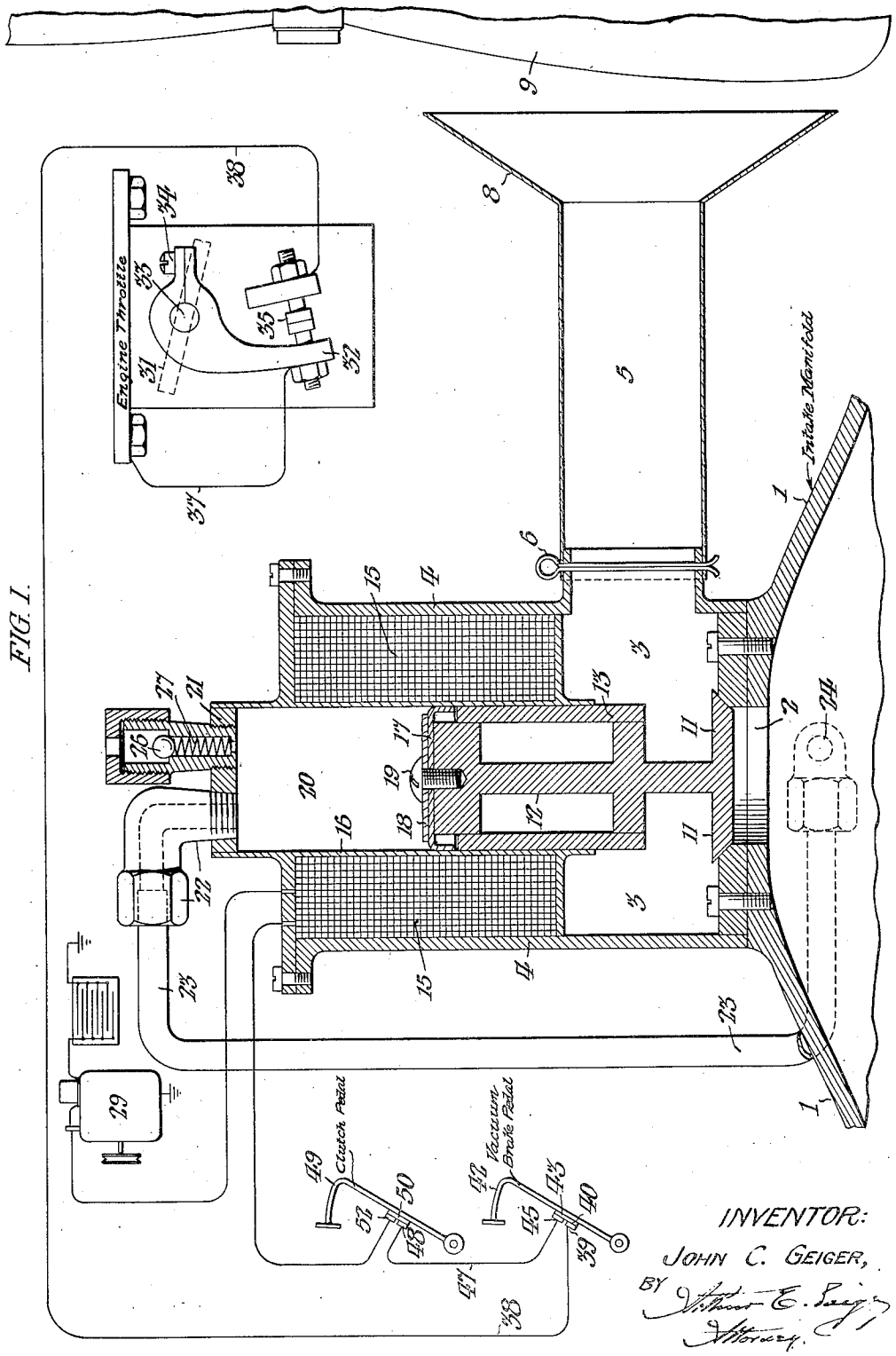
Oct. 18, 1932. J. C. GEIGER 1,883,686

INTERNAL COMBUSTION ENGINE

Filed Nov. 12, 1930 2 Sheets-Sheet 1

FIG. 1.



