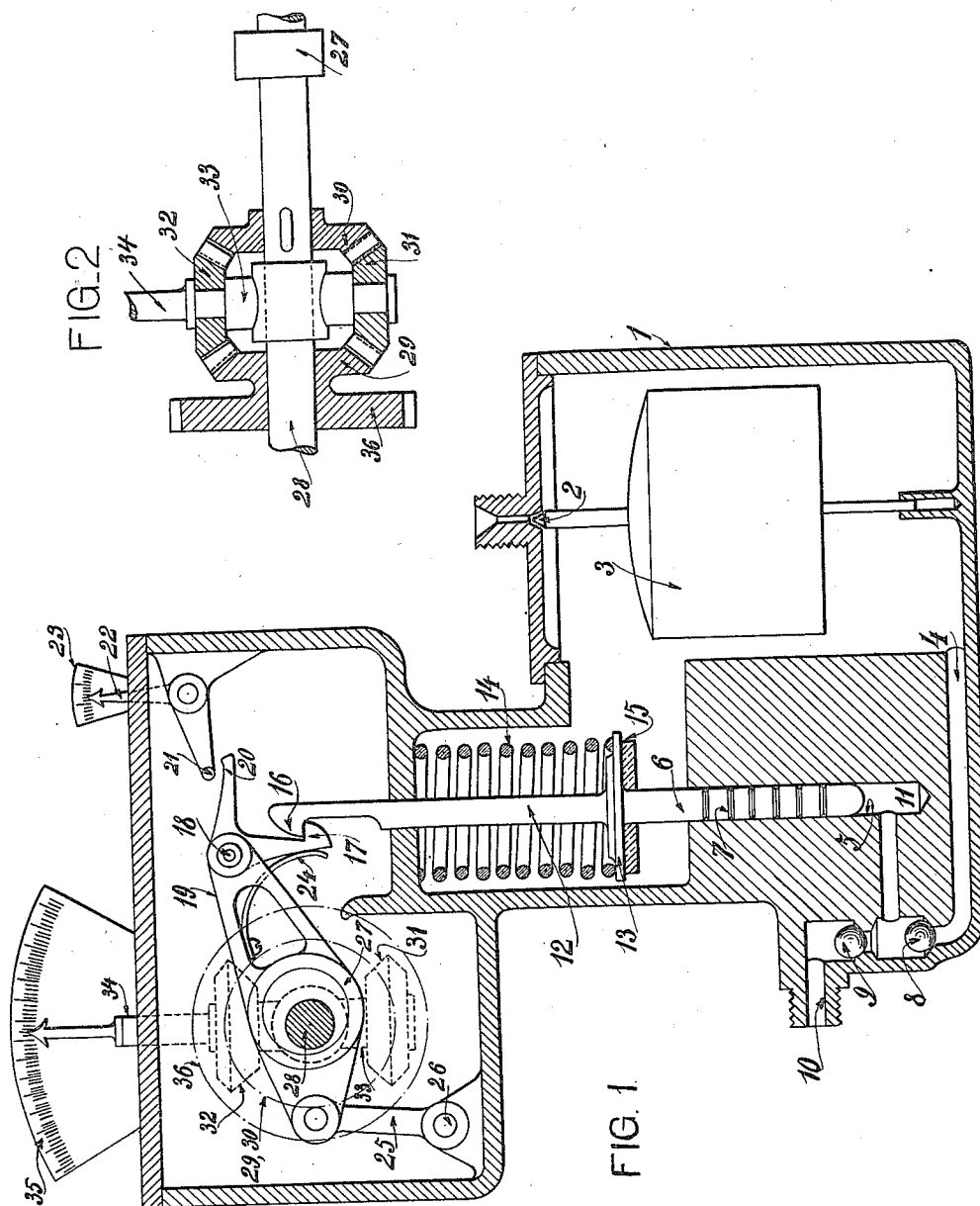


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 INJECTOR CARBURETER FOR EXPLOSION ENGINES.
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1,151,600.



