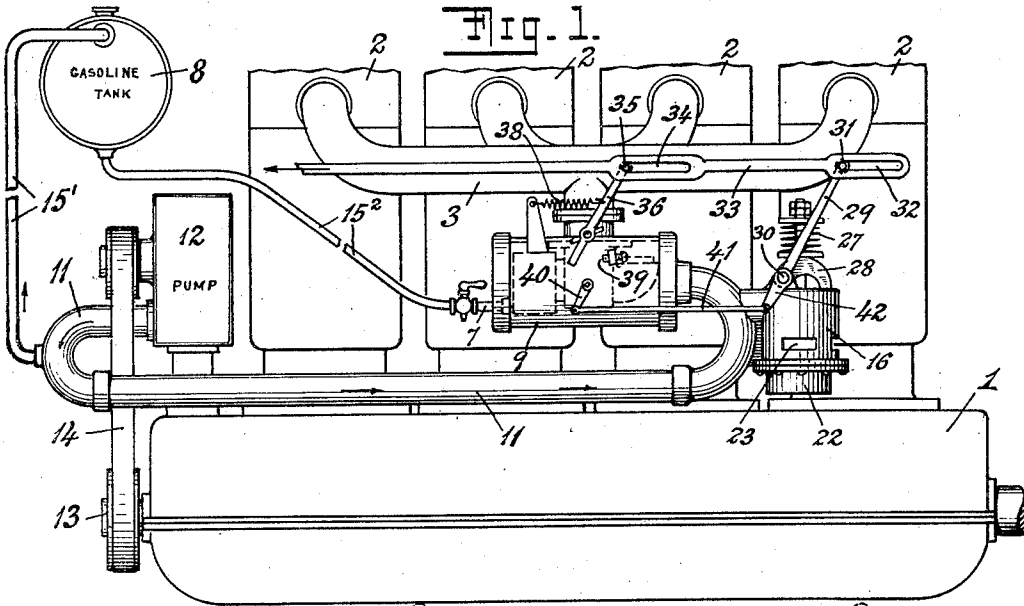
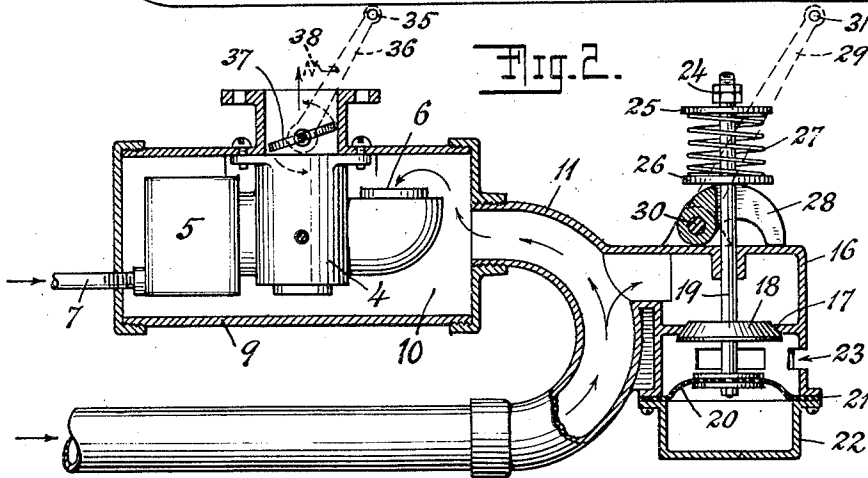
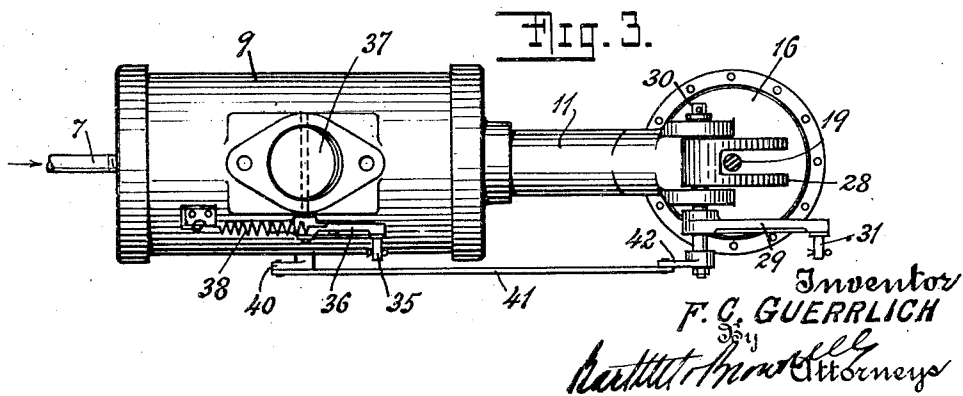


F. C. GUERRLICH.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED DEC. 3, 1918.

1,346,124.