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FIG. II.

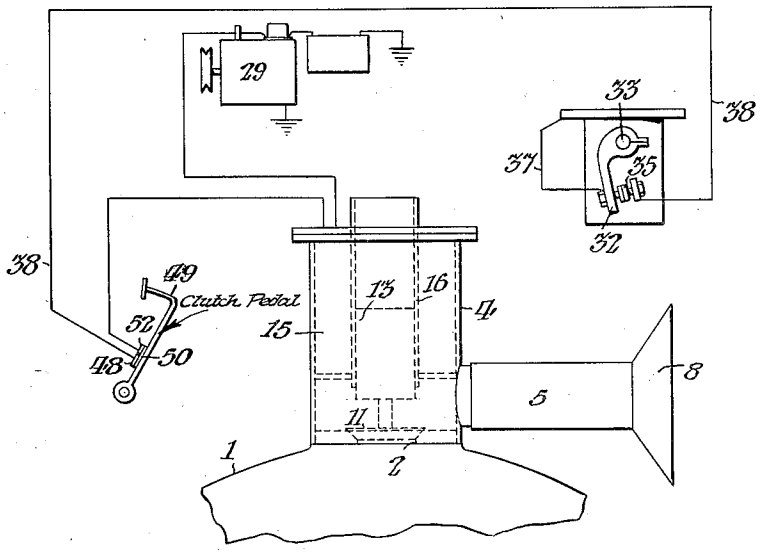
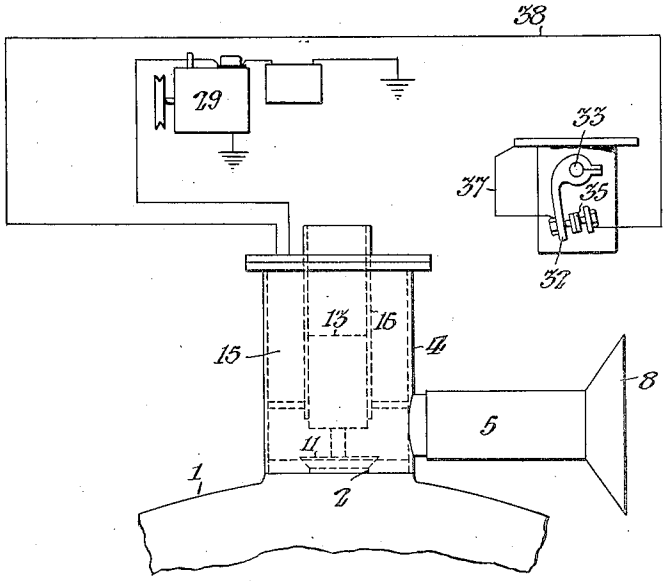


FIG. III.



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UNITED STATES PATENT OFFICE

JOHN C. GEIGER, OF BRYN MAWR, PENNSYLVANIA

INTERNAL COMBUSTION ENGINE

Application filed November 12, 1930. Serial No. 495,245.

My invention may be advantageously employed in any automotive vehicle with the purpose and effect of automatically cooling the engine valves, cylinders, pistons and spark plugs, and economizing the hydrocarbons used as lubricants and fuel.

Ordinarily, when such internal combustion engines are operated with the throttle valve closed, either with the vehicle stationary or progressing at a rate in excess of that at which it may be driven by the engine when thus throttled, the effect is to suck into the engine cylinders not only the lighter hydrocarbons used as fuel, but the heavier hydrocarbons used as lubricants, with consequent waste of both. My invention provides means for then automatically opening the intake manifold of the engine to the atmosphere, so that the partial vacuum created by the operation of the throttled engine sucks in the outer atmospheric air in lieu of the lubricant and fuel hydrocarbons aforesaid and thus avoids waste of the latter, and cools the engine parts as aforesaid.

