April 6, 1937. C. A. CHRISTENSEN 2,075,790

DEGASSER FOR INTERNAL COMBUSTION MOTORS

Filed Jan. 27, 1931 3 Sheets-Sheet 1

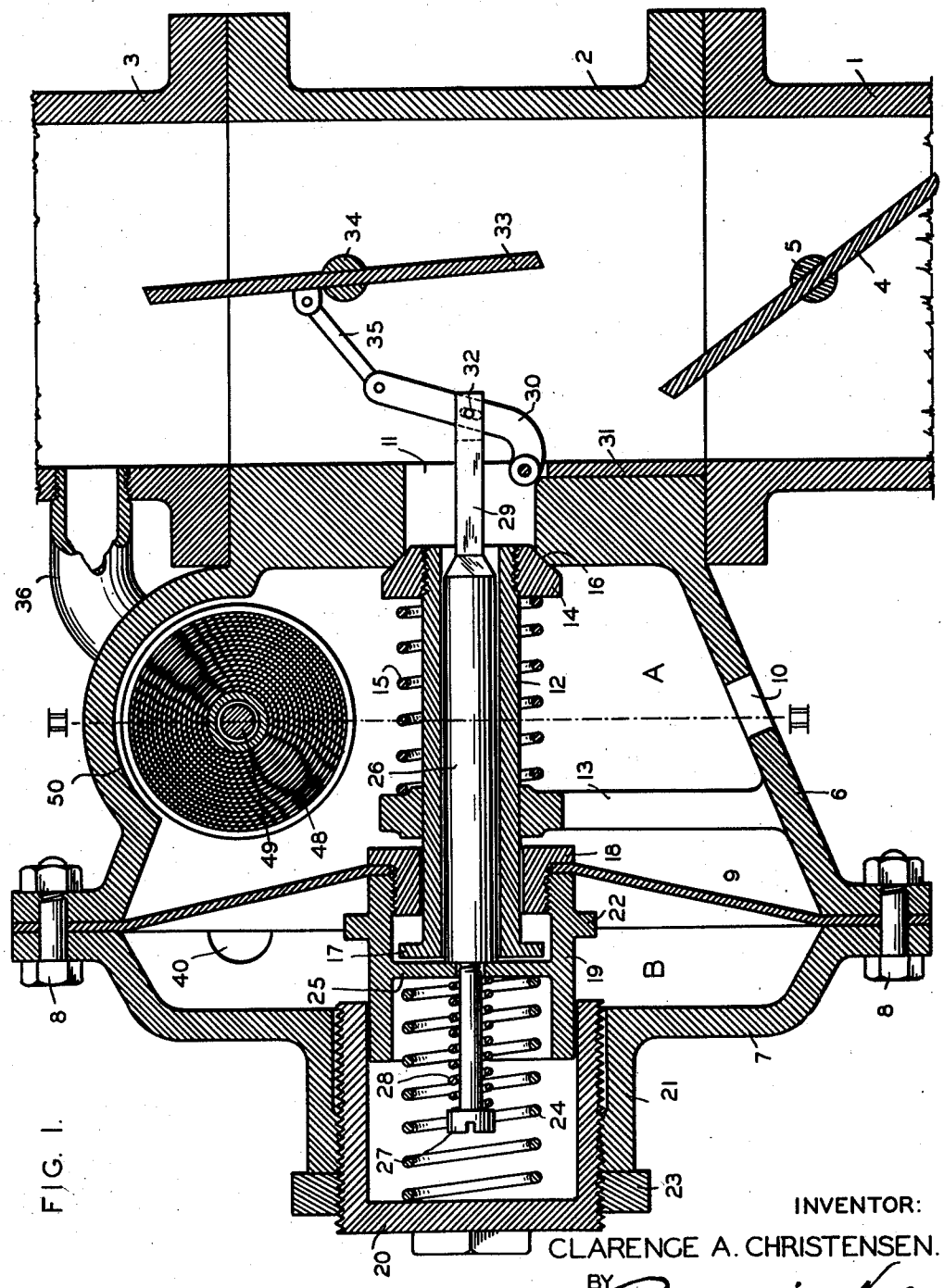



FIG. 1.

