March 6, 1951 M. MALLORY 2,544,463

INTERNAL-COMBUSTION ENGINE SPEED CONTROL

Filed Sept. 3, 1949 2 Sheets-Sheet 1

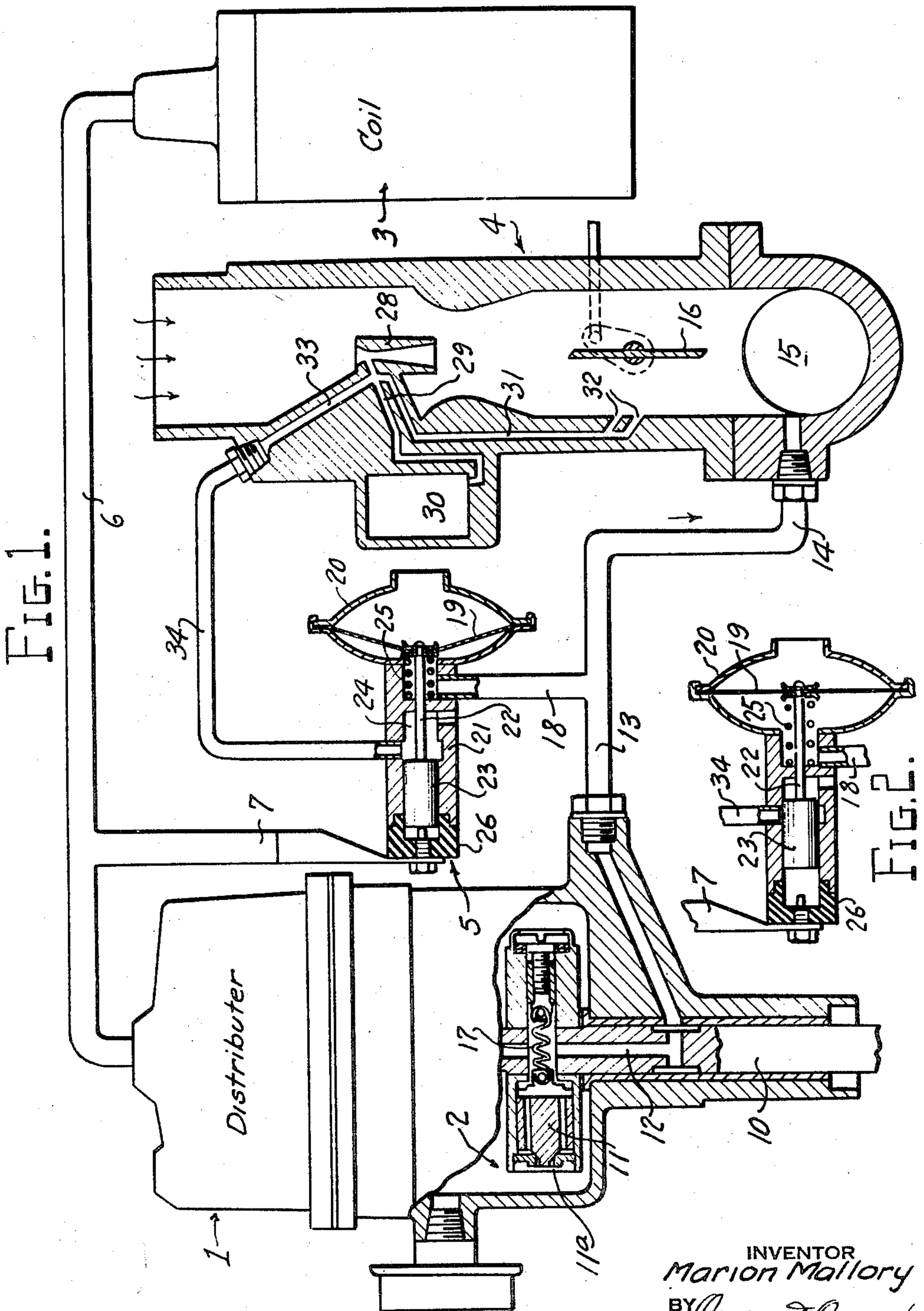

FIG. 1.

FIG. 2.

