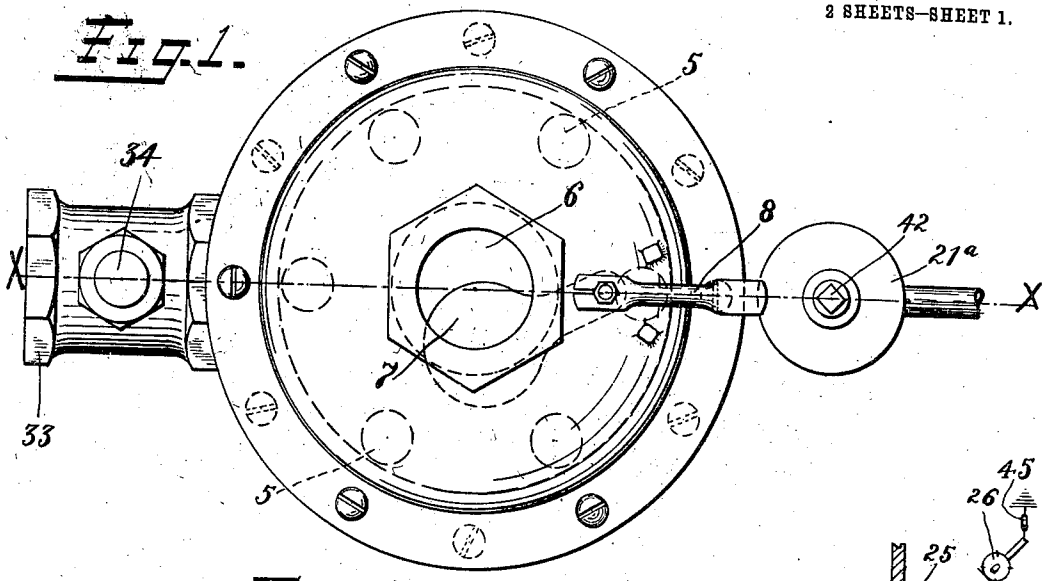
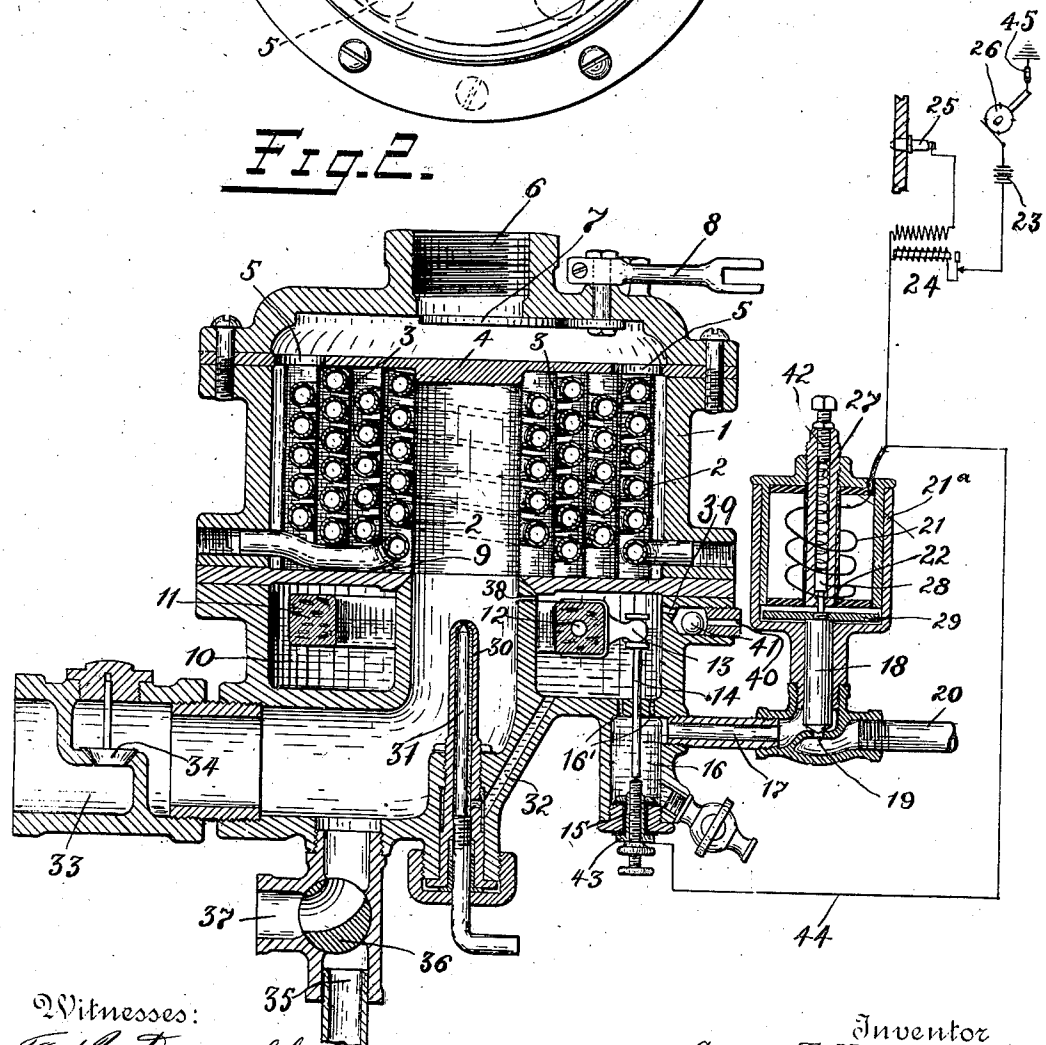


