

May 12, 1925.

1,537,595

J. C. FEDERLE

ENGINE

Filed Feb. 24, 1923

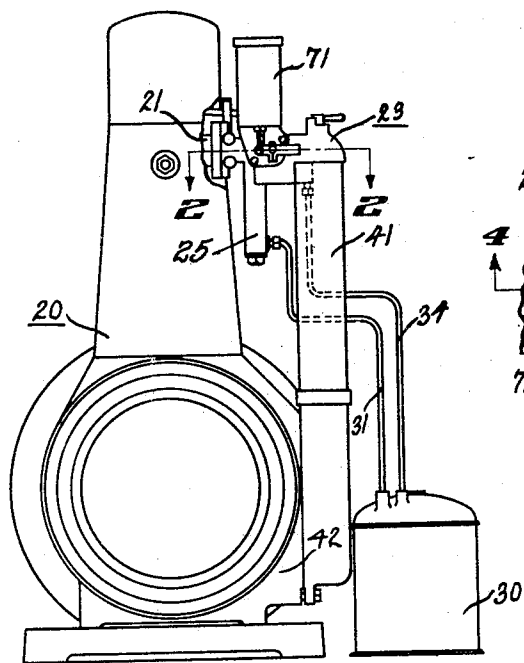


Fig. 1

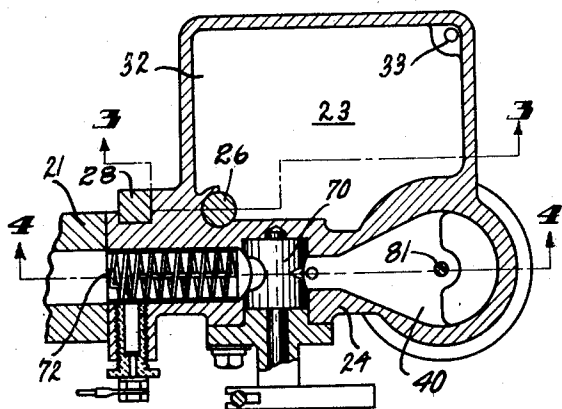


Fig. 2.

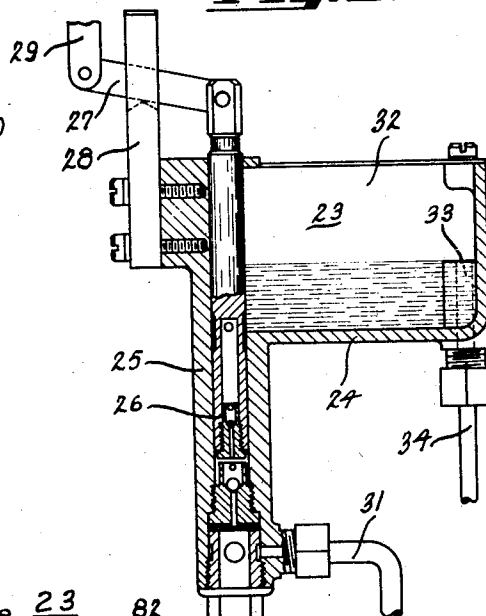


Fig. 3.

THERMOSTAT HEATED BY ENGINE.

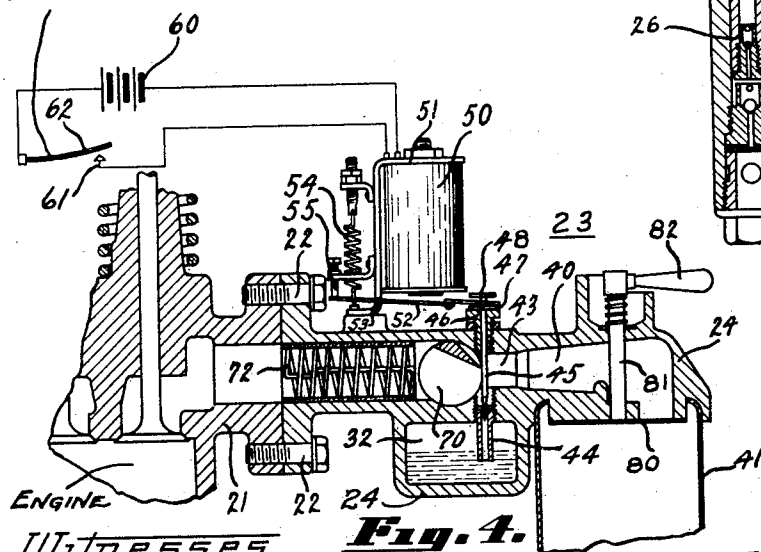


Fig. 4.

Witnesses

Charles E. Greene
Lloyd M. Neighley

Inventor

JOSEPH C. FEDERLE.

By

J. Ralph Fehr

His Attorney

Patented May 12, 1925.

1,537,595

UNITED STATES PATENT OFFICE.