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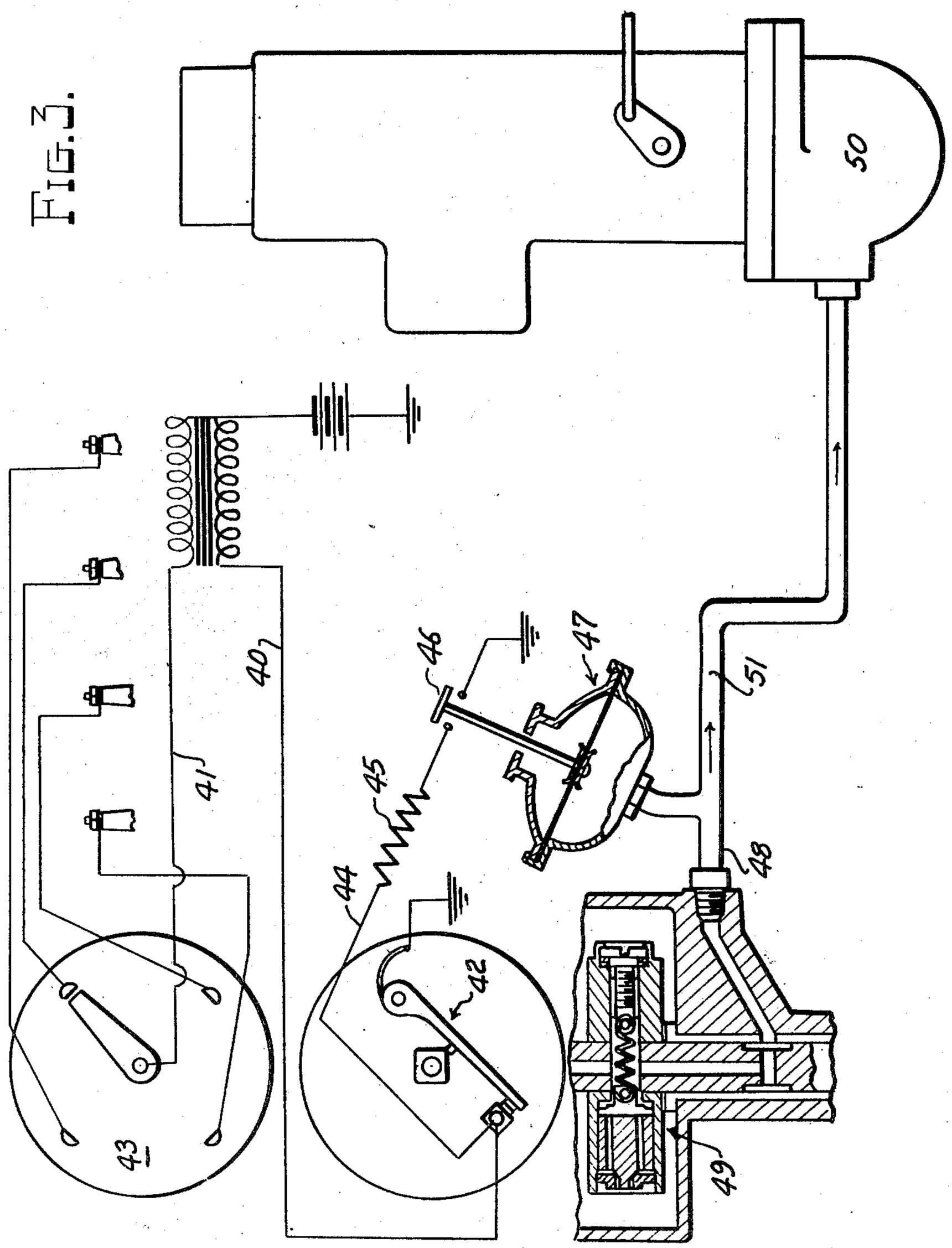
FIG. 2.



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INTERNAL-COMBUSTION ENGINE SPEED CONTROL

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13 Claims. (Cl. 123—117)

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This invention relates to means for stopping or slowing down the driving action of an internal combustion engine when a predetermined speed has been attained, and particularly to improvements in the control means disclosed in my prior applications Serial Nos. 776,113 and 776,114 filed September 25, 1947, which were issued June 6, 1949, as Patents 2,473,761 and 2,473,762, respectively.