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UNITED STATES PATENT OFFICE.

FREDERICK C. GUERRLICH, OF STAMFORD, CONNECTICUT.

INTERNAL-COMBUSTION ENGINE.

1,346,124.

Specification of Letters Patent.

Patented July 13, 1920.

Application filed December 3, 1918. Serial No. 265,090.

To all whom it may concern:

Be it known that I, FREDERICK C. GUERRLICH, a citizen of the United States, residing at Stamford, county of Fairfield, and State of Connecticut, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a full, clear, and exact description.

My invention relates to internal combustion engines and has for its object to provide a new and improved means for supplying to such engines, when subjected to varying atmospheric pressures, such for instance as occur during the flight of an aeroplane, a mixture of air and gas under a desired pressure.

It further has for its object to provide a means whereby the pressure of the air supplied to the engine can be increased or diminished as desired, and further has for its object to provide a means for varying the fuel supply as the air pressure is thus varied.

The following is a description of an embodiment of my invention, reference being had to the accompanying drawings, in which:

Figure 1 shows in side elevation an engine and supply system embodying my invention;

Fig. 2 is an enlarged detail of the supply system, partially in section; and

Fig. 3 is a plan view of parts of Fig. 2.

Referring more particularly to the drawings, which are intended to show my invention embodied in connection with an aeroplane engine, 1 is the crank case of an internal combustion engine, above which are a plurality of cylinders 2 connected to a manifold 3 to which is connected the outlet of a carbureter 4 of ordinary aeroplane type having float chamber 5 and an air intake 6 and being supplied with gasoline through the conduit 7 leading from the gasoline tank 8. The body of the carbureter is inclosed in an air-tight casing 9, forming a surrounding chamber 10. To one end of this chamber is connected a pipe 11, which leads from an air pump 12 operated from the engine shaft 13 by a belt 14. This supplies air under pressure to the interior of the casing 9. The upper part of the gasoline tank 8 is connected to the pipe 11 by a pipe 15 so as to equalize the pressure above the gasoline and at its discharge point so that it will feed by gravity through the pipe

15² to the carbureter. Connected to the casing 9 is a valve casing 16, the same, in the construction shown, opening directly into the pipe 11, Fig. 2. This valve casing is provided with a valve seat 17 and a relief valve 18 carried by a valve rod 19 passing through the valve casing with a fit as substantially air-tight as is compatible with free movement of the rod. To the lower end of the rod is connected a diaphragm 20, secured at 21 between flanges carried by the valve casing and a supplemental casing 22. This supplemental casing forms a closed air chamber below the diaphragm. If the pressure within the casing 9 is to be kept substantially the same as the pressure within the chamber 22 the area of the valve 18, which is subject to pressure of air within the casing 9, is so related to the diaphragm 20 that the force due to the internal pressure of the chamber 22 holding the valve to its seat shall be equal to the force due to the pressure of the air within the casing 9 upon the valve, where the densities in the chamber 22 and casing 9 are equal. Between the diaphragm 20 and the valve 18 are ports 23 opening to the atmosphere. The upper end of the valve rod 19 is provided with an adjusting nut 24 below which are two movable disks 25, 26 and between these disks is a spring 27. Below the disk 26 is a cam 28 rigidly connected to a crank arm 29 through a shaft 30, the cam 28 being such that when the shaft 30 is moved counter-clockwise by the handle 29 the disk 26 will be lifted so as to compress the spring 27, thus exerting an upward spring pressure upon the rod 19 and tending to hold the valve 18 more securely to its seat. The upper end of the crank arm 29 is provided with a pin 31 which moves in a slot 32 in an actuating rod 33. This actuating rod has another slot 34 in which lies a pin 35 connected to the lever 36 for operating a butterfly throttle valve 37 in the outlet of the carbureter 34. A spring 38 has one end connected to a stationary abutment and tends to move the lever 36 counter-clockwise so as to open the butterfly throttle valve 37. An adjustable stop 39 is provided for limiting the movement of the lever 36. Below the lever 36 is a crank arm 40 of a spray-controlling valve for adjusting the spray of fuel delivered to the mixing chamber of the carbureter. This crank arm 40 is connected by a link 41 to

an arm 42 connected to the shaft 30 so that as the arm 29 is moved to compress the spring 27 the arm 42 acts to move the crank arm 40 to increase the fuel delivered by the carbureter and thereby increase the gas in the mixture delivered to the engine.