My invention comprises the various novel features of construction and arrangement hereinafter more definitely specified, including the specific construction of means for automatically controlling admission of air directly to the fuel intake manifold, by including such means in electrical connection with a device by which an internal combustion vehicle motor is ordinarily controlled, such as a throttle valve, clutch lever, and brake lever.

In said drawings; Fig. I is a somewhat diagrammatic vertical sectional view showing the construction and arrangement of the most complex form of my invention, wherein the air valve controlling means is electrically connected with the ordinary electric generator of the vehicle under control of three switches respectively operatively connected with the fuel mixture throttle valve and with the clutch lever and with the brake lever.

Fig. II is a diagram indicating the inclusion of such valve controlling means as shown in Fig. I in electrical connection with the generator under control of but two switches respectively operatively connected with the throttle valve and with the clutch lever.

Fig. III is a diagram indicating the inclusion of such valve controlling means as shown in Fig. I in electrical connection with the generator under control of but one switch, which is in operative relation with the fuel mixture throttle valve.

Referring to the form of my invention shown in Fig. I; the intake manifold of an internal combustion engine is indicated at 1, provided with the special port 2 for communication with the atmosphere thru the chamber 3 in the casing 4 which is preferably provided with the conduit 5 detachably connected therewith by the cotter pin 6 and having at its intake end the funnel 8 immediately adjoining the fan 9 whereby the automobile radiator is ventilated. Such construction and location of the air intake conduit are preferable because they minimize the noise which is otherwise produced by the inrush of air to said chamber 3.

Said air inlet port 2 is adapted to be controlled by the valve 11 which is of non-ferric metal but has the stem 12 and jacket 13 of ferric metal serving as a core for the solenoid coil 15 which is supported by the cylinder 16 in which said valve stem and core are mounted to reciprocate. Said stem 12 is preferably provided with the cup leather 17 held thereon by the washer 18 and screw 19; so that said valve stem 12 acts as a piston in substantially fluid-tight relation with said cylinder 16 to subject said valve to the control of fluid pressure in the chamber 20 of said cylinder 16. Said cylinder is provided with the head 21 supporting the union fitting 22 from which the conduit 23 extends in communication with said intake manifold 1 at the opening 24. The effect of that arrangement is that when the valve 11 is in closed position over said port 2, as shown in Fig. I; it is subjected to the same fluid pressure at each end, which is less than that of the outer atmosphere in the conduit 5, so as to counterbalance said valve 11 and its appurtenant core member 13 and thereby minimize the magnetic stress necessary to be produced by electrically energizing said coil 15 to lift said valve from its seat.

Moreover, in order to further facilitate the closing movement of said valve 11, I prefer to provide said cylinder head 21 with the check valve 26, which is preferably a metal ball, provided with the spring 27; which function to prevent the chamber 20 from acting as a dashpot when the piston descends therein. Said valve 26 is closed by atmospheric pressure, as shown in Fig. I, against the stress of said spring 27, when the chamber 20 is evacuated, by the operation of the engine.

