Nov. 17, 1953

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APPARATUS FOR REGULATING THE PASSAGE OF FUEL IN CARBURETOR MANIFOLDS

2,659,352

Filed July 15, 1950

3 Sheets-Sheet 1

FIG. 2

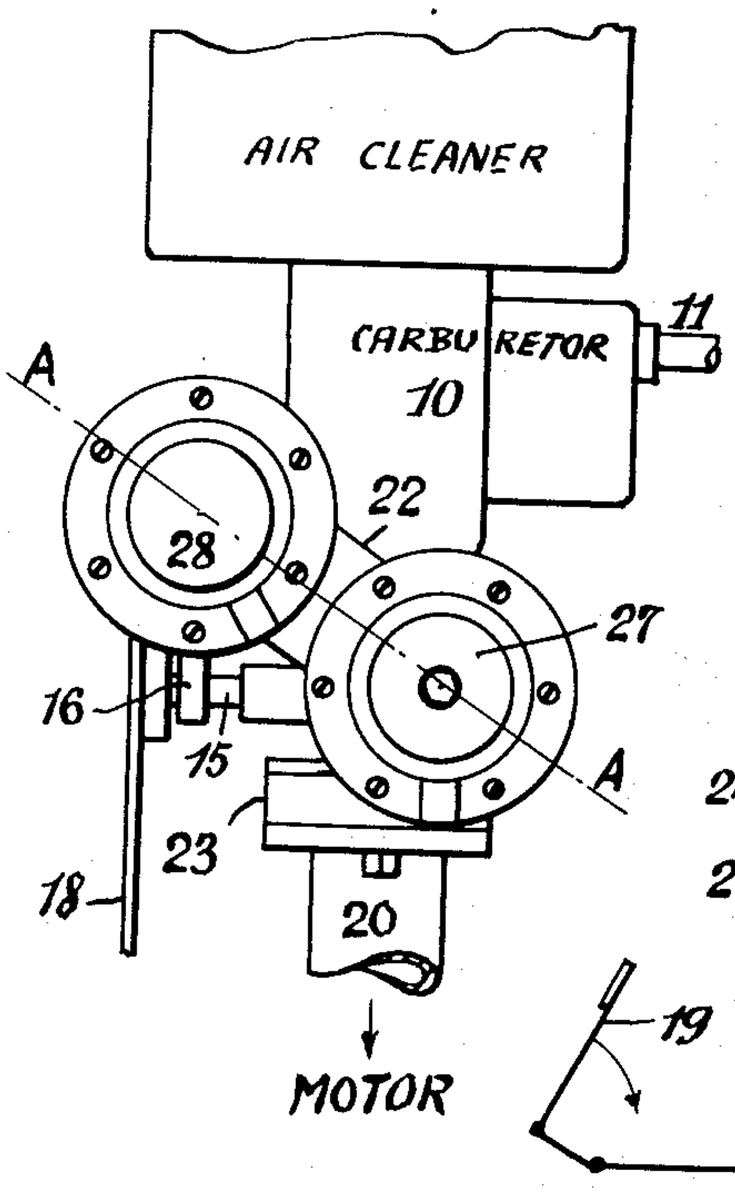
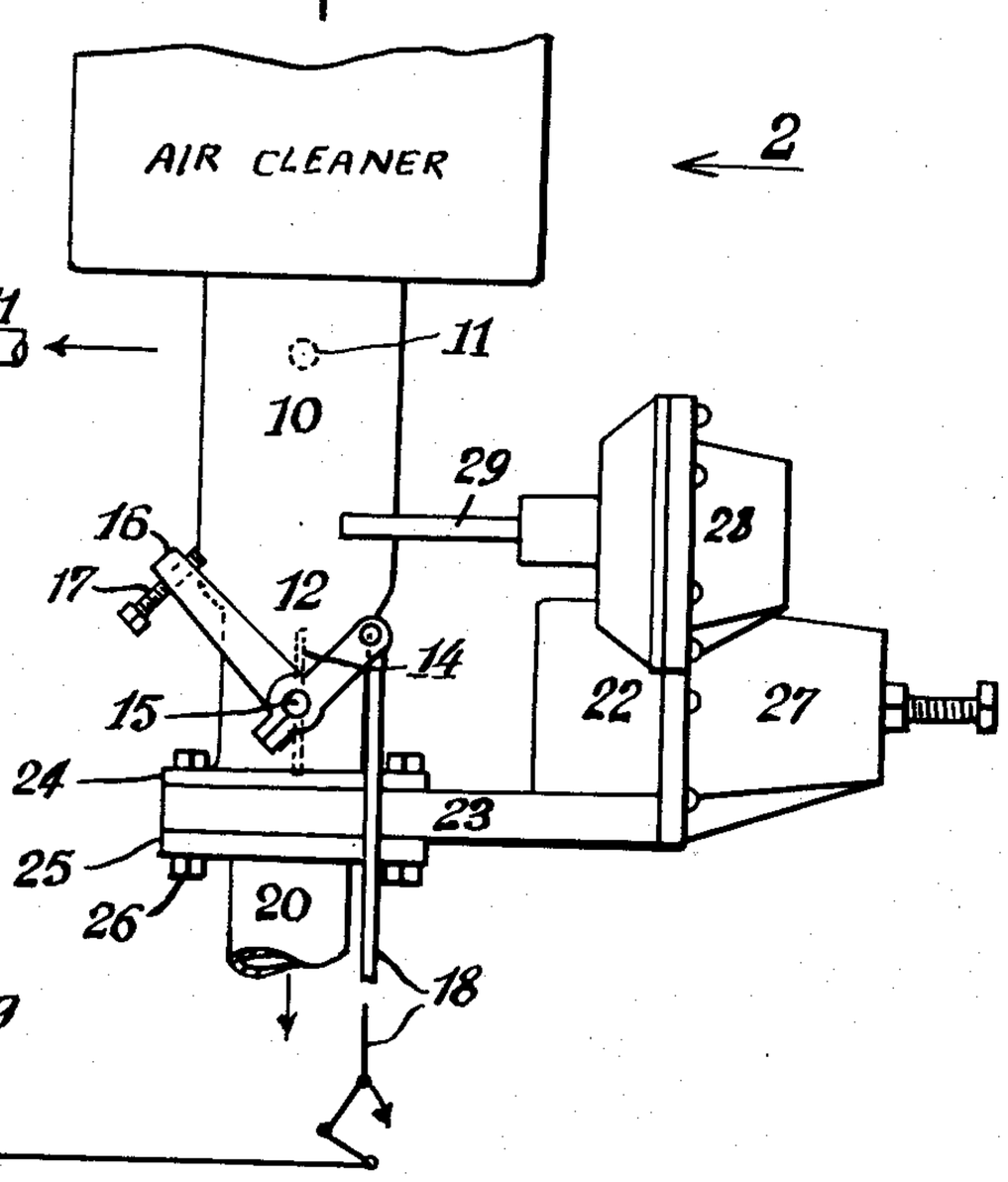