In the use of the means of each of said applications, the supply of fuel to the carburetor is shut off when a predetermined engine speed has been attained and is again opened when the speed has been reduced a predetermined extent, the ignition, however, remaining on, and it is found in practice that upon shutting off the fuel the mixture will lean up slightly before the fuel is completely shut off and this frequently causes popping back through the carburetor and the liability of overheating of the valves.

The object of the present invention is to avoid said objectionable popping back by the provision of simple and efficient means that is automatically operable to stop the ignition of charges slightly in advance of a shutting off of the fuel when a predetermined speed has been attained, thus preventing ignition of any such lean mixtures as may remain in the cylinders or in the fuel supply manifold of the engine.

Other objects of the invention will be apparent from the following description and from the accompanying drawings illustrating one embodiment of the invention, in which—

Fig. 1 is a diagrammatical arrangement of an apparatus embodying the invention, with some parts in section, Fig. 2 is a sectional view of the valve means the same as in Fig. 1, with the parts in normal position, and Fig. 3 is a diagrammatic illustration of a modified embodiment of the invention.

In the drawing, 1 designates an ignition distributor of the type commonly used in connection with internal combustion engines, 2 a speed control governor, 3 the usual ignition coil associated with the distributor, 4 the fuel supply carburetor for the engine and which has its throat in suction communication with the governor, and 5 a grounding switch unit disposed in the secondary current supply circuit between the coil and the distributor and controlled by the governor action in accordance with the invention. The secondary member of the coil 3, as is customary in ignition systems, is in connection with the current distributing parts of the distributor through an insulated secondary cable 6, and this cable has a

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lead 7 for grounding and which, when grounding connection is made, is adapted to shunt the secondary sparking circuit from the distributor to the ground, thus shutting off the ignition.

The governor 2, in the present instance, is mounted on the distributor shaft 10 for rotation therewith within the distributor housing, and is of the type shown in my U. S. Letters Patents Nos. 2,415,510 and 2,415,511. This governor includes a normally open spinner valve 11 which, at predetermined low speeds of the shaft 10, permits air to pass from the interior of the distributor casing at atmospheric pressure through a passage 12 in the shaft and a tube 13 and branch 14 to the manifold or engine distributing end of the carburetor throat 15 preferably at the engine side of the throttle valve 16 in said throat. As the shaft speed increases a predetermined extent, the spinner valve 11 closes by centrifugal action against the tension of the spring 17, thus shutting off the relief air supply to the carburetor and permitting a suction pressure to build up in the lines 13 and 14 and in the connecting branch line 18 which has communication with the suction side of a diaphragm 19 mounted in a casing 20. The opposite side of the diaphragm is in communication with the atmosphere through an opening in the casing.

The casing 20 is mounted, in the present instance, on one end of a body 21 forming a part of the switch unit 5, and the diaphragm 19 is centrally attached to a rod 22 which projects from a piston 23 at the suction side of the diaphragm. The piston 23 is reciprocably movable in a cylinder 24 provided in said body 20, and is normally held at the right end of its stroke by a coiled expansion spring 25 to press the diaphragm toward the atmospheric side of its chamber, as shown in Fig. 2. The piston 23 forms the movable member of a grounding switch 26, the stationary side of which is fixed to the outer end of the body 21, and is in connection with the grounding cable 7. When the switch members are in contact, grounding occurs through the piston and the connected metal parts of the apparatus and the ignition is shut off or rendered inoperative.

The carburetor 4, in the present instance, is the same as shown in Fig. 1 of my U. S. application Serial No. 776,113, filed September 25, 1947, and operates in the same manner in connection with the governor. The carburetor has a fuel nozzle 28 disposed lengthwise and axially of its throat and is connected by a fuel passage 29 to a fuel bowl 30. A channel 31 extends from the passage 29 adjacent to its discharge orifice to

two idling jets 32 opening into the carburetor throat, one being at the outer side and one at the inner side of the throat valve 16 when in closed position. It is apparent that suction through the jets 32 and channel 31 will draw fuel from the bowl 30 through the passage 29.

For the purpose of automatically venting the fuel supply passage 29 to discontinue the fuel supply to the carburetor throat when a predetermined engine speed has been attained, a vent passage 33 opens into the fuel passage 29 near the discharge end and has communication with the atmosphere through a tube 34. This communication is through the control unit 5 and is closed by the piston 23 when the switch 26 is open and the diaphragm 19 with its connected parts are in normal running position, as shown in Fig. 2. In my said former application, the fuel vent is controlled directly by the centrifugal governor instead of indirectly by the unit 5, as in the present invention.

