

No. 654,140.

Patented July 24, 1900.

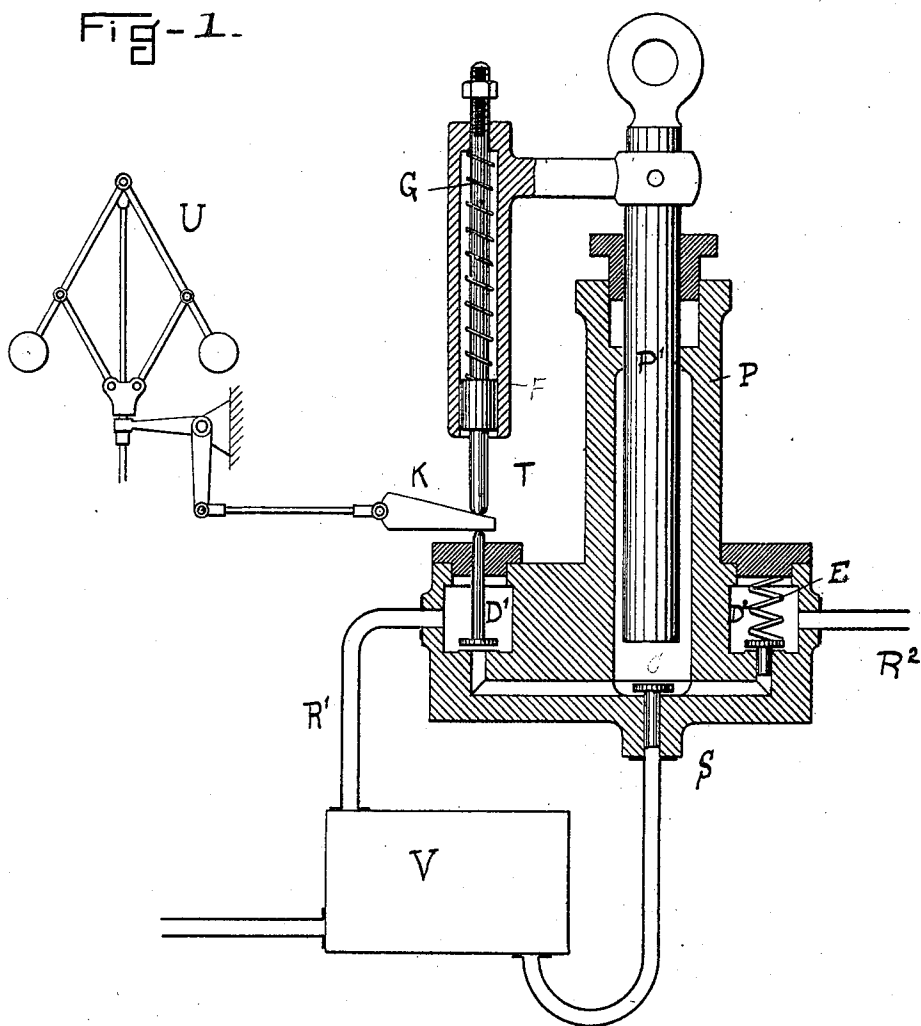
R. DIESEL.

APPARATUS FOR REGULATING FUEL SUPPLY OF INTERNAL COMBUSTION ENGINES.

(Application filed Sept. 10, 1898.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