Although said coil 15 may be energized by any suitable means to open said valve 11 whenever desired, I prefer to effect such opening automatically by including said coil 15 in an electric circuit with switch means operatively connected with some device used to control the ordinary operation of the engine with which said valve is connected. In Fig. I, I have shown a complex wiring system for energizing said coil 15, wherein the generator 29, which may be the generator used for energizing an ignition circuit of the vehicle, is included in circuit with three distinct switches in series relation, viz., a switch local to the throttle valve 31 of the engine and including the movable switch lever 32 which may be adjustably rigidly connected with the shaft 33 of said throttle valve 31 by the clamp screw 34, so as to be moved with said valve. Said valve 31 is normally set in partly open position as indicated, to then pass the minimum amount of fuel mixture to cause the engine to operate idly, which amount may be varied in accordance with the set of said valve. Said lever 32 is, however, so positioned that it closes the circuit by contact with the stationary terminal 35 in any such predetermined idling position of said valve 31. Said valve 31 may be, of course, further opened by the ordinary controlling means with which automotive vehicles are provided and with the effect of breaking the circuit between said switch member 32 and the terminal 35 whenever said valve 31 is thus opened to increase the flow of gas to the engine. Said switch lever 32 may be grounded upon the vehicle frame by the conductor 37. However, said terminal 35 is preferably provided with the conductor 38 leading to the other switches. For instance, as shown in Fig. I, said conductor 38 leads to the terminal 39 of the switch 40 which is in operative relation with the brake lever 42. The switch member 43, conveniently shown as carried by said brake lever, is adapted to bridge the gap between said terminal 39 and the terminal 45 and thus close the circuit whenever said brake lever is in idle position, with the brakes released. However, when said brake lever is depressed to operate the brakes, the circuit to energize the coil 15 is broken so that the valve 11 shall then be shut. That arrangement is desirable where the vehicle is provided with what is termed a "vacuum" braking system; because, it is necessary to have the valve 11 shut to permit the maintenance of the vacuum requisite to operate such a brake system. However, it is to be understood that said brake lever 42 may be part of any kind of brake system. The conductor 47 leads from said brake switch to the terminal 48 of a switch in operative relation with the clutch lever 49 and including the switch member 50 which, in the normal engaged position of the clutch lever, bridges the gap between said terminal 48 and the terminal 52. The arrangement shown is such that when said lever 49 is depressed to release the clutch of the vehicle, the circuit energizing said coil 15 is broken and the valve 11 permitted to shut.

The apparatus above described operates as follows: The valve 11 is closed when the engine to which it is appurtenant is not in operation, but opened when said engine is operated with the throttle valve closed, either with the vehicle stationary or progressing at a rate in excess of that at which it may be driven by the engine when thus throttled. In that condition, with each of the switches 32, 43, and 50 closed, the coil 15 is energized by current from the generator 29 to open said valve 11 so that the partial vacuum created by the operation of the throttled engine sucks in the outer atmospheric air through the conduit 5, in lieu of the fluid fuel and lubricant and thus avoids waste of either of the latter. However, if the throttle valve 31 is opened, or the clutch pedal 42 depressed or the brake pedal 49 depressed, the circuit through said coil 15 is broken and the valve 11 closed. As shown in Fig. I, the conductor leading to the coil 15 from the generator 29 is connected to the latter at the side thereof remote from the battery, and, as the frame of said generator is grounded, as usual, the circuit for energizing the coil 15 from the generator 29 is completed without the interposition of the battery, and the battery has no effect upon said coil 15 at any time.

However, as shown in Fig. II, the brake lever switch above described may be omitted from the wiring circuit adapted to energize the coil 15, in any vehicle which is not provided with a brake system of the vacuum type.

Moreover, as shown in Fig. III, both the brake lever switch and the clutch lever switch above described may be omitted from the circuit energizing said coil 15, leaving said circuit to be automatically controlled solely by the switch local to the throttle valve.

Therefore, I do not desire to limit myself to the precise details of construction and arrangement herein set forth, as it is obvious that various modifications may be made therein without departing from the essential fea-

tures of my invention, as defined in the appended claims.

I claim:

1. In an internal combustion engine, the combination with a combustible mixture intake manifold, having an air inlet port; of a valve controlling said port; means adapted to move said valve to close said port during the normal operation of the engine and to open said port when the engine throttle valve is closed, including a solenoid coil in registry with said port, and a core adapted to reciprocate in said coil and rigidly connected with said valve; an electric circuit adapted to energize said coil and including a switch; and an engine controlling device, movable in changing said engine, from normal to throttled condition, operatively connected with said switch; whereby said circuit is closed when the engine is throttled and opened when it is not throttled and suction upon the carburetor is minimized during each throttled operation, by then establishing communication between said intake manifold and the outer atmosphere; wherein said core is mounted to reciprocate in a fluid pressure chamber within said coil, and including a conduit continually establishing communication between said intake manifold and said chamber; whereby the fluid pressure is balanced upon opposite ends of said valve and core and the magnetic stress necessary to open said valve thereby minimized.