JOSEPH C. FEDERLE, OF DAYTON, OHIO, ASSIGNOR TO DELCO-LIGHT COMPANY, OF DAYTON, OHIO, A CORPORATION OF DELAWARE.

ENGINE.

Application filed February 24, 1923. Serial No. 621,097.

To all whom it may concern:

Be it known that I, JOSEPH C. FEDERLE, a citizen of the United States of America, residing at Dayton, county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Engines, of which the following is a full, clear, and exact description.

This invention relates to internal-combustion engines and has among its objects to provide an automatic fuel mixture control whereby during the cranking period the engine is provided with a relatively rich fuel mixture to facilitate starting the engine, and when the engine is self-operative, the richness of the mixture is reduced to suit the requirements of engine running.

Other and further objects and advantages of the present invention will be apparent from the following description of a preferred form thereof, reference being made to the accompanying drawings.

In the drawings:

Fig. 1 is an end view of an internal-combustion engine equipped with the present invention;

Fig. 2 is a sectional view on the line 2—2 of Fig. 1;

Fig. 3 is a sectional view on the line 3—3 of Fig. 2; and

Fig. 4 is a sectional view on line 4—4 of Fig. 2.

In the drawings, 20 designates an engine and generator power unit which includes an engine intake 21, on which is mounted by means of screws 22 a carburetor 23, which includes a body 24 constituting a frame for a carburetor. Body 24 includes a pump cylinder 25 which cooperates with a pump piston 26 having connections with the valve mechanism of the engine through a rocker arm 27 fulcrumed on post 28, and through a link 29 adapted to be connected with one of the rocker arms of the valve mechanism of the engine. The pump causes fuel to be withdrawn from a tank 30 through a pipe 31 and to be delivered into a constant level fuel chamber 32, having an overflow 33 connected by pipe 34 with tank 30.

The body 24 is provided with a passage 40 connected by breather pipe 41 with the engine crank case 42. Passage 40 includes a venturi restriction 43 connected by a nozzle 44 with the fuel chamber 32. Nozzle 44 is controlled by a needle valve 45 extending

through a bushing 46 and provided with flanges 47 and 48.

A magnet 50 is mounted on a frame 51 supported by the body 24, and cooperates with armature 52 pivoted at 53. Armature 52 is normally held by a spring 54 against a stop 55 with its other end tending to maintain the shoulder 47 upon the upper end of the bushing 46. This position of the needle valve 45 provides the restriction of the nozzle 44 necessary to give the proper mixture for engine running. One terminal of the magnet 50 is connected with a storage battery 60 which may be charged by the generating plant 20, and the other end of magnet 50 is connected with a contact 61 normally engaged with a switch contact 62 of bimetallic thermostat metal connected with battery 60. The thermostat 62 is mounted on the engine, and preferably adjacent the cylinder head so that the contact 62 will bend away from the contact 61 when the cylinder head has attained a temperature normally attained when the engine is self-operative.

When the engine is idle and the cylinder head is cold contacts 61 and 62 will touch and the magnet 50 will receive current from the battery 60. The armature 52 will be attracted and will cooperate with the flange 48 on the needle valve 45 to retract the valve slightly from the nozzle 44. The restriction of the nozzle 44 being decreased more fuel can be drawn into the passage 40 for a given engine suction than when the valve 45 is in its lower position. Consequently the fuel mixture will be richer before the engine cylinder head has attained a certain temperature causing the contacts 61 and 62 to separate than after this temperature has been reached.

When the engine becomes self-operative and has attained a certain speed the cylinder head will finally attain a temperature sufficient to cause the thermostat contact 62 to bend away from the contact 61 thus interrupting the magnet circuit and permitting the armature 52 to return to its normal position during engine running. In this manner the fuel mixture proportions are controlled in response to a change in temperature of the cylinder head. When the engine is cold an initially rich mixture is provided. When the engine develops a certain amount of heat due to self-operation the richness of the fuel mixture is reduced

to suit the requirements of normal engine running.

The passage of fuel mixture to the engine is controlled by throttle valve 70 which may be actuated manually or be controlled by an electro-magnet contained within a housing 71 and connected across the terminals of the generator of the plant 20 so that the speed of the engine may be limited.

10 To facilitate engine starting the passage 40 is provided with an electrical heating coil 72 adapted to be connected with the battery 60 by suitable circuits which are not, however, illustrated as this heating feature 15 forms no part of the invention to which this present application relates. This application discloses means for automatically starting and stopping a generating plant in which electrical circuits are provided for 20 connection with the electro-magnet and thermostat switch included in the present invention.

The admission of air to the passage 40 is controlled by valve 80 mounted on shaft 81 25 provided with handle 82.

The bushing 46 is adjustable with respect to the body 24 in order to provide an initial adjustment of the fuel mixture proportions. The rich mixture could be made richer in 30 cold weather than during warmer weather, therefore the bushing 46 can be screwed out of the body 24 causing the valve 45 to be retracted from the nozzle 44. This adjustment will provide a running mixture which 35 is also more rich in cold weather than in warm, and this is desirable since it is more difficult to vaporize engine fuels in cold weather than in warm.