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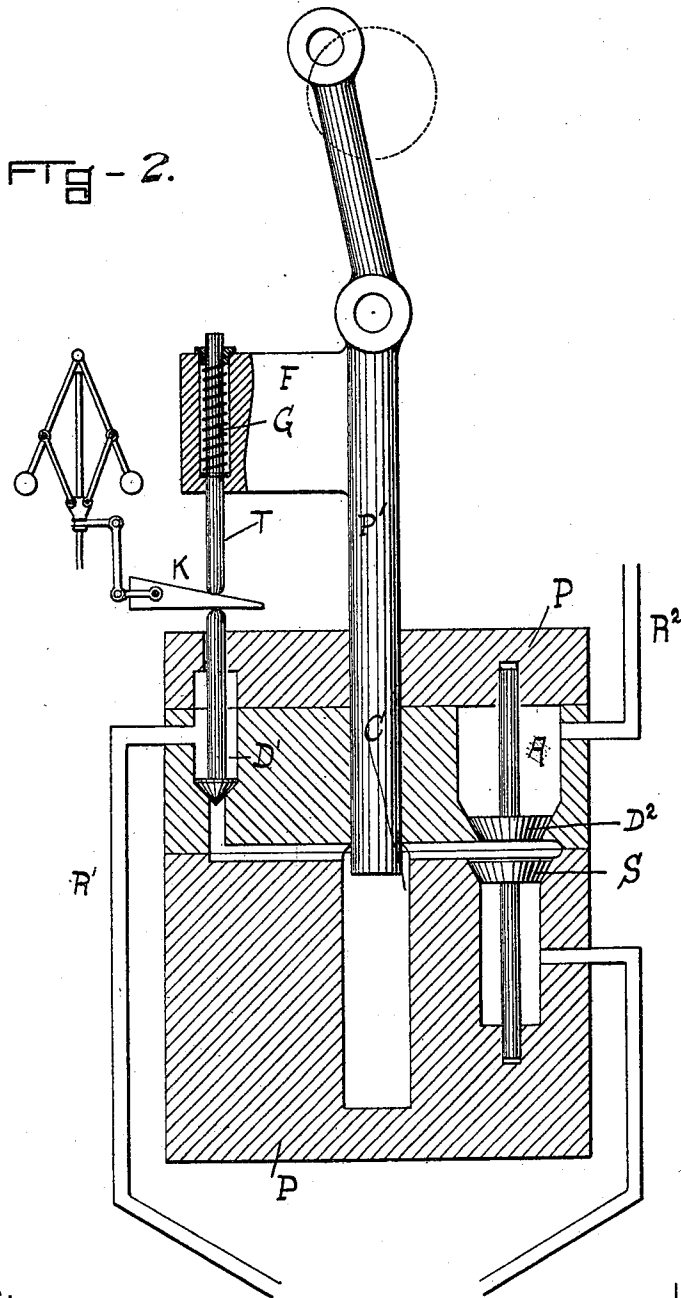
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WITNESSES:

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UNITED STATES PATENT OFFICE.

RUDOLF DIESEL, OF MUNICH, GERMANY, ASSIGNOR TO THE DIESEL MOTOR COMPANY OF AMERICA, OF NEW YORK.

APPARATUS FOR REGULATING FUEL-SUPPLY OF INTERNAL-COMBUSTION ENGINES.

SPECIFICATION forming part of Letters Patent No. 654,140, dated July 24, 1900.

Application filed September 10, 1898. Serial No. 690,692. (No model.)

To all whom it may concern:

Be it known that I, RUDOLF DIESEL, a subject of the Emperor of Germany, residing at Munich, Kingdom of Bavaria, Germany, have invented certain new and useful Improvements in Apparatus for Regulating the Fuel-Supply of Internal-Combustion Engines, of which the following is a specification.

My invention relates to improvements in an apparatus for regulating the fuel-supply of internal-combustion engines, its object being to supply a quantity of fuel, varying with the load of the motor, to a certain part of the motor, from which part the fuel is fed into the combustion-chamber, either directly or indirectly, by means of atomizers, vaporizers, gasifiers, or mixing-chambers.

To this end my invention consists, essentially, in the combination, with a fuel-supply, of a pump having its chamber provided with a suction-valve connected to the fuel-supply, a fuel-feed valve connected to the part from which the fuel is fed into the combustion-chamber and with a return-valve connected to the fuel-supply, and means for throttling or closing the return-valve by the governor of the engine, so as to regulate the volume of fuel actually delivered to the combustion-chamber of the motor, the balance of the fuel drawn at each stroke being returned to the fuel-supply.

The nature of my invention will best be understood when described in connection with the accompanying drawings, in which—

Figure 1 represents a diagrammatic sectional elevation of one form of my invention, particularly applicable to gaseous fuel. Fig. 2 is a similar elevation of another form, particularly applicable to liquid fuel.

Similar letters of reference designate corresponding parts throughout both views of the drawings.

In the drawings the letter P designates the pump-body, and P' the plunger or piston, of a fuel-pump actuated by the motor, and which plunger at every stroke raises a certain volume of fuel.

C is the pump-chamber; S, the suction-valve of the pump; D' and D², discharge-valves, of which D' is connected to the fuel-supply by a pipe R' and serves to return the

excess of fuel drawn by the plunger or piston to the supply-chamber or pipe V, while the balance passes through the valve D² and pipe R² to the combustion-chamber. By any suitable means, such as a spring E or by the pressure beyond it, the valve D² is loaded more heavily than the valve D', so that unless the valve D' is throttled during part of the stroke all the fuel is returned to the supply.

T is a stem held down by a spring G and located within a casing F, connected with the plunger P', so as to cause the stem to move up and down with the said plunger. Any other suitable connection may be substituted. During its downward motion this stem closes or throttles the return-valve D' for a certain period of time.

K is a wedge interposed between the stem T and the stem of the return-valve D' and so connected to the regulator U of the engine that it is moved in and out from between the two stems, thereby regulating the time and duration of throttling or closing of the valve D', which time may be further regulated by the tension of the spring. Thus the fuel actually delivered to the combustion-chamber is regulated by the governor of the engine. The wedge K may be replaced by any other usual device serving the purpose of closing or throttling a valve by the action of the governor, or it may be adjusted or set by hand.