Fig. 2.



Witnesses:

Fred W. Dannenfelser.

Chas. A. Peard

Inventor

George T. Hanchett.

By his Attorneys.

Barrett, Howell & Mitchell

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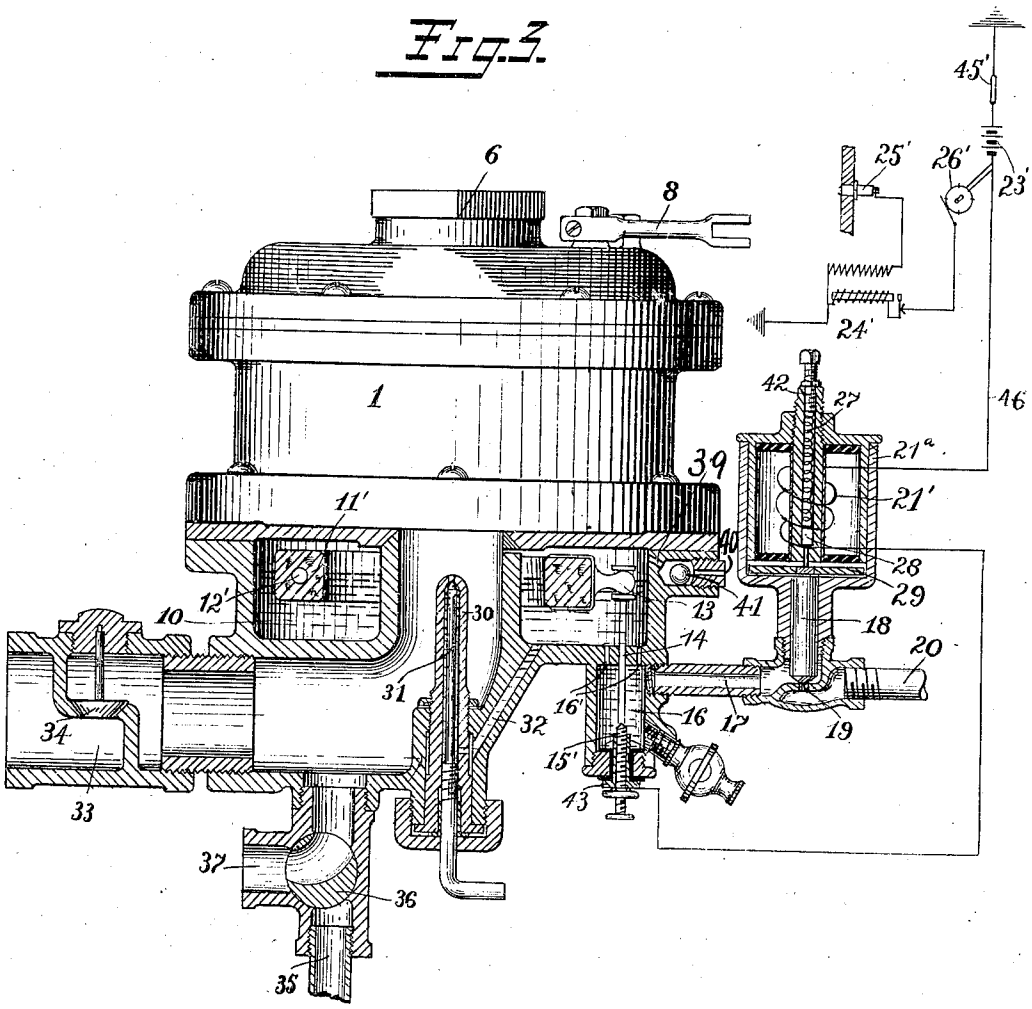
Fig. 2.