FIG. 1



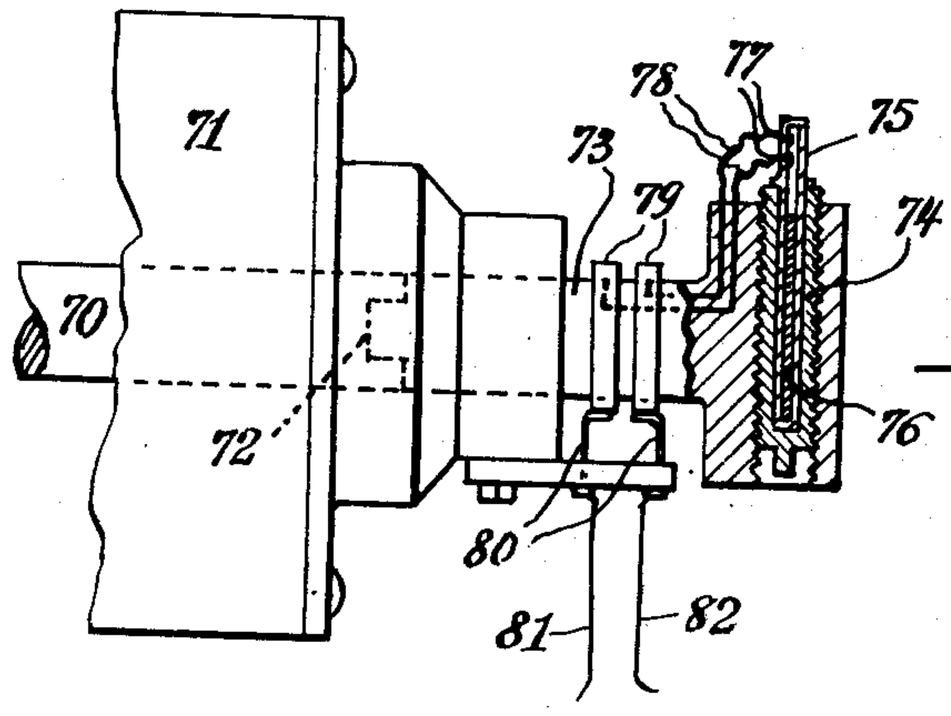


FIG. 9

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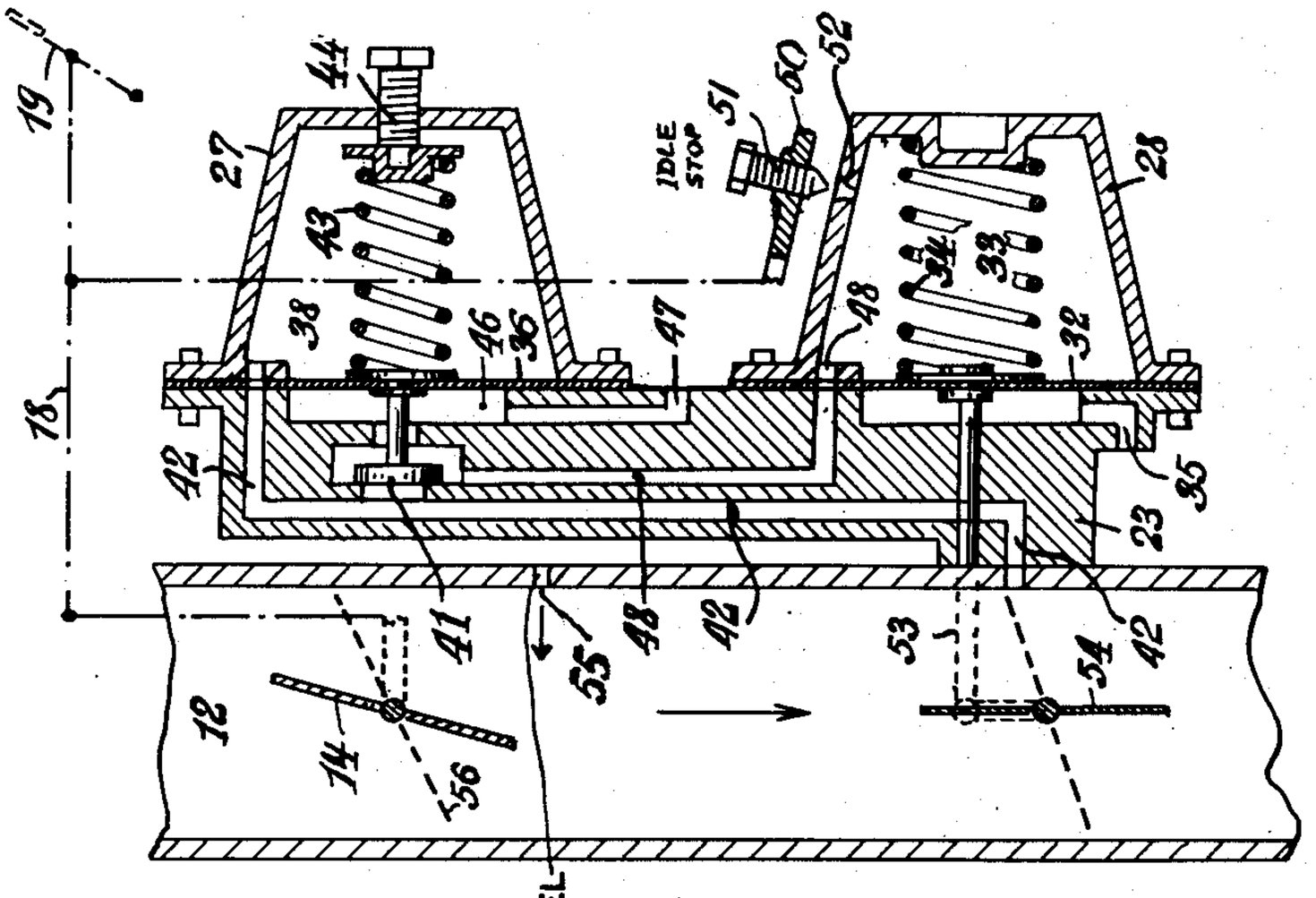