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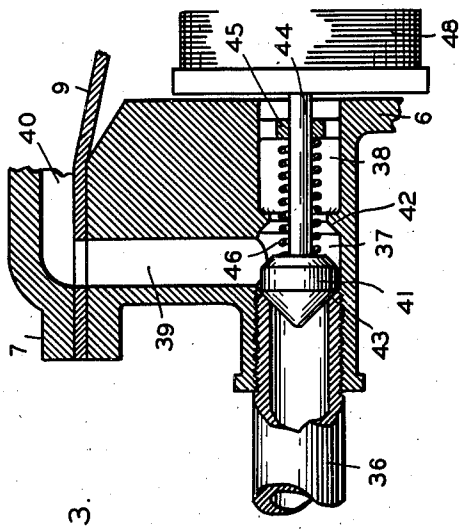



FIG. 3.

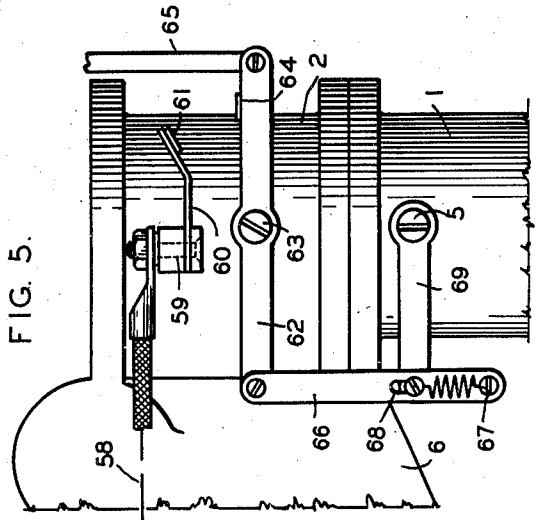



FIG. 5.

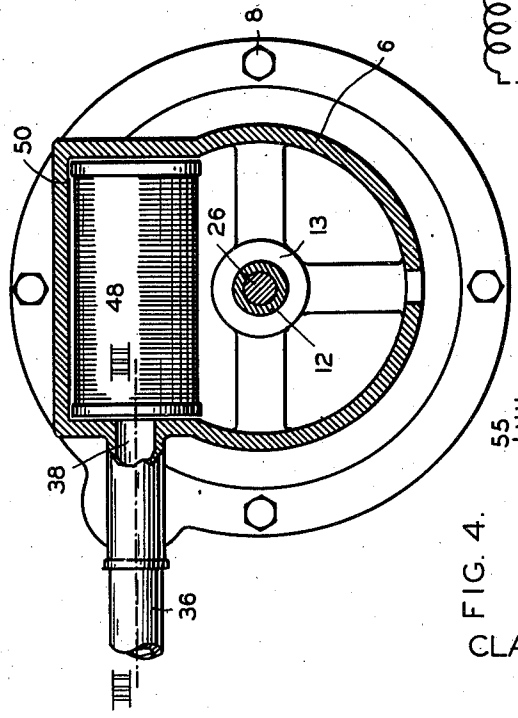



FIG. 2.

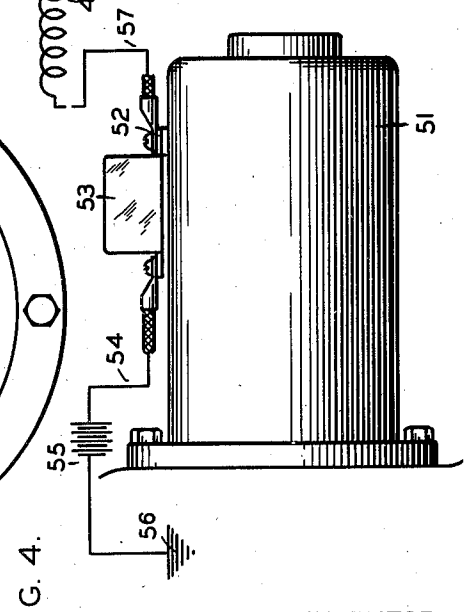



FIG. 4.

