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FUEL SUPPLY PUMP

Filed July 12, 1932

Fig. 1.

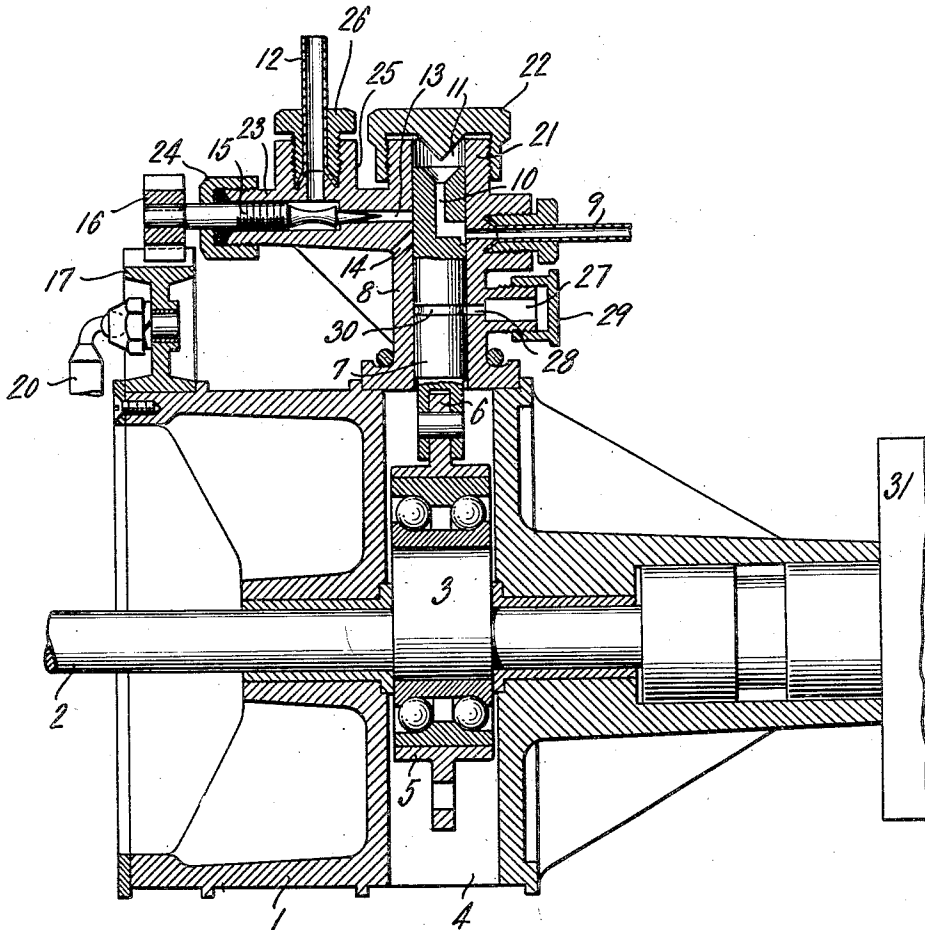
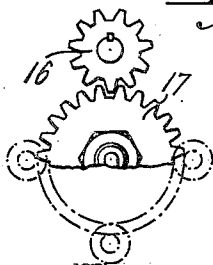


Fig. 2.



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FUEL SUPPLY PUMP

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This invention relates to an improvement in fuel pumps and particularly a pump to supply fuel for internal combustion engines.

An object of the invention is to provide a pump adapted to inject fuel into so-called low compression engines for automotive, aviation, marine or stationary use, and of the type on which carburetors are usually employed and in which the degree of compression does not cause self-ignition of the fuel therein. Such engines usually operate on the two or four-cycle principle and the engine for which my improved pump is intended is similar.

Heretofore with engines having carburetors it has been customary to force either air alone into the combustion chamber of the engine and then inject fuel after the completion of the intake period and after the intake valves are closed; or to inject fuel into the air drawn into the engine during the intake period and at a predetermined instant in the course thereof. In previous fuel pumps for injecting fuel into said engines the fuel alone passes through the pump.