FIG. 4

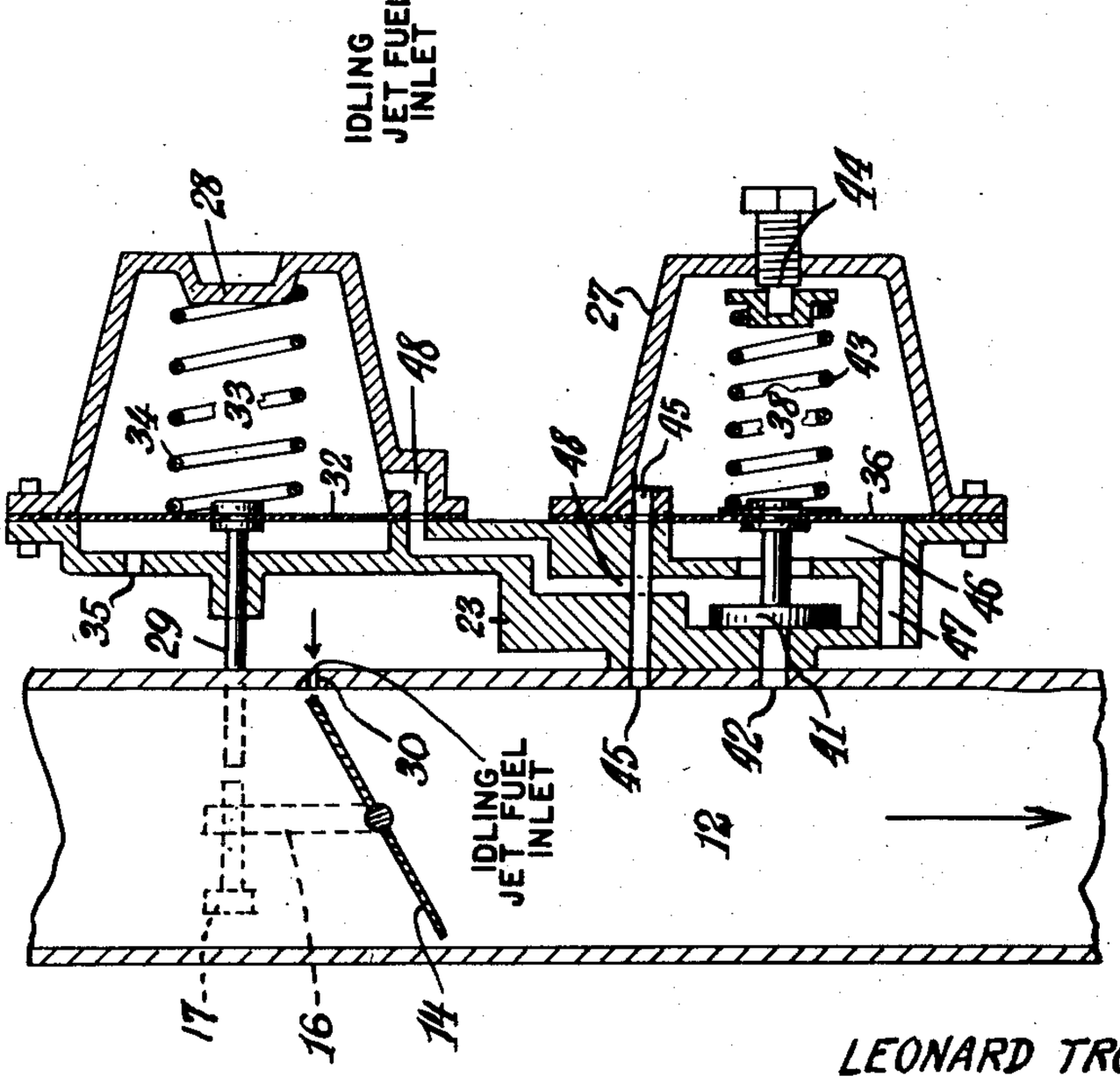

FIG. 3

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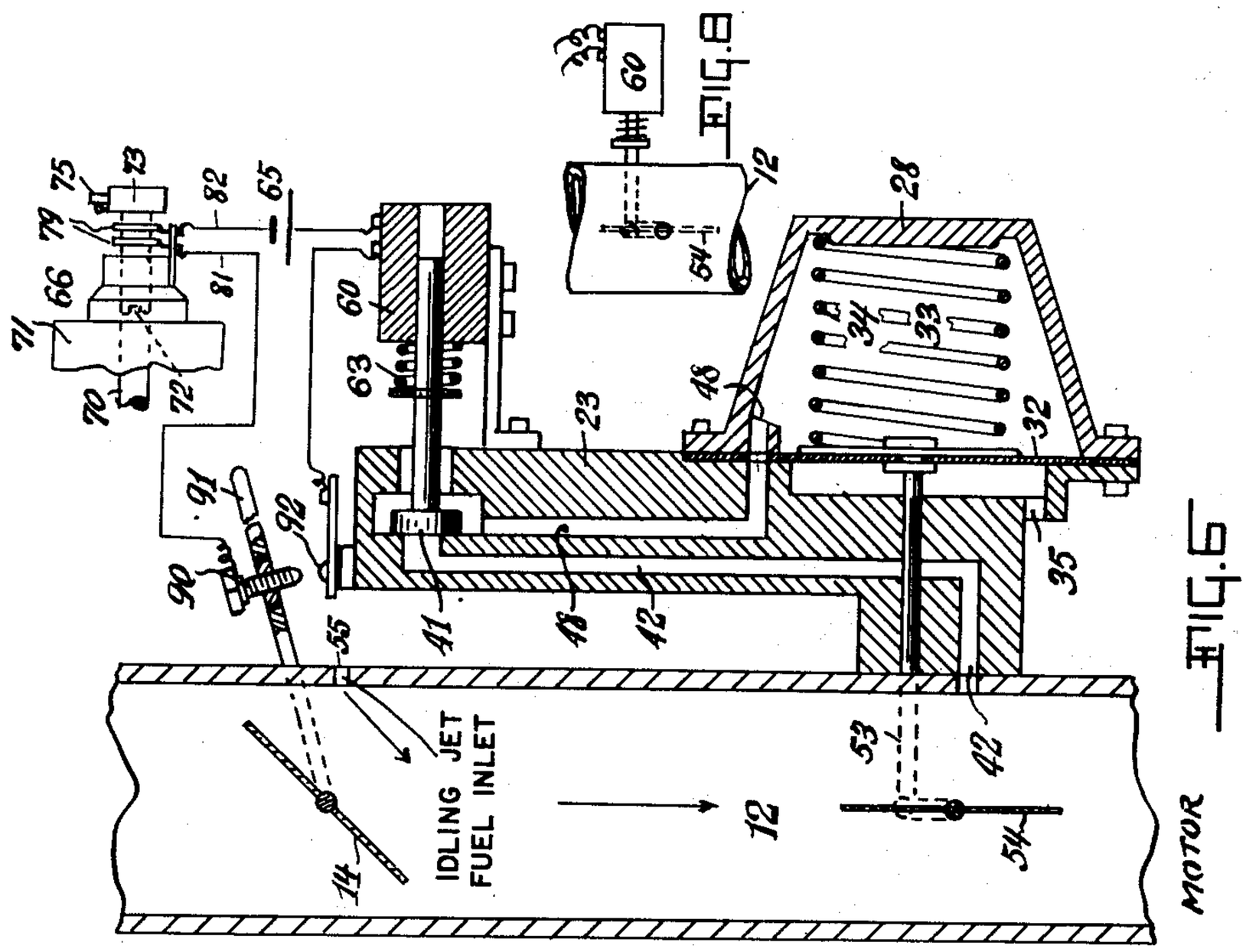

FIG. 5

FIG. 6

FIG. 7

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APPARATUS FOR REGULATING THE PASSAGE OF FUEL IN CARBURETOR MANIFOLDS

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7 Claims. (Cl. 123—102)

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This invention relates to a novel apparatus for controlling the operations of a throttle valve in the carburetor circuit for supplying fuel to a motor in a motor vehicle whereby to provide for more efficient operations resulting in fuel economy, reduction in oil dilution, elimination or reduction of gas fumes, back firing and the like.

The object of the invention is to provide apparatus for shutting off the fuel supply to the motor in a motor vehicle when fuel is not required to operate the motor while the vehicle is moving. This condition occurs when the momentum of the vehicle drives the motor or when the fuel controlling throttle valve in the carburetor manifold is closed by the operator because power from the motor is not required to move the vehicle, that is, when he takes his foot off the gas.

One object of the invention is to provide a fuel controller adapted to be installed between the carburetor and the motor without requiring any special tools or disarrangement of the existing installation. Another object is to provide a fuel controlling mechanism which shall be entirely automatic in operation. Still another object is to provide such a mechanism which shall function only when the motor is running at a speed sufficiently above stalling speed so that there is no possibility of the mechanism causing the motor to stall, particularly when the motor is declutched at low speed. Another object is to provide a fuel controlling mechanism which in no manner interferes with the normal known manual operation of the throttle valve in a carburetor.