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DEGASSER FOR INTERNAL COMBUSTION MOTORS

Filed Jan. 27, 1931 3 Sheets-Sheet 3

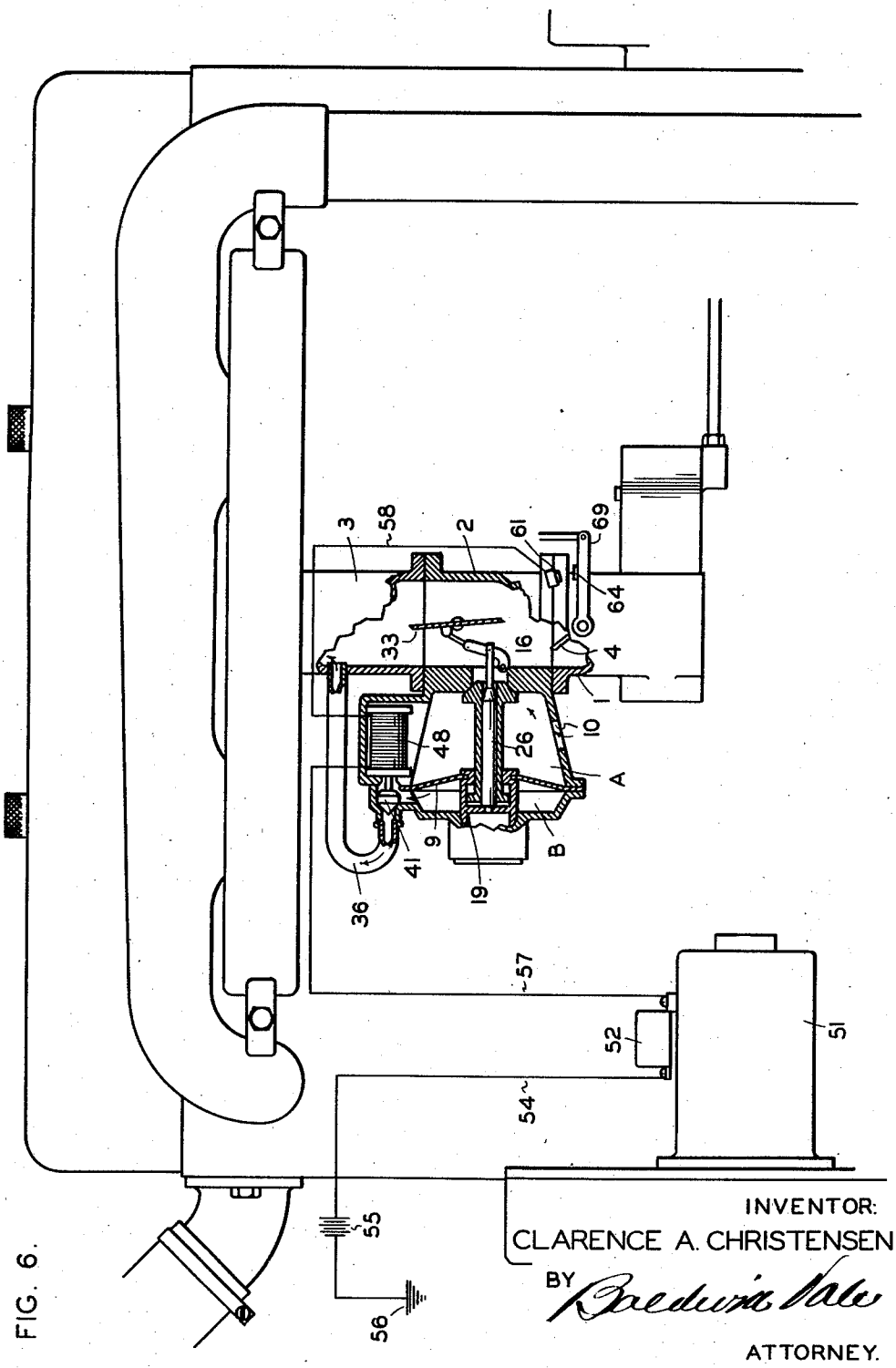



FIG. 6.