It is another object of my invention to provide a pump which forces a mixture of air and fuel into the engine at a predetermined instant; and by causing the pump to furnish both the air and fuel together, better regulation can be obtained and higher efficiency of operation for the engine itself.

An embodiment of the invention is set forth in the accompanying drawing and described hereinafter; but I, of course, reserve the right to make changes in the shape, size, and arrangement of the parts without going beyond the principle of the invention or exceeding the scope of the appended claims.

On the drawing:

Fig. 1 shows a pump according to my invention in section, and

Fig. 2 is a detail.

The pump comprises a casing or housing 1 with bearings for a drive shaft 2 carrying an eccentric 3. This eccentric operates in a space or cavity 4 of the casing 1 and the encircling strap 5 thereof has an anti-friction bearing between it and the eccentric 3 itself. Extending outward from the strap 5 is a

perforated lug or lobe 6 which is shown connected to the plunger 7. The pump barrel 8 receives the plunger 7; and as many such barrels as are required will be affixed to the casing 1 in any suitable manner, corresponding to the number of cylinders of the engine on which the pump is mounted.

Each pump barrel 8 will be provided with a discharge conduit 9 leading to one of the engine cylinders and each plunger 7 will have an angle-shaped duct 10 opening through the inner end of the plunger and at one side to put the conduit 9 into communication with the compression chamber 11 of the barrel 8 at the correct instant. The fuel is conducted to the pump barrel 8 through a pipe 12 and intake passage 13 entering the chamber 11 at such a point that it will be uncovered by the plunger near the outer end of its stroke, and the pump barrel 8 will also have an air port 14 adjacent the duct 13 to be overrun by the plunger 7 when the suction or intake stroke thereof is about finished. The pressure which the pump produces in the chamber 11 will of course be less than the ignition pressure of the fuel entering this chamber.

On the suction stroke of the plunger 7 the fuel is drawn in through the pipe 12 and duct 13 as soon as the plunger overruns this duct. The side port of the passage 10 in the piston 7 is now out of registry with the discharge conduit 9 and this condition continues for part of the suction stroke of the piston in the cylinder to which the conduit 9 leads. On the suction stroke of the plunger 7 itself the end of the port in the side of this plunger remains in registry with the conduit 9 for a short period, thus creating a suction on the conduit 9 relieving this pipe and the injection nozzle and thereon in the engine cylinder of all pressure, and thereby prevent after-drip of fuel. As soon as the plunger closes the conduit 9 the pressure in the chamber 11 falls and when the pump plunger passes down far enough the duct 13 is opened. The fuel then passes into the cylinder 11 and on further movement the plunger opens the port 14, restoring the pressure in the chamber 11 to atmosphere. Hence no more fuel enters this chamber, but air flows in and mixes with the fuel. On its return

or compression stroke the port 14 and duct 13 are closed in succession. Then the air and fuel mixture in the chamber 11 is compressed and as soon as the duct 10 registers with the conduit 9 the compressed mixture will flow through this pipe to the fuel nozzle of the engine and enter the combustion chamber thereof.

The duct is controlled by a needle valve 15 having a gear head 16 which can be adjusted by a ring gear 17 which is rotatably mounted on the housing 1 in any suitable way. This ring gear may be turned by a lever 20 which can be connected to move in unison with the air throttle lever of the engine.

The upper end of the pump barrel 8 is in the form of a boss 21 closed by a cap 22 and from the side of the barrel 8 projects a boss 23 containing the duct 13; the outer end of this boss being closed by a perforated cap 24 which may contain suitable packing surrounding the needle valve 15. On the top of the projection 23 is an internally threaded boss or hollow projection 25 containing a packing gland 26 to enable the fuel supply pipe to be connected to the pump. The needle valve 15 is of course threaded in the boss 23.