The invention is embodied in apparatus designed for use with carburetors of known type and operation and includes modifications adapted to meet varying conditions and constructions of carburetors and throttle valve operations. In carrying out the objects of the invention, one form of embodiment utilizes the presence of an abnormally high vacuum in the carburetor manifold as an actuating force in operating the fuel control to shut off the supply of fuel to the motor. Another method, according to my invention, provides apparatus which operates in response to the minimum required speed of the motor which is slightly above idle speed. This form of the invention includes an electric circuit and circuit closing and opening means as will be explained hereafter.

Some carburetors are so constructed that when the operator takes his foot off the gas, the throttle valve does not close completely. Its closing movement is limited by an adjustable idle stop which leaves the throttle valve sufficiently open to permit a small quantity of fuel to pass to the motor. For this type of carburetor circuit my invention provides that the usual idle stop be removed and replaced by an idle stop which is operated to permit complete closure of the throttle valve, said idle stop being again operated to open the throttle valve enough to supply fuel to the motor to prevent it from stalling.

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Other carburetors include a throttle valve which is completely closed, but a small quantity of fuel is supplied to the motor from a so-called idle jet in the carburetor manifold located below the throttle valve. In this case my invention includes an auxiliary throttle valve which is operated to cut off the idle jet and thus completely shuts off the fuel supply to the motor. The auxiliary valve is thereafter operated to open the idle jet so that sufficient fuel may pass to the motor to prevent stalling.