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Patented Apr. 6, 1937

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# UNITED STATES PATENT OFFICE

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## DEGASSER FOR INTERNAL COMBUSTION MOTORS

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Application January 27, 1931, Serial No. 511,512

13 Claims. (Cl. 123—97)

This invention relates to improvements to degassers for internal combustion motors.

The principal object of the invention is to prevent the discharge of noxious fumes from the internal combustion motors of automobiles, when coasting.

Another object is to prevent the intake of combustible fuel gases into the motor while the vehicle is being decelerated or coasting and driving the motor.

It is the general practice in driving automobiles, to utilize the motor suction as a retarding force, in descending hills. This is accomplished by closing the throttle without declutching the motor. The motor is then driven by the momentum of the vehicle.

Modern carbureters are effective on very low suction and will continue to function, by aspiration, if atmosphere is bypassed into the intake manifold between the carbureter and the motor cylinders. While such a diluted lean mixture will not burn regularly it is highly explosive when ignited, and produces carbon monoxide and other noxious gases, in excess of the volume produced in the regular operation of the motor under full combustion.

Broadly stated, the present invention consists of adding an auxiliary throttle valve above the regular carbureter throttle valve with means for automatically admitting atmosphere through a bypass intermediate the said upper and lower throttle valves, for the purpose of diverting the suction from the carbureter.

In this specification and the accompanying drawings the invention is disclosed in its preferred form. But it is to be understood that it is not limited to this form because it may be embodied in other forms. It is also to be understood that in and by the claims following the description, it is desired to cover the invention in whatsoever form it may be embodied.

In the three sheets of drawings:

Fig. 1 is a vertical section through a degassing mechanism constructed and applied in accordance with this invention.

Fig. 2 is a fragmentary detail in reduced size of the operating solenoid assembly, partly in cross section on the line II—II, Fig. 1.

Fig. 3 is a similar view of the bypass valve mechanism taken on the line III—III, Fig. 2.

Figs. 4–5 read together are a diagrammtic elevation of the intake tube, showing the throttle control mechanism and electric circuit for energizing the solenoid for actuating the bypass valve.

Fig. 6 is a schematic diagram of the degasser assembly illustrating its mode of operation, the planes of some of the parts having been rearranged for clarity.

In detail the construction illustrated in the drawings comprises the intake tube 1 connected with a conventional carbureter (not shown). The degasser mechanism has the tubular section 2 interposed between the intake tube 1 and the neck 3 of the manifold communicating with the cylinders of the motor.

During the operation of the motor the explosive mixture of gasoline and air is drawn from the carbureter through the intake 1—2—3 by the suction produced by the reciprocation of the pistons within the cylinders. The volume of fuel mixture consumed by the engine, and the consequent speed thereof are regulated by the butterfly valve 4 pivoted at 5.

The housing 6 is integral with the section 2 of the intake and flares outwardly therefrom. The open end of the housing 6 is closed by the cover plate 7 bolted thereto at 8—8. The diaphragm 9 has its margins confined between the abutting flanges of the housing 6 and the plate 7 and partitions the chamber formed by the housing and its cover 7 into the atmospheric and suction compartments A and B, respectively.

The atmospheric pressure within the chamber A in the housing 6 is maintained by the inlet opening 10 in the lower portion of the housing. The bypass 11 communicates between the chamber A and the interior of the section 2 of the intake.

The tubular stem 12 is slidably mounted in the spider 13 and has the valve 14 threaded on the end thereof. The spring 15 expands between the valve 14 and the spider 13 and closes the bypass 11 by seating the valve 14 at 16.

The annular bushing 18 is slidable on the tube 12 and is adapted to engage the collar 17 formed on the end thereof. This bushing is screwed into the end of the sleeve 19 and attaches the center of the diaphragm thereto.

The rear end of the sleeve 19 telescopes within the guide cup 20 threaded in the hollow boss 21 of the plate 7. The extent of the movement of the sleeve and the diaphragm is limited by the annular shoulder 22 on the sleeve contacting the cup 20. The movement may thus be regulated by screwing the cup 20 in or out. The jam nut 23 locks the cup in adjusted position.