In the operation of the present control, assuming the associated engine is normally running at 2500 R. P. M., and it is desired to cut off the ignition and fuel when the engine has reached a speed of 2800 R. P. M., the tension of the governor spring 17 would be adjusted to hold the valve 11 open until the engine reached said latter speed. So long as the valve 11 is open it will air bleed the diaphragm chamber 20 at the suction side of the diaphragm, this occurring through the passages 18, 13, 12 and the valve-controlled orifice 11a, and the spring 25 will hold the piston 23 retracted with the grounding switch 26 open so that the secondary ignition current would go through the distributor to the spark plugs of the engine. At the same time the piston 23 would stand in a position to close the communication of the vent tube 34 with the atmosphere. As soon as the engine speed reached 2800, the governor valve 11 would close the vent port 11a and a vacuum would build up in the diaphragm chamber 20 from the fuel supply passage 15, thus moving the piston 23 to the left against the tension of the spring 25. This movement would open the fuel vent passage 33, 34 to the atmosphere and close the switch contacts 26 so as to ground the ignition current. In this manner, the fuel supply to the carburetor and the engine ignition are shut off practically simultaneously so that even should some lean fuel mixture be drawn into the cylinders it will not be ignited and no popping back through the carburetor will occur.

In the modification shown in Fig. 3, 40 and 41 designate the primary and secondary circuits, respectively, of the ignition system, the former leading from the positive side of the battery to the circuit breaker 42 and the latter leading to the ignition distributor 43. In addition to the usual grounding of the primary circuit through the breaker arm a parallel short circuiting ground 44 is provided around the breaker arm and in this is located a resistance 45 and at the grounding side thereof a normally open switch 46.

The movable member of the switch 46 is connected to the diaphragm or movable member of a suction device 47 so that when this device is normal the switch is open and when under suction action the switch is closed. The suction side of the device is in communication with the atmosphere through a vent line 48 controlled by a governor 49 the same as the vent line 13 in the form shown in Fig. 1, and also has communication with the suction manifold 50 of the associated engine through a tube 51.

With this arrangement it is apparent that so long as the engine is running below a predetermined speed for which the governor is set, suction in the line 51 is vented to the atmosphere through the governor and the sparking takes place in the usual manner. Upon a closing of the governor vent the suction in the line 51 acts on the suction device 47 to close the switch 46 and ground the primary circuit 40 through the auxiliary ground 44, thus rendering the ignition means inoperative.

The purpose of the resistance 45 is to prevent sparking and consequent back firing or damage to the engine occurring should the primary circuit be opened by the switch 46 in out-of-timed relation to an opening of the breaker contact. It is found that by using only a small amount of current in line 44, which is the case when a high resistance 45 is used, the switch 46 can operate either closed or open without causing a spark to occur.

I wish it understood that my invention is not limited to any specific construction, arrangement or form of the parts, as it is capable of numerous modifications and changes without departing from the spirit of the claims.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent, is:

1. In combination with an internal combustion engine having a suction passage, an ignition circuit for the engine, a ground for said circuit, a normally open switch in said ground, a suction device having connections with said switch and operable by suction action in said passage to close said switch, and means normally venting said suction device to render it inoperative to close the switch and being automatically operable at a predetermined engine speed to close the vent of said last means to render such suction device operable to close said switch.

2. The combination with the fuel suction passage of an internal combustion engine and an ignition circuit for the engine, of a ground for said circuit, a normally open switch in said ground, a suction device having connection with and operable by suction in said passage to close said switch, vent means for said suction device, and a centrifugal governor driven by the engine and operable at a predetermined speed to close said vent means to permit operation of the suction device to close said switch.

3. The combination with the fuel suction passage of an internal combustion engine, and an ignition circuit for the engine, of means operable to render said circuit inoperable, a suction device having connection with said passage and operable by suction therein to move said means to render said circuit inoperable, and means venting said suction device and operable at a predetermined speed of the engine to stop the venting so as to render the suction device operative to move said first means to render said circuit inoperative.