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UNITED STATES PATENT OFFICE.

GEORGE TILDEN HANCHETT, OF HACKENSACK, NEW JERSEY.

LIQUID-FUEL-CONTROL SYSTEM.

991,152. Specification of Letters Patent. Patented May 2, 1911.

Application filed June 10, 1909. Serial No. 501,392.

To all whom it may concern:

Be it known that I, GEORGE T. HANCHETT, a citizen of the United States, residing at Hackensack, county of Bergen, State of New Jersey, have invented certain new and useful Improvements in Liquid-Fuel-Control Systems, of which the following is a full, clear, and exact description.

My invention relates to improvements in liquid fuel control systems and has for its object to provide a new and improved means of controlling the supply of liquid fuel to carbureters and the like.

The following is a full, clear and complete description of my invention, such as will enable those skilled in the art to make and use the same, reference being had to the accompanying drawing, in which,

Figure 1 shows a plan view of the carbureter, and, Fig. 2 shows a vertical section of the same on the line *x*—*x* Fig. 1. Fig. 3 shows a modification of circuits.

Referring more particularly to the drawings, 1 is a mixing chamber containing a coil pipe 2 for hot water having a plurality of vertical series or turns each separated by a vertical wire screen 3. Above the coils is a plate 4 having perforations 5 for the passage of the mixed gas and air, which mixture ultimately passes through the port 6 to the cylinder. The port 6 is controlled by a damper 7 operated by the lever 8. Below the lower wall 9 of the mixing chamber is a constant level cup 10 containing a float 11 pivoted to the body of the carbureter at 12. Connected to this float is a lever arm 13 which actuates a rod 14 causing it to engage and disengage the upper end of an adjustable screw contact 15, within a liquid pocket 16, which is connected by orifices 16′ with the constant level cup 10. The liquid pocket 16 is supplied with liquid fuel through the pipe 17 which is controlled by the valve 18, seating on the seat 19, the fuel being supplied under pressure from any convenient source through the pipe 20. Above the plunger of the valve 18 is an electromagnet consisting of the winding 21 and the core 22 having a non-magnetic casing 21ª. The winding 21 of the electromagnet has one terminal connected to the core 22 of the magnet so as to be grounded and the other terminal thereof is connected with one terminal of any suitable source of electric current whose other terminal is grounded, such for instance as the electric battery 23, which supplies the spark coil 24.