It is advantageous to control the magnet 40 50 in correspondence with the heat of the engine because the warming up period is longer in cold weather than in warm and consequently the duration of the initially rich mixture should be longer. In the 45 present invention the greater the time to warm up the engine the greater will be the duration of the delivery of the rich starting mixture.

While the form of mechanism herein 50 shown and described constitutes a preferred embodiment of one form of the invention, it is to be understood that other forms might be adopted and various changes and alterations made in the shape, size, and proportion of the elements therein without departing 55 from the spirit and scope of the invention.

What is claimed is as follows:

60 1. In a fuel control system for internal-combustion engines, the combination with means for controlling the fuel mixture proportions; of an electromagnet for actuating said means; a current source; a circuit in which said electromagnet and current source 65 are included; and means for breaking said

circuit after the engine has started, and has become heated to a pre-determined degree.

2. In a fuel control system for internal-combustion engines, the combination with 70 means for controlling the fuel mixture proportions; of an electromagnet for actuating said means; a current source; a circuit in which said electromagnet and current source are included; and temperature responsive 75 means for breaking said circuit upon a rise in engine temperature.

3. In a fuel control system for internal-combustion engines, the combination with 80 means for controlling the fuel mixture proportions, including a nozzle and a needle valve; of an electromagnet for actuating said valve; a current source; a circuit in which said electromagnet and current source 85 are included; and means for breaking said circuit after the engine has started, and has become heated to a pre-determined degree.

4. In a fuel control system for internal-combustion engines, the combination with 90 means for controlling the fuel mixture proportions, including a nozzle and a needle valve; of an electromagnet for actuating said valve; a current source; a circuit in which said electro-magnet and current source are 95 included; and a thermostat switch located adjacent the cylinder head for breaking said circuit after the engine has started and has become heated to a pre-determined degree.

5. In a device of the class described and 100 in combination with a carburetor having a nozzle arranged to supply liquid fuel to an air passage, a valve for controlling the flow of liquid fuel through said nozzle, and which valve is initially open to thereby permit a copious supply of liquid fuel to said 105 passage; means including an electro-magnet for operating said valve to restrict the flow of liquid fuel through the nozzle and into the passage aforesaid; a circuit in which 110 said electromagnet is included; and a thermostat exposed to engine temperature for controlling said circuit.

6. In a device of the class described and 115 in combination with a carburetor having a nozzle arranged to supply liquid fuel to an air passage, a valve for controlling the flow of liquid fuel through said nozzle, and which valve is initially open to thereby permit a copious supply of liquid fuel to said 120 passage; an electro-magnet having an armature which is operatively connected with said valve; a normally closed circuit wherein said electro-magnet is included; and a thermostat exposed to engine temperature 125 for breaking said circuit upon a rise of engine temperature.

7. In a device of the class described and 130 in combination with a carburetor having a nozzle arranged to supply liquid fuel to an air passage, a valve for controlling the flow

of liquid fuel through said nozzle, and which valve is initially open to thereby permit a copious supply of liquid fuel to said passage; an electro-magnet having an armature which is operatively connected with said valve to open the same; a spring acting upon said armature and tending to close said valve; a normally closed circuit wherein said electro-magnet is included; and a thermostat included in said circuit and exposed to engine temperature for breaking said circuit upon a rise of engine temperature.

8. In a fuel control system for internal-combustion engines, the combination with means including a movable member for controlling the fuel mixture proportions; of an electromagnet for controlling said member; of a circuit for controlling the electromagnet; and means for controlling said circuit after the engine has started, and has become heated to a predetermined degree.

9. In a fuel control system for internal-combustion engines, the combination with means including a movable member for controlling the fuel mixture proportions; of an electromagnet for controlling said member; of a circuit for controlling said electromagnet; and temperature responsive means for controlling said circuit upon a rise in engine temperature.

10. In a fuel control system for internal-combustion engines, the combination with means for controlling the fuel mixture proportions, including a nozzle and a needle valve; of an electromagnet for controlling said valve; of a circuit for controlling said valve; of a circuit for controlling the electromagnet; and means for controlling said circuit after the engine has started, and has become heated to a predetermined degree.

11. In a device of the class described and in combination with a carburetor having a nozzle arranged to supply liquid fuel to an air passage, a valve for controlling the flow of liquid fuel through said nozzle, and which valve is initially open to thereby permit a copious supply of liquid fuel to said passage; an electromagnet having an armature which is operatively connected with said valve; a circuit for controlling said electromagnet; and a thermostat exposed to engine temperature for controlling said circuit whereby the valve returns to closed position upon a rise of engine temperature.

In testimony whereof I hereto affix my signature.

JOSEPH C. FEDERLE.

Witnesses:

MILDRED PEASE,
LLOYD M. KEIGHLEY.