The spring 24 expands between the end of the cup 20 and the wall 25 within the sleeve 19 and serves to maintain the sleeve and diaphragm in extended position, as is shown in Fig. 1.

The rod 26 is slidable within the tube 12 and

is resiliently attached to the wall 25 by the screw 27 threaded in the rod 26 and the encircling spring 28 expanding between the head of the screw and the wall 25. The end of the rod 26 is flattened as at 29 and extends through the bypass 11. The lever 30 is fulcrumed on the hinge 31 gained into the section 2 of the intake and is connected to the yoke end of the rod 26 at 32, by a pin and slot connection.

The auxiliary butterfly valve 33 is cross pivoted at 34 in the section 2 of the intake. The link 35 operatively connects the butterfly valve 33 to the lever 35.

The operation of the motor creates a suction in the intake manifold 3. This is utilized to operate the diaphragm 9. The tube 36 is connected to a hole drilled and tapped in the manifold 3 and communicates with a three-way solenoid valve, see Fig. 3.

This valve comprises the chamber 37 at the end of the tube 36. The passage 38 communicates with the chamber 37 and opens into the chamber A which is maintained at atmospheric pressure. The passage 39 is disposed at right angles to the passage 38, and communicates between the chamber 37 and the bypass 40 opening into the chamber B.

The valve head 41 registers with the seat 42 in the passage 38 and the seat 43 formed on the end of the tube 36. The stem 44 carries the head 41 and is guided in the spider 45. The spring 46 encircles the stem 44 and expands between the head 41 and the spider 45, seating the valve at 43. This closes the end of the tube 36.

The housing 6 is recessed as at 50 to accommodate the solenoid 48. The soft iron end 49 of the stem 44 extends into the solenoid and forms the movable core thereof.

The solenoid is adapted to be energized by the conventional generator 51 which is bolted to the timing case of the motor and is driven in the usual manner. The negative pole of the generator is grounded on the engine block, and the positive pole is connected at 52 to the cutout 53. The wire 54 connects the cutout to the battery 55, the negative pole of which is grounded at 56.

When the engine is operating at ordinary speed, the current generated at 51 flows through the cutout 53 to the battery 55 and through the ground 56 back to the grounded pole of the generator. The cutout 53 functions principally as an underload circuit breaker, opening the circuit when the generator does not produce sufficient current to resist the counterbalancing flow from the battery 55. This prevents leakage of the current from the battery through the generator when the motor is idling or dead.

The wire 57 connects one end of the solenoid 48 to the terminal 52 between the generator and the cutout. The other end of the solenoid coil 48 is connected through the wire 58, to the dielectric base 59 on the exterior of the intake 2. The blade 60 is mounted on the base 59 and carries the contact 61.

The lever 62 is fulcrumed at 63 on the intake and has mounted thereon the contactor 64 opposite the contactor 61. The rod 65 is connected to one end of the lever 62 and is operable at the will of the driver.

The lever 69 is fixed on the pivot 5 to operate the intake throttle valve 4. The link 66 is connected to the end of the lever 62 opposite the rod 65. The spring 67 in cooperation with the slot 68 resiliently connects the link 66 to the lever 69.

When the throttle is manipulated by the driver, the rod 65 is moved longitudinally, swinging the lever 62 and adjusting the position of the valve lever 69 and the butterfly valve 4 in the intake. This increases or diminishes the amount of fuel admitted to the motor and its consequent speed, as desired. Complete closing of the throttle inclines the lever 62 to bring the contacts 64 and 61 together, grounding the circuit of the solenoid 48.

In the case of an abrupt closing of the throttle, the resilient connection 67—68 produces a lag in the closing of the butterfly valve 4. This allows the contacts 64—61 to be brought together slightly in advance of the closing of the throttle valve 4 to insure the prompt operation of the degasser mechanism as will be presently more fully described.

The device operates substantially as follows:

When the butterfly valve 4 is closed to effect deceleration of the motor, the suction maintained in the intake 3 continues to draw fuel from the carbureter beyond the closed butterfly valve 4. This fuel passes through the motor without being fully consumed and is discharged from the exhaust, causing an objectionable odor.