In the arrangement shown in Fig. 2, the winding 21 of the electro-magnet is in series with the commutator 26. This does not, however, seriously affect the action of the electro-magnet in carrying out its function. In the arrangement shown, the spark coil has one terminal connected to the spark plug 25 to ignite in the engine cylinder in the ordinary manner the mixed air and gas supplied thereto from the carbureter and is controlled by the commutator 26. Within the core of the electromagnet is a spiral spring 27 which bears upon a plunger 28, connected to the valve 18, there being a space between the upper end of the valve 18 and the electromagnet so that when the electro-magnet is energized, the valve 18 can be lifted from its valve seat 19. Preferably the valve 18 has an extended magnetic face 29. The spring 27 assists gravity in returning the valve 18 to its seat.

30 is a spray nozzle within the central chamber of the carbureter having a controlling needle valve 31. The space outside the nozzle constitutes a spray chamber. The nozzle 30 is connected with the chamber 10 by passage 32 so that oil in the passage 32 flows to the spray nozzle and when the fuel in the chamber 10 is at its normal height, and when under normal pressure, rises to the mouth of the nozzle 30.

33 is an air passage leading to the atmosphere and connected through the check valve 34 with the inner chamber of the carbureter.

35 is a passage connected with a source of compressed air. 36 is a three-way cock. When the cock 36 is turned so as to connect the compressed air source with the inner carbureter chamber, the compressed air is supplied through it to the engine cylinder for the purpose of starting the engine.

37 is a port connected with the atmosphere so that when the cock 36 is turned so as to cut off the compressed air, the chamber within the carbureter is connected with the atmosphere directly through the port 37. The constant level chamber 10 is connected with the internal chamber of the carbureter through a constricted orifice 38 and to the atmosphere through a constricted orifice 39 and a passage 40 controlled by a check valve 41. The spring 27 can be adjusted by the

screw 42 which bears upon the upper end of the same. The contact 15 is insulated from the metallic portions of the carbureter by insulation 43. The electromagnet can be controlled in various ways. In the particular arrangement shown the winding 21 of the electromagnet is shunted when the plunger 14 engages the contact 15 so as to be out of circuit, the shunt consisting of the conductor 44 and contact 15 to which it is connected, plunger 14, and casings of the carbureter and electromagnet and the core 22.

45 is a manual switch which interrupts the circuit of the battery 23 when desired. With the switch 45 located as shown, the valve 18 is closed whenever the ignition is cut out.

In the operation of the apparatus, when the cup 10 is empty or below normal, gasolene or other liquid fuel enters the constant level cup through the valve seat 19, passing the plunger 18 of the control valve. As it enters the carbureter it passes through the pocket 16 and thence into the constant level cup 10, and continues to flow until the float 11 is raised so as to bring the plunger 14 into engagement with the contact 15. This short circuits the winding 21, deënergizing the electromagnet and permits the valve 18 to close. The level in the cup 10 is maintained at any desired point by the float 11, thus when the level in the fluid constant level chamber 10 falls the float 11 falls, lifting the rod 14 and breaking engagement with the contact 15. This interrupts the short circuit made by the conductor 44 around the electromagnet causing the electromagnet to become energized and lift the valve 18 so that the liquid flows through the valve seat 19 into the cup 16 and thence through the orifices 16′ to the chamber 10. When the chamber 10 has become filled to the desired level, the float 11 rises causing the plunger 14 to engage the contact 15, thus completing the shunt through the conductor 44, deënergizing the electromagnet and permitting the valve 18 to fall so as to close the valve at the valve seat 19, as above described. The valve is made to move down by any convenient means such as the spring 27 above referred to. In this way the fluid in the chamber 10 is maintained in constant level whenever the battery 23 is in circuit, the result being accomplished by the automatic float control of the electric circuit through the electromagnet, without, however, causing any interruption of the circuit through the battery 23 or the spark coil. When the engine is in operation, atmospheric air enters the carbureter through the check valve 34 and passing the nozzle 30 mixes with the spray therefrom and thence passes to the vaporizing chamber 1, in which the mixing and vaporizing takes place, thence outward through the outlet 6. The screens 3—3 produce a thorough mixing of the fuel and air and the heat from the hot water pipes 2, which are connected to any convenient source, preferably the cooling jacket of the engine, volatilizes the fuel so as to reduce it to a gaseous state.