The apparatus operates as follows: When the pressure in the casing 9 is to be maintained substantially equal to atmospheric pressure at the sea level, the chamber between the casing 22 and the diaphragm piston 20 is filled with air at sea level atmospheric pressure, this chamber being sealed so that air when once therein is retained therein under all conditions so as to have an internal gaseous pressure. The pump 12 supplies sufficient air to the chamber within the casing 9 so as to maintain it filled with air above atmospheric pressure, provided the only air discharged is that consumed in the operation of the engine, that is, the pump 12 is so proportioned as to always supply to the casing 9 air in excess of that taken by the engine whatever the surrounding atmospheric pressure may be. When the aeroplane is at sea level, the cam 28 being in the position shown in Fig. 2 and the spring 7 being thereby relaxed so as to exert substantially no effect upon the valve 18, the valve 18 will open if the internal pressure within the casing 9 exceeds atmospheric pressure and the pressure within the chamber 9 will therefore be kept at substantially atmospheric pressure. As the aeroplane rises, however, so that the surrounding atmospheric pressure appreciably diminishes, the gaseous pressure of the air within the chamber 22 upon the diaphragm 20 holds the valve 18 to its seat until the gaseous pressure within the chamber 9 equals atmospheric pressure at the sea level, whereupon, if the internal pressure of the casing 9 increases, the valve 18 will open so as to permit enough air to escape to prevent the pressure within the chamber 9 from rising substantially above the sea level atmospheric pressure. The pressure in the chamber 22 will act to again close the valve 18 without regard to what the surrounding atmospheric pressure may be whenever the pressure in the casing 9 falls below the sea level pressure. This action is more fully described in my co-pending application No. 235,184, filed May 17, 1918.

In case it is desired to supercharge the engine, *i. e.*, supply the air and gas mixture under a higher pressure, for the purpose of getting greater power for greater effort or greater rate of speed, the rod 33 is moved to the left sufficiently to cause the lever 29 to be turned counter-clockwise. This causes the cam 28 to compress the spring 27 and results in exerting an upward pressure upon the valve 18, holding it more firmly to its seat, where it will remain until the pressure

within the casing 9 exceeds atmospheric pressure by an amount sufficient to cause the added internal pressure upon the valve 18 to overcome both the action due to the compression of the spring 27 and the action of the pressure within the chamber 22 so as to open the valve. It is to be noted that before the cam 28 begins to act the butterfly valve 37 has been opened to its maximum, that occurring on account of the action of the spring 38, which opens the butterfly valve whenever the position of the rod 33 permits it to do so. The slot 34 permits the rod 33 to continue its movement after the butterfly valve is fully opened, and during this continued movement the lever 29 is acted upon so that the spring 27 is compressed and the engine becomes supercharged only after it has reached the maximum power which it is possible for it to attain through the opening of the butterfly valve alone. The supercharging of the engine is accompanied by an increase in the fuel from the carbureter resulting from the movement of the spray controlling device 40 through the action of the lever 29. The supercharge can be varied within the limits of the compression of the spring 27 corresponding to the various positions of the cam 28.

As will be noted, in every case the supercharge is added to the original pressure determined by the density of the air within the chamber 22, which original pressure when the piston and valve are substantially equal in diameter, is not reduced by changes in altitude, so that the total pressure in the casing 9 at any time is always equal to or in excess of the original pressure, being equal to the original pressure plus that due to the action of the spring 27 as adjusted by the cam 28.

As will be evident to those skilled in the art, my invention permits of various modifications without departing from the spirit thereof or the scope of the appended claims.