2. In an internal combustion engine, the combination with a combustible mixture intake manifold, having an air inlet port; of a valve controlling said port; means adapted to move said valve to close said port during the normal operation of the engine and to open said port when the engine throttle valve is closed, including a solenoid coil in registry with said port, and a core adapted to reciprocate in said coil and rigidly connected with said valve; an electric circuit adapted to energize said coil and including a switch; and an engine controlling device, movable in changing said engine, from normal to throttled condition, operatively connected with said switch; whereby said circuit is closed when the engine is throttled and opened when it is not throttled and suction upon the carburetor is minimized during each throttled operation, by then establishing communication between said intake manifold and the outer atmosphere; wherein said core is mounted to reciprocate in a fluid pressure chamber within said coil, and including a conduit continually establishing communication between said intake manifold and said chamber; whereby the fluid pressure is balanced upon opposite ends of said valve and core and the magnetic stress necessary to open said valve is thereby minimized; and a check valve controlling communication between said chamber and the outer atmosphere, adapted to facilitate the closing movement of said valve and core.

3. In an internal combustion engine, the combination with a combustible mixture intake manifold, having an air inlet port; of a valve controlling said port; means adapted to move said valve to close said port during the normal operation of the engine and to open said port when the engine throttle valve is closed, including a solenoid coil and a core adapted to reciprocate in said coil and operatively connected with said valve; an electric circuit adapted to energize said coil and including three switches in series relation; an engine throttling device, operatively connected with one of said switches; an engine clutch device, operatively connected with the second of said switches; and a braking device, operatively connected with the third of said switches; whereby said circuit is closed when the engine is throttled and opened when it is not throttled and suction upon the carburetor minimized during such throttled operation, by then establishing communication between said intake manifold and the outer atmosphere.

4. In an internal combustion engine, the combination with a fuel intake manifold, having an air inlet port; of a valve controlling said port; means adapted to move said valve to close said port during the normal operation of the engine and to open said port when the engine is throttled, including a solenoid coil and a core adapted to reciprocate in said coil and operatively connected with said valve; an electric circuit adapted to energize said coil and including a switch; and an engine clutching device operatively connected with said switch; whereby said switch is closed when the engine is clutched and opened when it is not clutched.

5. In an internal combustion engine, the combination with a fuel intake manifold, having an air inlet port; of a valve controlling said port; means adapted to move said valve to close said port during the normal operation of the engine and to open said port when the engine is throttled, including a solenoid coil and a core adapted to reciprocate in said coil and operatively connected with said valve; an electric circuit adapted to energize said coil and including a switch; and a braking device operatively connected with said switch; whereby said switch is closed when said braking device is operated, and opened when said braking device is idle.

6. In an internal combustion engine, the combination with a fuel intake manifold, having an air inlet port; of a valve controlling said port; means adapted to open and close said port, including a solenoid coil, a fluid tight chamber within said coil, a core adapted to reciprocate in said chamber as a piston and operatively connected with said valve, and an electric circuit adapted to ener-

gize said coil; including means continually establishing communication between said intake manifold and said chamber; whereby the fluid pressure is balanced upon opposite ends of said valve and core and the magnetic stress necessary to open said valve thereby minimized.

7. In an internal combustion engine, the combination with a fuel intake manifold, having an air inlet port; of a valve controlling said port; means adapted to open and close said port, including a solenoid coil, a fluid tight chamber within said coil, a core adapted to reciprocate in said chamber as a piston and operatively connected with said valve, and an electric circuit adapted to energize said coil; including a check valve controlling communication between said chamber and the outer atmosphere, adapted to facilitate the closing movement of said valve and core.

8. The combination with a valve; of means adapted to open and close said valve, including a solenoid coil, a fluid tight chamber within said coil, a core adapted to reciprocate in said chamber as a piston and operatively connected with said valve, means arranged to maintain a partial vacuum in said chamber and thereby partially counterbalance the weight of said valve and core, and an electric circuit adapted to energize said coil.

In testimony whereof, I have hereunto signed my name at Norristown, Pennsylvania, this 8th day of November, 1930.

JOHN C. GEIGER.