When the engine is started by the compressed air, the compressed air is admitted from the port 35 through the three way cock 36 and thence passing up through the carbureter, passes the nozzle 30, and through the chamber 1 to the outlet 6 and the engine.

The port 38 connected with the constant level chamber 10 permits the pressure due to the compressed air to be exerted upon the upper surface of the liquid within that chamber with the result that the pressure at the mouth of the nozzle 30, due to compressed air, does not force the liquid away from the mouth of the nozzle and hence the liquid levels are substantially undisturbed. The compressed air which is admitted closes the main air intake by reason of the check valve 34 and creates a pressure through all parts of the carbureter including the float chamber 10. If while in this condition the compressed air is suddenly turned off at the cock 36, relieving the pressure in the spray chamber, the fluid chamber 10 bleeds slowly by reason of the reduced orifice 38, and the connection of the inner or vaporizing chamber with the atmosphere through the port 37. The pressure in the fluid chamber therefore for a time at least exceeds the pressure in the vaporizing chamber, which causes the liquid fuel to squirt up through the spray nozzle 30 into the vaporizing chamber of the carbureter. If compressed air is then again readmitted, it finds abundant fuel in the vaporizing chamber from which to take up its explosive properties. The second charge of compressed air, being thus impregnated with a large amount of fuel, primes the engine so that its charge will ignite and it will continue to run after the compressed air has been cut off. After the compressed air is cut off the engine continues to run in the ordinary manner, drawing in atmospheric air and producing a spray at the nozzle 30. In some cases a second application of compressed air may not be necessary.

It is to be noted that the float in my carbureter does not actuate any valves mechanically. It serves merely to make and break an electrical connection, the control valve itself being operated electrically. The operation of the control valve therefore does not depend upon the feeble power which can be supplied by the float, but is operated by a powerful means so as to promptly open and close the valve in spite of any normal friction or sticking or the presence of foreign matter. I have preferred to have the controlling valve opened electrically and closed by any suitable means, although this

is not necessary so long as it is operated electrically in at least one direction.

It is to be noted that the engaging contact surfaces on the plunger 14 and contact 15 for controlling the electromagnet are submerged beneath the liquid fuel in the cup 16 and therefore there is no danger of disastrous sparking. Since the spark does not come in contact with the air, there is no danger of explosion of the fuel or the ignition of any gases which are apt to surround the carbureter.

Instead of the circuit arrangements shown in Fig. 2, I may employ those shown in Fig. 3 wherein elements having numerals with exponents correspond to elements of Fig. 2 to which similar numerals without exponents are applied. In this arrangement the ignition battery 23′ is located between the ground and the commutator 26′. The spark coil 24′ is connected in circuit between the commutator and another ground, one terminal of the secondary being connected to the spark plug 25′ in the ordinary way. Connected to one terminal of the battery 23′ by the conductor 46 is one terminal of the coil 21′ of the electro-magnet, its other terminal being connected to the contact 15′, with which the plunger 14′ engages. The float 11′ in this case is pivoted at the other end from which it is pivoted in Fig. 2, namely, at 12′, so that the engagement between 14′ and 15′ is made as the float falls. In this arrangement, the circuit of the electro-magnetically controlled valve is entirely independent of the spark coil circuit, and is broken whenever the fuel chamber is normally full, but is completed so as to energize the electro-magnetic valve whenever the float 11′ falls. Switch 45′ cuts out the battery 23′. With this arrangement, as with the other arrangement, whenever the battery circuit is interrupted between the battery and the ground, the electro-magnet valve is deënergized, that is, whenever the ignition is cut off the electro-magnet valve closes. With the parts so connected, the resistance of the electro-magnet is eliminated from the spark coil circuit at all times and that circuit is not affected by the condition of the fuel chamber or the position of the float therein.