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UNITED STATES PATENT OFFICE.

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INJECTOR-CARBURETER FOR EXPLOSION-ENGINES.

1,151,600.

Specification of Letters Patent.

Patented Aug. 31, 1915.

Application filed June 23, 1914. Serial No. 846,806.

To all whom it may concern:

Be it known that I, LOUIS LACON, citizen of the Republic of France, residing at 8 Rue François Millet, Paris, in the Republic of France, have invented new and useful Improvements in Injector-Carbureters for Explosion-Engines, of which the following is a specification.

The invention relates to improvements in carbureters for explosion engines and has for its object an injector carbureter intended to carburate the air in the engine cylinder during the compression.

Usually the motor compresses the explosive mixture or else compresses air only. In the first case spontaneous ignition is produced (which is too irregular to be employed systematically) as soon as the value of the compression exceeds a given limit which varies with different engines. In the second case, particularly in the Diesel method, the fuel is injected in atomized form by means of a jet or air at a very high pressure, the compression acting upon the air alone. This method presents numerous inconveniences: 1. The employment of air at a very high pressure necessary for atomizing the liquid fuel entails costly complications and renders it impossible to employ volatile liquids which might explode in contact with it. 2. The employment of non-volatile liquids renders mixing in the cylinder difficult, and in order to insure ignition, renders compression to a high pressure necessary. 3. The employment of high pressures at compression is not advantageous above a certain limit, as the efficiency is not increased in proportion to the difficulties of construction of the engine thereby entailed. For these reasons it would be preferable to inject the liquid alone into the cylinder without atomizing it by means of an air jet, but hitherto great difficulties have been experienced in the construction of the injection pump which is then required. This pump should fulfil the following conditions: Inject a quantity of fuel varying with the load on the engine in a very brief time, at an adequate pressure and at variable moments in accordance with the speed and the heat of the engine.

The injector carbureter which forms the object of the present invention fulfils this fourfold purpose. It is mainly characterized by the fact that the constant level supply reservoir supplies a fuel pump, the piston of which is lifted to produce the suction

in opposition to the action of a powerful spring, by a member operated by the engine, this member suddenly abandoning the piston at a given moment, in such a manner that, under the influence of the spring, it suddenly and vigorously forces the fuel into the driving cylinder.

The improved carbureter has also other characteristics which will hereinafter be described.

An embodiment of the invention is illustrated by way of example in the accompanying drawing in which:

Figure 1 is a vertical section through the device as a whole; Fig. 2 is a vertical section of the differential controlling gear.

1 is a constant level reservoir of the usual type having a pin valve 2 for the admission of the spirit and a float 3. Through the conduit 4 the spirit passes to a pump constituted by a vertical cylinder 5 in which a relatively long plunger piston 6 is displaced, this piston fits the cylinder as closely as possible. The extremity of this piston is rounded off for reasons that will be explained and in order that it may form a better joint it is provided with channels or grooves 7 which create losses of charge in order to reduce leakages to the minimum. The operation of this piston would be very uncertain if packing rings or the like were relied upon to form a good joint. With spirit it is not possible to lubricate such packings and the descent of the piston would be stopped by the friction.

The pump comprises valves 8 and 9 for suction and delivery respectively; 10 is the socket through which the fuel is injected into the engine. The sump 11 is an extension of a cylinder forming a shock absorber for the piston and the terminal cross-section of which is somewhat restricted for this purpose. At its upper part the piston is continued by a rod 12 carrying a plate 13 receiving the thrust of a spiral spring 14 and a leather or other washer 15 to serve as a shock absorber for the plate 13. At its upper part the rod 12 is provided with a notch which forms a nose 16 of tempered steel. A pawl 17 of a bell-crank lever is able to engage beneath the nose 16, this lever is pivoted at 18 to the end of the rocker 19 while its other arm 20 is acted upon by the stop 21 pivoted to the frame of the device and ad-