To lubricate the plunger 7 a hollow boss 27 is formed on the side of the barrel 8 with an oil hole 28 at its inner end passing through the wall of the barrel 8 and closed at its outer end by a cap 29. The plunger may be surrounded by a groove 30 which receives the oil when it registers with the opening 28.

To simplify the installation of this pump the shaft 2 may also be employed to operate the timer 31 at the same speed as the pump itself.

I can also provide regulation by connecting an air bellows between the throttle valve and the device 15 arranging this bellows so that it is connected to the inlet manifold of the engine to contract or be expanded by the degree of compression therein and thus change the degree of opening of the needle valve.

The means for driving the plunger from the shaft 2 and eccentric 3 as shown in Fig. 1 should be viewed as diagrammatic only; for the connections between the eccentric 3 and the strap 5 and the plunger 7, when several pumps are driven from the same shaft, can be properly designed and made by anyone skilled in this art. Such connections are not part of this invention and no claim therefor is made herein.

The device is thus very simple and unlikely to get out of order and capable of very efficient operation. The air and fuel are thoroughly mixed in the chamber 11 and when discharged through the pipe 9 to the particular cylinder, combustion occurs at once and is quickly completed.

Having described the invention, what is claimed is:

1. A pump comprising a barrel and a

plunger movable therein, a discharge pipe, a supply pipe and an air port in the barrel in position to be overrun by the plunger at the outer end of its stroke and connecting the interior of the barrel with the atmosphere adjacent the supply pipe, said barrel and plunger forming a chamber and being formed so that the interior walls of said chamber are rigid throughout.

2. A pump comprising a plunger, a barrel for the plunger with a supply duct leading into the barrel and an air port adjacent said duct, both the duct and the air port being successively overrun by the piston on its outstroke, and a pipe connected by the piston to the interior of the barrel on the in-stroke of the piston, said barrel and plunger forming a chamber and being formed so that the interior walls of said chamber are rigid throughout.

3. A pump comprising a plunger, a compression barrel receiving the plunger, a duct having a port communicating with the barrel and a supply pipe connected to said duct, an air port adjacent the said duct, said duct and said port being adapted to be overrun successively by the plunger on its outstroke, a delivery conduit connected to the cylinder, the plunger having an L-shaped passage opened through its inner end and one side to put the delivery conduit in communication with the barrel on the compression stroke of the plunger, said barrel and plunger forming a chamber and being formed so that the interior walls of said chamber are rigid throughout.

4. A pump comprising a compression barrel having a boss at one side and means received therein for connecting a discharge pipe to said barrel, the latter also having a longer boss containing a duct for the admission of fuel, means on said last-named boss for connecting a supply pipe to the barrel, a needle valve controlling said duct, a gear on the outer end of said valve and a gear meshing with said first gear to enable said valve to be turned and regulated.

5. A pump comprising a plunger, a barrel for the plunger with a supply duct leading into the barrel and an air port adjacent said duct, both the duct and the air port being successively overrun by the plunger on its outer stroke, and a discharge pipe connected by the plunger to the interior of the barrel on the in-stroke of the plunger, the barrel having a lubricating opening and the plunger a groove to register with said opening, said barrel and said plunger enclosing a chamber and being so formed that the walls of said chamber are rigid throughout.

6. A pump comprising a compression barrel having a boss at one side and means received therein for connecting a discharge pipe to the barrel, the latter also having a longer boss containing a duct for the admis-

sion of fuel, a hollow projection on said last-named boss for connecting a supply pipe to the barrel, a needle valve controlling said duct, and means for adjusting said valve.

5 7. A pump comprising a compression barrel having a boss on one side, and means received therein for connecting a discharge pipe to the barrel, another boss on the barrel

containing a duct for the admission of fuel, a hollow projection on said last-named boss for connecting a supply pipe to the barrel, a needle valve controlling said duct and gearing on the outer end of said valve to enable 70 said valve to be turned and regulated.

In testimony whereof I affix my signature.

LOUIS BEEH.

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