What I claim is:

1. In a device of the character described, the combination of an outlet, a source of liquid fuel supply connected therewith, electromagnetic means controlling the flow of fuel from said source, a circuit controlling said electromagnetic means and controlling contacts in said circuit immersed in said liquid fuel.

2. In a device of the character described, the combination of a float chamber, a source of liquid fuel supply connected therewith, a valve between said source and said chamber, a float in said chamber, contacts controlled by said float, electromagnetic means controlled by said contacts and actuating said valve, and an outlet connected with said float chamber, said contacts being immersed in said fuel.

3. In a device of the character described, the combination of a float chamber, a float therein, a valve leading from a source of fuel supply, electro-magnetic means controlling said valve and a shunt around said electro-magnetic means controlled by said float and an outlet connected to said float chamber.

4. In a device of the character described, the combination of a float chamber adapted to contain liquid fuel, a float therein, contacts below the normal level of the fuel in said chamber and brought into and out of engagement by movements of said float, an electro-magnetic supply valve controlled by said contacts controlling the level of the fuel in said chamber and means outside of said chamber for adjusting the point of engagement of said contacts for any desired position of the float.

5. In a device of the character described, the combination of a source of fuel supply, a fuel chamber, a connection between the two, a valve in said connection, an electromagnetic device for controlling said valve, relatively movable contacts controlling said electromagnetic device, means for moving said contacts relatively, and a pocket for liquid fuel located below the body of said fuel chamber and surrounding said contacts, and an outlet connected to said fuel chamber.

6. In a device of the character described, the combination of a fuel chamber adapted to contain liquid fuel, a supply passage leading thereto, a valve seat in said passage, a casing rising from said valve seat to above the level of the fuel in said chamber, a valve within said casing, a solenoid for actuating the same, a float within said fuel chamber, and contacts controlled by said float and adapted to cut said solenoid in and out of circuit.

7. In a device of the character described, the combination of a fuel chamber adapted to contain liquid fuel, a supply passage leading thereto, a valve seat in said passage, a casing rising from said valve seat to above the level of the fuel within said chamber, a valve and a solenoid for actuating the same both within said casing, a float within said fuel chamber, and contacts controlled by said float and adapted to cut said solenoid in and out of circuit.

8. In a device of the character described, the combination of a fuel chamber adapted to contain liquid fuel, a supply passage leading thereto, a valve seat in said passage, a casing rising from said valve seat to above the level of the fuel in said chamber, a valve within said casing, a solenoid for actuating

the same, a float within said fuel chamber, and contacts actuated by said float and adapted to cut said solenoid in and out of circuit, the engaging points of said contacts being immersed and below the normal level of the liquid fuel in said chamber.

9. In a device of the character described, the combination of a fuel chamber, a source of liquid fuel supply therefor, an outlet for said chamber, a valve between said chamber and said source normally tending to close, a casing for said valve rising above the level of the fuel in said chamber, electromagnetic means for opening said valve, and a float in said chamber controlling said electromagnetic means.

10. In a device of the character described, the combination of a fuel chamber adapted to contain liquid fuel, a supply passage leading thereto, a valve seat in said passage, a casing rising from said valve seat to above the level of the fuel in said chamber, a valve and a solenoid for actuating the same, both within said casing, a float in said fuel chamber, contacts actuated by said float and adapted to cut said solenoid in and out of circuit, the engaging points of said contacts being within said chamber and below the level of the liquid fuel therein, a spark coil, a source of current to which said coil and solenoid are connected, and a common switch for cutting both said solenoid and spark coil out of circuit.

GEORGE TILDEN HANCHETT.

Witnesses:
H. B. BROWNELL,
IDA M. HUNZIKER.