Closing of the throttle 4 brings the contacts 64—61 together, closing the circuit of the solenoid. Current then flows from the generator 50 to the solenoid 48 and thence through the ground 61—64—63 back to the grounded pole of the generator.

When the solenoid is thus energized, the core 49 on the end of the stem 44 is drawn into the solenoid. This withdraws the valve head 41 from the end of the tube 36 and seats it at 42, closing the passage 38.

The air impounded in the diaphragm chamber B is drawn through the passage 40, the passage 39, and the tube 36 to the intake manifold 3 by the motor suction in the manifold.

The diaphragm 9 is then forced into the evacuated chamber B by the atmospheric pressure maintained in the chamber A. This retracts the sleeve 19 into the cup 20 until stopped by the shoulder 22.

The rod 26 is also drawn backward by reason of its connection with the sleeve 19. This swings the lever 30 toward the bypass 11, closing the auxiliary butterfly valve 33. After the valve 33 is closed, the compression of the spring 28 encircling the screw 27, permits the sleeve 19 to continue its backward movement.

The annular bushing 18 has a short idle movement before contacting the collar 17. As the movement of the sleeve 19 progresses, the bushing 18 draws the tube 12 backward, unseating the valve 14 and opening the bypass 11.

Atmosphere is thus admitted through the opening 10 and the bypass 11 into the intake between the two closed butterfly valves 4 and 33. This stops the suction acting below the closed throttle valve 4 and prevents aspiration through the carbureter.

Due to the idle movement of the bushing 18 before contacting the collar 17, the butterfly 33 closes before the valve 14 is opened. This prevents the motor from drawing an excessive volume of air through the bypass 11 when the valve 14 opens.

When the motor is again accelerated, the contact 61—64 is broken. This opens the circuit of the solenoid 48. The valve 41 is returned to its seat 43 in the end of the tube 36 by the expansion of the spring 46. This closes the communi-

cation between the chamber B and the intake manifold 3.

Atmosphere then passes from the chamber A through the passages 38 and 39 to the chamber B. Atmospheric pressure is then restored on both sides of the diaphragm 9 and permits the spring 24 to restore the sleeve 19 to inoperative position.

The restoration of the sleeve 19 releases the bushing 18 from the collar 17, permitting the spring 15 to reseat the valve 14 at 16, closing the bypass 11.

As previously stated, the spring 28 is compressed by the continued operative movement of the sleeve 19 after the butterfly valve 33 is closed. The rod 26, therefore, remains stationary, during the first part of the restoration movement, until the wall 25 regains its normal position contacting the end of the rod 26. The rod is then moved to its inoperative position, see Fig. 1. This swings the lever 30 outward and opens the butterfly 33, leaving an unobstructed path for the fuel mixture drawn upward from the carbureter.

As may be readily understood, the delay in the opening of the butterfly 33 allows the bypass valve to close first. This exhausts the atmosphere in the section 2 before the fuel gas is admitted to the intake 3 through the opening valves 4—33. Dilution of the first volume of fuel mixture with atmosphere from the bypass is thus effectually prevented.

Should the motor be stopped or idled for a period, the generator 51 fails to generate sufficient current at the reduced speed to sustain the electromotive force of the solenoid. The valve 41 then reseats in the tube 36 and causes the restoration of the mechanism to inoperative position, in the manner described.

It is obvious that the diaphragm 9 could be dispensed with, and a solenoid arranged to operate the bypass valve 14 and the butterfly valve 33 directly, instead of by suction as disclosed, without departing from the spirit of this invention.

The decreased pressure in the intake 1 subsequent to the complete closing of the throttle valve 4 obviously could be utilized also for operating the diaphragm directly, without the use of the solenoid valve 41—48, within the purview of the annexed claims.

Having thus described this invention, what is claimed and desired to secure by Letters Patent is:

1. In combination with an internal combustion motor having a throttle valve in the intake, an auxiliary valve in said intake, means for closing said auxiliary valve when said throttle valve is closed, and means operated by said auxiliary valve closing means for admitting atmosphere into the intake subsequent to the closing of said auxiliary valve.