In the form shown in Fig. 1 the discharge-valves D' and D² are placed near to or are connected to the lower end of the pump-chamber C, and this form is particularly adapted for the use of gaseous fuel, although under favorable circumstances it is equally adapted to liquid fuel. When, however, leakages in the pump itself occur or when part of the pump-chamber is apt to be filled with vapors of petroleum—as, for instance, after a long stoppage—its action is less certain. The form of the apparatus shown in Fig. 2 overcomes these difficulties. In this form the return-valve D' is located higher than the top of the pump-chamber C and is connected to the top of the feed-chamber, while the lower face of the feed-valve D² when closed is about in line with or below the top of the pump-chamber C, so that any vapors or gases in the feed-chamber will rise to the return-valve D'

so long as the feed-valve D^2 is closed. The chamber above the valve D' extends above the outlet to the return-pipe R' and is open at the top around the valve-stem, so as to allow air and vapors to escape, while the excess of liquid fuel is returned to the fuel-supply through the return-pipe R' . The arrangement shown for closing or throttling the return-valve D' is substantially the same as shown in Fig. 1. The automatic ventilating and return valve D' opens during the first part of the pressure-stroke, allowing all the air and vapors to escape and a portion of the petroleum to return to the fuel-supply until the stem T closes it, as before described, whereupon the feed-valve D^2 is forced open and fuel supplied to the motor. It is apparent that this method of action of the pump may be reversed, inasmuch as the petroleum needed for the motor can be forced into the same at the beginning of the pumping stroke and at a fixed period of admission by keeping the ventilating return-valve closed during this time. After reopening the return-valve the surplus of petroleum is then discharged, as before.

What I claim as new is—

1. In an apparatus for supplying a variable quantity of fuel to a combustion-motor, the combination with the fuel-supply, of fuel-forcing means communicating therewith, and supplying at each working stroke of the motor an excess of fuel under a pressure less than the back pressure of the motor, means to allow part of this fuel to return to the fuel-supply under this lower pressure, and means to shut off the return flow and cause the remainder to be forced to the motor under a higher pressure, substantially as and for the purpose specified.

2. In an apparatus for supplying a variable quantity of fuel to a combustion-motor, the combination with the fuel-supply, of a pump operated by the motor, the pump-chamber being provided with a suction-valve, a return-valve and a fuel-feed valve; the return-valve

normally opening at a lower pressure than the feed-valve, and means for closing or throttling the return-valve at a part of the stroke regulated by the governor of the motor, or by hand, substantially as and for the purpose specified.

3. In an apparatus for supplying a variable quantity of fuel to a combustion-motor, the combination with the fuel-supply, of a pump operated by the motor; the pump-chamber being provided with a suction-valve, a return-valve and a fuel-feed valve; the return-valve normally opening at a lower pressure than the feed-valve, a spring-rod connected to the pump-rod and adapted to close the return-valve, a speed-governor of suitable construction, and connections substantially as described for varying the time and duration of the closing or throttling of the return-valve through the action of the governor, substantially as and for the purpose specified.

4. In an apparatus for supplying a variable quantity of liquid fuel to a combustion-motor, the combination with the fuel-supply, of a pump operated by the motor; a suction-valve connected to the pump-chamber; a ventilating return-valve D' located above and connected to the top of the pump-chamber, a chamber above said valve with a ventilating opening at the top and a return connection R' from beneath the top to the fuel-supply; a feed-valve D^2 , the lower face of which, when closed, is at or below the top of the pump-chamber; the return-valve normally opening at a lower pressure than the feed-valve, and means substantially as described for closing or throttling the feed-valve at a part of the stroke regulated by the governor, or by hand, substantially as and for the purpose specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

RUDOLF DIESEL.

Witnesses:

EPSIVUCKY,
HARRY BELMONT.

It is hereby certified that in Letters Patent No. 654,140, granted July 24, 1900, upon the application of Rudolf Diesel, of Munich, Germany, for an improvement in "Apparatus for regulating Fuel-Supply of Internal-Combustion Engines," errors appear requiring correction, as follows: The drawings forming a part of said patent should have been corrected, as directed by the patentee in an amendment and drawing duly filed before the issue of the patent, as follows: In Fig. 1 letter *C* should designate the *pump-chamber*, letter *F* should designate the *casing surrounding the spring G*, and letter "F" indicating the spring above the valve *D*² should be *E*, and, Fig. 2, the letter *A* should be erased; and that the drawings and the patent should be read as herein set forth to make the same conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 28th day of August, A. D., 1900.

[SEAL.]

Countersigned:

WALTER H. CHAMBERLIN,
Acting Commissioner of Patents.

F. L. CAMPBELL,
Assistant Secretary of the Interior.