Accordingly my invention is embodied in a fuel controlling apparatus for carburetor circuits and modifications thereof as hereinafter described and as illustrated in the accompanying drawings in which:

Fig. 1 is a side view in outline and with details omitted showing my fuel controlling device installed between a carburetor and the inlet manifold to a motor.

Fig. 2 is a view looking in the direction of the arrow 2 in Fig. 1.

Figs. 3, 4, 5 and 6 are views illustrating the constructions and operations of the several embodiments of my invention. These views are exploded diagrammatic views taken substantially on the line A—A of Fig. 2 and the embodiment shown in each figure will be set forth hereinafter.

Figs. 7 and 8 are views illustrating modifications of Figs. 5 and 6, respectively.

Fig. 9 is a sectional diagrammatic view, partly broken away, illustrating a speed control switch used in the electric circuit referred to above.

Fig. 1 shows in outline a carburetor 10 of any conventional type having a fuel inlet 11 and a carburetor manifold 12 with a throttle valve 14. The valve is mounted on a shaft 15 which in known manner is operated by the operator of a motor vehicle by a throttle lever 16 having an adjustable stop 17. A linkage 18 connects the lever 16 with the foot pedal 19. The fuel controlling mechanism embodying my invention is contained within a casing 22, Figs. 1 and 2, which arises from a base 23 adapted to fit between the flange 24 of the carburetor manifold 12 and flanges 25 of the motor intake manifold 20, the parts being so designed that the usual bolts 26 may be em-

ployed for mounting the apparatus. The casing or housing 22 forms two valve housings 27 and 28. The idle stop provided by the invention is shown at 29 and is so located that when the throttle lever 16 is moved to close the throttle valve, the stop 17 will hit the idle stop 29.

My fuel control device includes operating valves connected by passages to the carburetor manifold. The valves, passages and other parts are located within the housing 22 and in the walls thereof and are also bored in the main supporting base 23. In order to avoid complicated drawings, my invention is shown in exploded diagrammatic views in which the several passages, parts and operations may be easily traced and clearly understood.

Fig. 3 shows the carburetor manifold 12 with throttle valve 14 and throttle lever 16 and these parts are repeated in all the views. The inlet idle jet of the carburetor is shown at 30. The idle stop 29 is carried by a diaphragm 32 stretched across a valve chamber 33 in the housing 28 and is held in normal position by a spring 34. The other side of the diaphragm is subject to air pressure through an air inlet 35. Another diaphragm 36 is stretched across a valve chamber 38 within the other valve housing 27. The diaphragm 36 carries a valve 41 which normally closes a passage 42 leading to the manifold 12. The valve is held closed by a spring 43 adjustable by means 44. The valve chamber 38 connects with the manifold by a passage 45. On the other side of the diaphragm 36 there is an air chamber 46 with air inlet 47. A passage 48 connects the valve chamber 33 with the air chamber 46.

If the motor is being operated under throttle closed conditions, for example, the motor is being used as a brake going down hill, the vacuum in the manifold 12 is being built up to an abnormally high value. Through the passage 45 vacuum will be established in the valve chamber 38 where, as a suction force, and due to the air pressure in chamber 46, the diaphragm 36 will be drawn inwardly and the valve 41 will open shutting off communication between chamber 46 and passage 48. Vacuum will also exist in the other valve chamber 33 through the passages 42 and 48. The diaphragm 32 will be moved inward and the idle stop 29 will be retracted thereby permitting the throttle valve 14 to close completely and the fuel supply to the motor will be cut off.

The motor now slows down to a predetermined speed, usually somewhat above idling speed and consequently the vacuum in the manifold 12 will drop. Then the spring 43 in the chamber 38 will move the diaphragm to close the valve 41. Atmospheric air will pass through passage 48 to the valve chamber 33. The pressure on both sides of the diaphragm 32 will be equalized and the spring 34 will move the diaphragm 32 to move the idle stop 29 forward against the throttle lever to open the throttle valve sufficiently to keep the motor running. The same result will be obtained if the operator opens the throttle.