2. In combination with an internal combustion motor having a throttle valve in the intake, an auxiliary valve in said intake, a bypass communicating with the atmosphere between said valves, means to close said bypass, means, operable when said throttle valve is closed, for closing said auxiliary valve, and means for opening said bypass subsequent to the closing of said auxiliary valve.

3. In combination with an internal combustion motor having a generator, and a throttle valve in the intake, an auxiliary valve in said intake, means actuated by the generator for closing said auxiliary valve when said throttle valve is closed, and means for admitting atmosphere into the intake subsequent to the closing of the auxiliary valve.

4. In combination with an internal combustion motor having a throttle valve in the intake and a generator operable above a predetermined motor speed, an auxiliary throttle valve in said intake, an open circuit adapted to be actuated by said generator, a solenoid included in said circuit, means for closing said circuit when said throttle valve is closed, means operated by said solenoid for closing said auxiliary valve, and means for admitting atmosphere into said intake when said auxiliary valve is closed.

5. In combination with an internal combustion motor having a throttle valve in the intake; an auxiliary valve in said intake means for closing said auxiliary valve when said throttle valve is closed; and means, operated by the closing of said auxiliary valve, for admitting atmosphere into the intake.

6. In combination with an internal combustion motor having a throttle valve in the intake; an auxiliary valve in said intake; a bypass communicating with the atmosphere between said valves; a valve arranged to close said bypass; means, operable when said throttle valve is closed, for closing said auxiliary valve; and means, operated by the closing of said auxiliary valve, for opening said bypass valve.

7. In combination with an internal combustion motor having a throttle valve in the intake; an auxiliary valve in said intake; a bypass communicating with the atmosphere between said valves; a valve arranged to close said bypass; means, actuated by the suction in said intake, for closing said auxiliary valve when said throttle valve is closed; and means for opening said bypass valve subsequent to the closing of said auxiliary valve.

8. In combination with an internal combustion motor having a throttle valve in the intake; an auxiliary valve in said intake; a bypass communicating with the atmosphere between said valves; a valve arranged to close said bypass; a housing having a chamber therein with a passage communicating with the intake above said valves; a valve closing said passage; electromagnetic means for opening said passage valve; means for energizing said electromagnetic means when said throttle valve is closed; and a diaphragm in said chamber operatively connected to said auxiliary and bypass valves.

9. In combination with an internal combustion motor having a throttle valve in the intake; an auxiliary valve in said intake; a bypass between said valves communicating with the atmosphere; a valve arranged to close said bypass and having a stem extending therefrom; a member loosely engaging said stem; means for actuating said member when said throttle valve is closed; and a rod operatively connected to said auxiliary valve and resiliently engaging said actuated member.

10. Fuel control mechanism adapted for association with the carbureter and throttle of an internal combustion engine comprising a fuel supply control valve; means responsive to pressures on the engine side of the throttle lower than normal idling intake manifold pressures to actuate said valve only when the throttle is in idling position to cut off the fuel supply to the carbureter, and positively acting manually operable means to re-establish the fuel supply to the

carbureter when the throttle is moved away slightly from idling position.

11. Fuel control mechanism adapted for association with the carbureter and throttle of an internal combustion engine comprising a fuel supply control valve; means responsive to pressures on the engine side of the throttle lower than normal idling pressure to actuate said valve only when said throttle is in idling position to cut off the fuel supply to the carbureter; and means to re-establish the fuel supply to the carbureter when the normal idling intake manifold pressure is restored.

12. In combination with an internal combustion motor having an intake manifold, a throttle valve in said intake manifold, an auxiliary valve in said intake manifold between said throttle valve and the combustion chamber of said motor adapted to completely close off said manifold, and means for admitting atmosphere into the chamber formed between said valves whereby the suction can be maintained in said manifold above said auxiliary valve, and destroyed in said manifold below said auxiliary valve.

13. Fuel control mechanism adapted for association with the intake manifold and carbureter of an internal combustion motor comprising a pair of valves located in said manifold, and means for opening the manifold passage between said valves to the atmosphere whereby the suction on the carbureter is stopped while at the same time maintaining a suction in the section of the intake manifold above the valve nearest the engine.

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