4. The combination with the fuel suction passage of an internal combustion engine, and an ignition circuit for the engine, of a control for said circuit including a normally open switch which when open renders the circuit operative, a suction device connected to said passage and including a movable member operated by suction action thereon to close said switch to render the circuit inoperative, and means normally venting

said suction device to render it inoperative and operable at a predetermined engine speed to stop said venting and render the suction device operable to close said switch.

5. The combination with the fuel suction passage and the ignition circuit of an internal combustion engine, of a switch in said circuit having a movable member normally standing in position to render the circuit operative, a suction device connected to said movable switch member and having connection with said passage and operable by suction action therein to move said switch member to a position to render said circuit inoperative, and means normally venting said suction device to render it inoperative and being responsive to a predetermined engine speed to stop said venting and render the suction means operative.

6. In combination with an internal combustion engine having a fuel suction passage, an ignition distributor and an ignition circuit for the distributor, of a control switch in said circuit, means normally holding the switch in a position to render the circuit operative, suction means operable by suction in said passage to act on the switch to render the circuit inoperative, and means normally venting said suction means and operable to close the vent and render said suction means operable when the engine has acquired a predetermined speed and then to vent the suction means when the speed has been reduced.

7. In an internal combustion engine having a carburetor, an ignition distributor and an electric operating circuit for the distributor, means forming a vent for the fuel feed line to the carburetor nozzle, a suction device in connection with the suction end of the carburetor, means actuated by the suction device to open said vent means and to render said ignition circuit inoperative, and means venting said suction device to render it inactive and being operable at a predetermined speed of the engine to close the venting of said last means and render the suction device active.

8. An internal combustion engine having a carburetor, an ignition distributor and an electric operating circuit for the distributor, together with means for venting the fuel suction passage to the carburetor nozzle, an electric switch in association with said circuit, suction means normally operable to close said vent and to move the switch to render said circuit operative and operable by suction generated by the engine to close said switch and open said vent, and means for venting said suction device to render it inoperative and being operable at a predetermined engine speed to stop the venting of the suction device and to render it operative.

9. In an internal combustion engine having a carburetor with a suction fuel feed and an ignition circuit, a ground for said circuit, a normally open switch in said ground, a vent for relieving the fuel suction feed to the carburetor nozzle, a valve for closing said vent, a suction device in connection with the suction side of the carburetor and operable by suction action to move said valve to open said vent and to close said switch, and means venting said suction device to render it inactive and automatically

operable at a predetermined speed of the engine to stop the venting and render the suction device operable.

10. In an internal combustion engine having a carburetor with a suction fuel feed, an ignition distributor and a secondary electric circuit for said distributor, a ground for said circuit, a normally open switch in said ground, a vent means for relieving the fuel feed suction in the carburetor, a valve normally closing said vent and having connection with the movable member of said switch, a suction device connected to said valve and switch member and operable by suction from the engine side of the carburetor to open said valve and to actuate the switch to close said ground, and means forming a vent for said suction device to render it inoperative and being operable at a predetermined engine speed to close the suction device vent and permit its operation.

11. The combination with the fuel suction passage of an internal combustion engine and an ignition circuit for the engine, of a ground for the secondary of said circuit, a normally open switch in said ground, a suction device having connection with and operable by suction in said passage to open said switch, vent means for said suction device, and a centrifugal governor driven by the engine and operable at a predetermined speed to close said vent means to permit compression of the suction device to close said switch.

12. The combination with the fuel suction passage of an internal combustion engine and an ignition circuit for the engine, of a short circuiting ground in the primary of said circuit, a normally open switch in said ground, a suction device having connection with and operable by suction in said passage to close said switch, vent means for said suction device, and a centrifugal governor driven by the engine and operable at a predetermined speed to close said vent means to permit compression of the suction device to close said switch.

13. An internal combustion engine having a suction fuel feed manifold, an ignition distributor, an electric operating circuit therefor, and a circuit breaker in the primary of said circuit together with a suction device having operative connection with said manifold, means venting said suction device and operable at a predetermined engine speed to stop said venting and render the device operative, a short circuiting ground in the primary of said ignition circuit around the circuit breaker, a resistance in said ground, and a normally open switch in said ground circuit at the ground side of said resistance and operable by said suction device to close said ground when venting of said device has stopped.

MARION MALLORY.

REFERENCES CITED

The following references are of record in the file of this patent:

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