Fig. 4 shows an embodiment of the invention in which the idle adjustment stop of the carburetor is in the form of an arm 50 which is also connected by the aforesaid linkage 18 (Fig. 1) to the gas foot pedal, the connections being indicated in Fig. 4. The idle stop 50 has an adjustable valve 51 adapted to close on a valve seat 52 which leads to the valve chamber 33. The diaphragm 32 carries a rod 53 connected

to an auxiliary valve 54 in the manifold 12. The carburetor idle jet is shown at 55. When the operator takes his foot off the gas, the throttle valve closes moving to the position 56 indicated in dotted lines and through the linkage 18 the valve 51 will also be closed. The idle fuel supply then passes to the motor from the idle jet 55. If the motor is running at a speed sufficiently high above idle or stalling speed, vacuum in the manifold 12 will rise to a point or value to cause the diaphragm 36 in valve chamber 38 to be drawn inward by the air pressure through air inlet 47 and the valve 41 will open. Vacuum as suction force will then pass from the manifold through the passages 42 and 48 to the other valve chamber 33 where air pressure through air inlet 35 will move diaphragm 32 to retract the rod 53 and the auxiliary valve 54 will be closed and the fuel supply to the motor will be cut off.

When thereafter the vacuum drops in the manifold and via the passages 42 and 48 also drops in the valve chambers 38 and 33, the spring 43 will close the valve 41 and the spring 34 will move the rod 53 outward and the auxiliary valve 54 will open. The operation of the device shown in Fig. 3 functions only if the motor is operated under throttle closed conditions, i. e. the valve 52 is closed. On the other hand, any manual operation of the throttle valve will open the valve 52 and the auxiliary valve will be released.

Fig. 5 illustrates a modification which functions like that shown in Fig. 3 except that the valve 41 is operated by a solenoid 60 which is energized by an outside source. When the motor is running at a predetermined speed, the solenoid is energized and retracts the valve stem 61 of the valve 41 thereby opening the passage 48 to the valve chamber 33 and the idle stop 29 will be retracted as explained under Fig. 3, the valve 41 also closing the outlet port 62 at the end of the passage 48. When thereafter the speed of the motor decreases the circuit to the solenoid is opened and the spring 63 closes the valve 41. Air then enters valve chamber 33 through the port 62 and passage 48 and the spring 34 in chamber 33 moves the diaphragm 32 outward so that the idle stop 29 will open the throttle valve 14.

Solenoid 60 is connected in series with a battery 65 and a liquid speed controller 66 as shown at the top of Fig. 6. The controller 66 is illustrated in Fig. 9 to which reference will now be made. The principle underlying the operation of the liquid speed controller 66 is that an electric circuit may be closed by the controller in response to a predetermined speed of a rotating element in the automotive system employed for operating a motor vehicle. The rotating element may be, for example, the generator shaft or the distributor shaft. In Fig. 9 the rotating element is a shaft 70 within a housing 71. The shaft is at 72 operatively connected to a support 73 having a radially adjustable plug 74 in which a thin tube 75 is mounted so that when the plug is screwed in or out of the support, the tube is radially adjusted but not rotated within the plug. The thin tube 75 is partially filled with mercury 76 or other conducting liquid. The balance of the tube is filled with a compressible gas, for example, hydrogen under a predetermined pressure. The tube carries two contacts 77 connected by wires 78 to connector rings 79 secured to the support 73 to rotate

therewith. The current is taken off from the rings 79 by stationary connectors 80 from which circuit wires 81, 82 may be connected into an electric circuit.

In operation, the rotation of the shaft 70 and the support 73 will, through centrifugal force, cause the mercury in the thin tube to be moved radially outward in the tube against the pressure of the gas until the mercury covers the contacts 77 and closes a circuit through the wires 81, 82 and to the solenoid 60 via the battery 65, Fig. 6. The solenoid is thus energized in response to a predetermined R. P. M. of the shaft 70 or other rotating element in the system. The inside diameter of the tube 75 is such that bypassing of the gas is impossible. However, tubes with larger inside diameters may be used mounted oppositely in pairs and wired in series so that gravity alone will not close the circuit. Such a modification is not illustrated. The liquid speed controller disclosed affords an extremely accurate speed control for the operations of another device or for operating an electric circuit in response to a predetermined speed of rotation.

Fig. 6 illustrates another embodiment of the invention which is a modification of that shown in Fig. 4. In Fig. 6 the valve 41 is operated by the solenoid 60 at a predetermined speed as explained above, which is slightly above idle speed. The electric circuit includes an adjustable contact 90 carried by an arm 91 connected by the linkage 18 aforesaid to the foot pedal 19. Another contact 92 is mounted on the housing 22 and connected in the circuit as shown. When the motor is running at throttle closed speed the contact arm 91 is moved down with the throttle valve and the circuit is closed. If now the speed of the rotating element 70 is that which has been predetermined upon for completely shutting off the fuel supply, the solenoid will be energized and the valve 41 opened. Communication will be established between the manifold 12 and the valve chamber 33 via passages 42 and 48. The valve rod 53 will be retracted and the auxiliary valve 54 will be closed. Fuel supply to the motor will then be completely shut off.

If now the speed of the element 70 falls below that necessary to close the solenoid circuit normal conditions will be restored in the system and the auxiliary valve will again be opened. Also, if the operator steps on the gas, the arm 91 will be moved away from the contact 92 and the circuit will be broken. Normal conditions will then be restored as explained under Fig. 4.