justable in position by means of the pointer 22 which is displaceable on the graduated dial 23. The pawl 17 is influenced by a leaf spring 24. The rocker 19 connected by means of a rod 25 to a fixed point 26 of the frame, is mounted on an eccentric 27 keyed upon a horizontal shaft 28 suitably journaled in the frame. This shaft 28 passes through a differential of the usual type constituted by two sun pinions 29 and 30 and two planet pinions 31 and 32. The latter pinions are mounted upon a cross-head 33 which rotates idly upon the shaft 28 and are adjusted by means of pointer or handle 34 which is displaceable over a graduated dial 35; the pinion 30 is keyed upon the shaft 28 while the pinion 29 is loose upon this shaft and integral with a toothed pinion 36 controlled by the engine by the intermediary of some appropriate transmission.

The operation of the device is as follows: The engine continuously drives the pinion 36 integral with the pinion 29 of the differential. By means of the planet pinions 31 and 32 journaled upon the cross 33 this pinion 29 drives the sun pinion 30 keyed upon the shaft 28 and consequently also drives the said shaft and the eccentric 27 mounted thereon. The eccentric imparts a reciprocating movement to the rocker 19 jointed to the fixed point 26 by means of the rod 25. The spring 24 tends to engage the pawl 17 beneath the nose 16 of the piston rod 12 in such a manner that when the rocker rises the pawl 17 carries with it the rod 12 and the piston 6, thereby compressing the spring 14. The fuel to be injected which enters the constant level chamber 3 in the usual manner at 2 is then drawn through the passage 4 into the pump 5 which it enters while lifting the valve 8. When the arm 20 of the pawl 17 has come into contact with the fixed but adjustable stop 21, the latter causes it to rock while releasing the pawl 17 from the nose 16, the rod 12 and the piston 6 are then suddenly and vigorously depressed by the action of the spring 14 which extends thereby producing the compression of the liquid and forcing it through the valve 9 and the socket 10 leading to the cylinder of the engine. The sump 11 becomes filled with liquid and the leather washer 15 reduces the shock at the end of the stroke of the piston 7. As the piston does not comprise packing, the thrust of the spring has only to overcome the inertia of the parts; the piston, its rod, half the weight of the spring, and presses upon the liquid in such a manner that the pressure upon the liquid can be very exactly determined in advance. To a large extent this pressure is independent of the leakages that may occur along the piston. As regards inevitable leakages by giving the pump large dimensions and in view of the

control mechanism which renders it possible to regulate the quantity injected at each instant, exactitude in the carburation can be maintained with certainty notwithstanding these leakages.

It will be noted that the commencement of the suction period depends upon the position of the rocker 19, this position can be modified by altering the angle at which the eccentric is fixed relatively to the drive of the engine, which can be effected by acting upon the pointer 34 which modifies the position of the cross 33 and consequently the relative positions of the planet pinions 31 and 32 to the pinions 29 and 30. The end of the suction period, that is to say the commencement of the delivery period, is similarly regulated by altering the position of the stop 21 by means of the index 22. The phases of the operation of the pump and the quantity of fuel can also be regulated exactly. Moreover the pump produces a powerful and rapid delivery; the leakage is very small and any liquid that escapes returns to the constant level supply chamber.

It may be desirable to ascertain, at all events approximately the quantity of liquid fuel injected. This can readily be effected by suitably graduating the scale 35 corresponding to the commencement of the suction and the scale 23 corresponding to the commencement of the delivery. The difference between the readings furnishes the value of the effective stroke of the piston of the pump. This reading can be simplified by providing two superposed movable dials. It will of course be understood that the invention is not limited to the diagrammatic form described and illustrated. The carbureter is equally applicable for all liquid or liquefiable fuels (such as naphthalene) and will act at low pressure and with separate ignition, or at high pressure and spontaneous ignition in the air heated by the compression. In particular, the separate ignition may be catalytic.