What I claim is:

1. An inclosure for supplying air to an internal combustion engine and a carbureter therein, in combination with means for continuously supplying air to said inclosure in excess of that supplied to said engine, means for maintaining the pressure of the air in said inclosure approximately fixed for a given atmospheric pressure, means for preventing variations in surrounding atmospheric pressure from affecting the action of said pressure maintaining means, and adjustable means for modifying the action of said pressure maintaining means so as to cause an increase in pressure within said inclosure when desired.

2. The combination of an inclosure for supplying air to an internal combustion engine, means for continuously supplying air to said inclosure sufficient to maintain at

least the desired pressure therein, a second inclosure containing a confined gaseous body, a relief valve for said first inclosure whose operation is controlled by the action of the gaseous pressures within said two inclosures, a spring acting in conjunction with the gaseous pressure within said second inclosure, means for adjusting said spring to increase its action, and a carbureter in said first inclosure supplying to said engine fuel mixed with air from said first inclosure.

3. The combination of an inclosure for supplying air to an internal combustion engine, means for continuously supplying air to said inclosure sufficient to maintain at least the desired pressure therein, a second inclosure containing a confined gaseous body, a relief valve for said first inclosure whose operation is controlled by the action of the gaseous pressures within said two inclosures, a spring acting in conjunction with the gaseous pressure within said second inclosure, means for adjusting said spring to increase its action, a carbureter in said first inclosure supplying to said engine fuel mixed with air from said first inclosure, a throttle valve controlling the outlet of said carbureter, and a rod controlling said throttle valve and said adjusting means, so that said throttle valve opens before the action of said spring is increased.

4. The combination of an inclosure for supplying air to an internal combustion engine, means for continuously supplying air to said inclosure sufficient to maintain at least the desired pressure therein, a second inclosure containing a confined gaseous body, a relief valve for said first inclosure whose operation is controlled by the action of the gaseous pressures within said two inclosures, a spring acting in conjunction with the gaseous pressures within said second inclosure, means for adjusting said spring to increase its action, a carbureter in said first inclosure supplying to said engine fuel mixed with air from said first inclosure, a spray controlling device for said carbureter, and means for actuating said spray controlling device to increase the spray as said spring is adjusted to increase the action of said spring.

5. The combination of an inclosure for supplying air to an internal combustion engine, means for continuously supplying air to said inclosure sufficient to maintain at least the desired pressure therein, a second inclosure containing a confined gaseous body, a relief valve for said first inclosure whose operation is controlled by the action of the gaseous pressures within said two inclosures, a spring acting in conjunction with

the gaseous pressure within said second inclosure, means for adjusting said spring to increase its action, a carbureter in said inclosure supplying to said engine fuel mixed with air from said first inclosure, a throttle valve controlling the outlet of said carbureter, a rod controlling said throttle valve and said adjusting means so that said throttle valve opens before the action of said spring is increased, a spray controlling device for said carbureter, and means for actuating said spray controlling device to increase the spray as said spring is adjusted to increase the action of said spring.

6. The combination of an inclosure for supplying air to an internal combustion engine, means for continuously supplying air to said inclosure sufficient to maintain at least the desired pressure therein, a second inclosure containing a confined gaseous body, a relief valve for said first inclosure whose operation is controlled by the actions of the gaseous pressures within said two inclosures, a supplemental spring adapted to exert a closing force upon said valve, a cam for increasing the closing force of said spring, means for actuating said cam, and a carbureter within said first inclosure.

7. The combination of an inclosure for supplying air to an internal combustion engine, means for continuously supplying air to said inclosure sufficient to maintain at least the desired pressure therein, a second inclosure containing a confined gaseous body, a relief valve for said first inclosure whose operation is controlled by the actions of the gaseous pressures within said two inclosures, a supplemental spring adapted to exert a closing force upon said valve, a cam for increasing the closing force of said spring, means for actuating said cam, a carbureter within said first inclosure, a spray controlling device for said carbureter, and means for actuating said device to increase the spray as the closing force of said spring is increased.

8. The combination of an inclosure for supplying air to an internal combustion engine, means for continuously supplying air to said inclosure sufficient to maintain at least the desired pressure therein, a carbureter having its air intake surrounded by said inclosure, a relief valve for said first inclosure acted upon by the internal pressure of said first inclosure so as to be opened thereby, an adjustable spring for holding said relief valve closed, a cam for adjusting said spring to increase its closing action, and means for controlling said cam from a point remote from said spring.

FREDERICK C. GUERRICH.