Fig. 7 shows a modification of Fig. 5 in that the idle stop 29 may be operated by a solenoid 60. Fig. 8 is a modfication of Fig. 6 in that here the auxiliary valve 54 may be solenoid operated. In view of the foregoing detailed description it is believed the modifications in Figs. 7 and 8 will be easily understood.

In Fig. 3 the valve 41 is operated in response to a variation in pressure in the carburetor manifold, i. e. a high vacuum value to retract the idle stop 29 to permit complete closure of the throttle valve. When the vacuum drops the valve 41 will be closed by spring pressure and other spring pressure will then move the idle stop forward to open the throttle valve. The same is true with respect to the device shown in Fig. 5 except that the valve 41 is here operated in response to a predetermined speed of the motor. In Fig. 4. the invention provides a different form of idle stop in the valve 51 connected to the gas foot pedal. The invention also provides an auxiliary

valve to take care of a different type of carburetor circuit. Here also the valve 41 is operated in response to the vacuum value in the manifold to effect the operation of the auxiliary valve to cut off the fuel supply. If the operator steps on the gas, the valve circuits are broken and normal operations may be resumed, or if the vacuum drops the valve 41 will close and the spring 34 will open the auxiliary valve. The same is true with respect to the modification shown in Fig. 6 except for the solenoid operation.

The liquid speed controller provides a very accurate apparatus for the operation of an electric circuit in response to a predetermined speed condition. Its use is not limited to the disclosure herein. It will also be understood that means other than those disclosed may be used for shutting off the fuel supply in accordance with the principles of operations herein set forth.

The springs for operating the valves are calibrated to respond to the pressures on the diaphragms and the forces necessary to operate the valves and other parts. The springs may all be adjustable to suit local conditions. The fuel controller provided by the invention is of a convenient size to be installed with known carburetors. Actual tests have shown that by its use a very considerable saving in fuel is obtained. This is of course an important factor in the operation of commercial motor vehicles.

The disclosed invention is not limited in its use or application to a carburetor controlled motor. It may be used with diesel engines, gas turbines and other forms of motors. Neither do I intend to limit myself to the exact details of the disclosure but claim all such modifications and embodiments as come within the principle of the invention and the scope of the appended claims.

I claim:

1. The combination with a carburetor manifold, a throttle valve therein, means for manually operating said valve to shut off the fuel supply passing through the manifold to a motor for operating the same, a movable idle stop, said idle stop normally opposing complete closure of said throttle valve, a device for retracting said idle stop to permit complete closure of said throttle valve and for thereafter moving said idle stop in the opposite direction to open said valve, and means for operating said device in response to a predetermined variation in air pressure in said manifold.

2. A device according to claim 1 including means for operating the device in response to a predetermined speed of the said motor.

3. A device according to claim 1 including electrically actuated means for operating said device in response to a predetermined speed of said motor.

4. In combination, a carburetor having a manifold for the passage of fuel to a motor, a throttle valve in said manifold to control the passage of the fuel therethrough, a device for controlling the operations of said throttle valve comprising a housing, a movable idle stop for controlling the operations of said throttle valve, means in the housing for supporting said idle stop in operative relation to said throttle valve, means for actuating said idle stop and valve means in said housing operable in response to a given air pressure in said manifold for operating the said idle stop actuating means.

5. In combination, a carburetor having a manifold for the passage of fuel from the carburetor

to a motor for operating the same, valve means in said manifold for regulating the passage of the fuel therethrough, a device for operating said valve means comprising an idle stop member, pressure responsive means for actuating said idle stop member to operate the said valve means, a valve mechanism in said device operable in response to a given air pressure in said manifold and pressure communicating passages between said valve mechanism and said pressure responsive means for varying the pressure therein in direct relation to the variations in pressure in the said manifold.

6. In combination, a carburetor having a manifold for the passage of fuel from the carburetor to a motor for operating the same, a throttle valve in said manifold, manual means for operating the throttle valve to regulate the passage of the fuel through said manifold, a device for permitting said throttle valve to close completely when not manually operated and when the said motor is running at a speed above normal idling speed, said device comprising a movable idle stop, means for normally supporting said idle stop in position to oppose the complete closing of the throttle valve, means for retracting said idle stop

from said opposing position to permit complete closure of said throttle valve and for moving said idle stop in the opposite direction to cause said throttle valve to open and a valve mechanism operatively connected with said manifold and operatively responsive to a given air pressure therein for actuating said idle stop retracting and moving means.

7. A device according to claim 6 including a solenoid in said valve mechanism for causing the operation of said idle stop retracting means in response to a predetermined speed of the said motor.

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