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

1. In an injector carbureter for explosion engines, a constant level supply reservoir, a pump cylinder in communication with said reservoir, a suction valve and a delivery valve for said cylinder, a piston in said cylinder, a spring adapted to force the piston into the cylinder, a member adapted to lift the piston in opposition to the action of the spring and means for actuating said member from the engine and causing the member to suddenly abandon the piston at a certain moment of its upward movement, substantially as described and for the purpose set forth.

2. In an injector carbureter for explosion engines, a constant level supply reservoir, a

5 pump cylinder in communication with said
reservoir, a suction valve and a delivery
valve for said cylinder, a piston in said cyl-
inder, a spring adapted to force the piston
into the cylinder, an oscillating lever adapt-
ed to lift the piston in opposition to the
action of the spring, means for connecting
one end of the lever to a fixed point, an
eccentric driven by the engine for actuating
said lever, and means for causing the lever
to suddenly abandon the piston at a certain
moment of its upward movement, substan-
tially as described and for the purpose set
forth.

15 3. In an injector carbureter for explosion
engines, a constant level supply reservoir, a
pump cylinder in communication with said
reservoir, a suction valve and a delivery
valve for said cylinder, a piston in said cyl-
inder, a spring adapted to force the piston
into the cylinder, an oscillating lever adapt-
ed to lift the piston in opposition to the
action of the spring, means for connecting
one end of the lever to a fixed point, an
eccentric for actuating said lever, a differ-
ential gearing operatively connected to the
eccentric, means for driving the eccentric
from the engine through the differential
gearing, and means for causing the lever to
suddenly abandon the piston at a certain
moment of its upward movement, substan-
tially as described and for the purpose set
forth.

35 4. In an injector carbureter for explosion
engines, a constant level supply reservoir, a
pump cylinder in communication with said
reservoir, a suction valve and a delivery
valve for said cylinder, a piston in said cyl-
inder, a spring adapted to force the piston
into the cylinder, an oscillating lever adapt-
ed to lift the piston in opposition to the
action of the spring, means for connecting
one end of the lever to a fixed point, an
eccentric for actuating said lever, a differ-
ential gearing operatively connected to the

eccentric, means for driving the eccentric
from the engine through the differential
gearing, a spring pawl pivoted at the free
end of the oscillating lever and engaging the
piston and an adjustable stop for disengag- 50
ing said pawl from the piston, substantially
as described and for the purpose set forth.

5. In an injector carbureter for explosion
engines, a constant level supply reservoir, a
pump cylinder in communication with said 55
reservoir, a suction valve and a delivery
valve for said cylinder, a piston in said cyl-
inder, said piston having circumferential
grooves throughout its length, a spring
adapted to force the piston into the cylin- 60
der, a member adapted to lift the piston in
opposition to the action of the spring, and
means for actuating said member from the
engine and causing the member to suddenly
abandon the piston at a certain moment of 65
its upward movement, substantially as de-
scribed and for the purpose set forth.

6. In an injector carbureter for explosion
engines, a constant level supply reservoir, a
pump cylinder in communication with said 70
reservoir, a suction valve and a delivery
valve for said cylinder, a piston in said cyl-
inder, the pump cylinder terminating in a
sump which absorbs the shock of the piston
at the end of the delivery stroke, a spring 75
adapted to force the piston into the cylin-
der, a member adapted to lift the piston in
opposition to the action of the spring, and
means for actuating said member from the
engine and causing the member to suddenly 80
abandon the piston at a certain moment of
its upward movement, substantially as de-
scribed and for the purpose set forth.

In testimony whereof I have signed my
name to this specification in the presence of 85
two subscribing witnesses.

LOUIS LACON.

Witnesses:

LOUIS MOSES,
CHAS. P. PRESSLY.