H. LEMP.

PUMP.

APPLICATION FILED MAR. 26, 1913.

1,118,363. Patented Nov. 24, 1914.

Fig. 4.

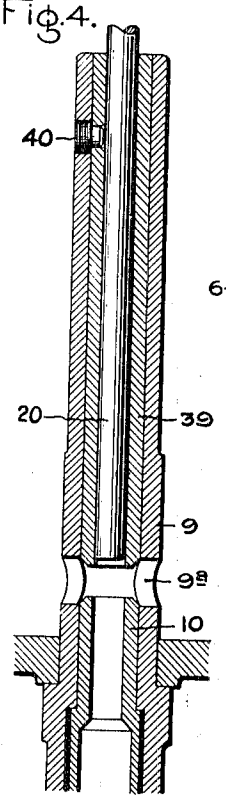

Fig. 1.

Fig. 2.

Fig. 3.

Witnesses:

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UNITED STATES PATENT OFFICE.

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PUMP.

1,118,363. Specification of Letters Patent. Patented Nov. 24, 1914.

Application filed March 26, 1913. Serial No. 756,837.

To all whom it may concern:

Be it known that I, HERMANN LEMP, a citizen of the United States, residing at Erie, in the county of Erie, State of Pennsylvania, have invented certain new and useful Improvements in Pumps, of which the following is a specification.

The present invention relates to pumps and more especially to those intended for supplying fuel under high pressure to internal combustion engines operating on the high compression plan.

The object of my invention is to provide a pump of simple construction and one which is capable of being easily regulated to vary the output from maximum to minimum, and vice versa, in accordance with the demand for fuel.

For a consideration of what I believe to be novel and my invention, attention is directed to the accompanying description and claims appended thereto.

In the accompanying drawing, which illustrates one of the embodiments of my invention, Figure 1 is a longitudinal section of a pump; Fig. 2 is a detailed view showing the arrangement of the ports admitting fluid to the cylinder on the suction stroke; Fig. 3 is a section taken on the line 3—3 of Fig. 2, and Fig. 4 is a longitudinal section of a slight modification of the pump cylinder.

5 indicates the pump casing which is secured to a support 6 of any suitable character, such, for example, as the frame of an internal combustion engine. The casing is cored out to form a chamber 7 to which fuel is admitted by the passage 8 from an elevated tank or other source of supply. The casing is provided with a central bore, and located therein is a lining 9 forming a pump barrel which is provided with a flange or shoulder at its lower end that engages with an internal shoulder formed on the casing. The lining or pump barrel has a central bore of uniform diameter throughout its length. In the lower part of the lining is mounted a cylinder 10 which is made as hard as possible to reduce wear. In the upper end of the cylinder are formed ports 11 through which fluid freely flows from the lining ports 11^a and chamber 7 when said cylinder ports are uncovered by the pump plunger. The cylinder is also provided with a flange or shoulder 12 that rests on the shoulder on the lining. The cylinder and lining are held in place by the coiled compression spring 13 that rests on the head 14 which is screw-threaded to the casing. The lower end of the cylinder 10 is provided with a seat for the pressure actuated discharge valve 15. This valve is normally held on its seat by a coiled compression spring 16. In order to decrease the liability of the pump failing to operate by reason of faulty operation of the high pressure discharge valve I provide two such valves 15 and 17 and arrange them in series. The valves are similar in construction, all being hollow to reduce the weight and are held against their seats by springs 16. In the head is a fitting 18 containing a passage communicating with the pipe 19 that extends to the fuel injector or pulverizer supplying fuel to the combustion space of the engine.

Located inside of the lining or pump barrel 9 is a plunger 20, the lower end of which is somewhat reduced in diameter so as to make a good working fit with the bore of the cylinder 10. This plunger is also hardened to reduce wear. The upper part of the plunger is guided by the lining 9. The top of the plunger is provided with a head 21 having a rounded upper surface, and resting thereon is a plug 22 having a flat under face. This arrangement of parts prevents binding or cramping as the plunger moves up and down. Plug 22 is carried by a cylindrical cross-head 23 which is guided in its movements by the wall of the pump casing. In the upper side of the cross-head is mounted a removable plug 24 which is engaged by a roller 25 on the rocker 26. As the roller is depressed the cross-head 23 and plunger 20 are correspondingly depressed and any fluid in the cylinder 10 is displaced and passes through the valves 15 and 17 into the discharge pipe 19. In order to lift the plunger after it has been depressed by the rocker, a coiled compression spring 27 is provided that rests on the casing at its lower end and engages a holder 28 at its upper end, said holder having a central bore and an internal shoulder that engages the head 21 of the plunger.

The rocker 26 is provided with a pivot made in the form of an eccentric 29, which is mounted upon a shaft 30, the latter being mounted in a suitable bearing 31 carried by the frame 6. The rocker is constantly vibrated with a fixed stroke by the eccentric 32 which is mounted upon the shaft 33,

the latter being driven from the engine by any suitable form of mechanical connection. Surrounding the eccentric is a strap that is connected to the rod 34, the latter being pivotally connected to the rocker.

In the operation of an internal combustion engine it is necessary to change the amount of fuel admitted to the cylinders to compensate for changes in load or speed. This is particularly true where the engines are employed to drive motor cars either directly or indirectly through suitable speed reducing means such as electric generators and motors, for example. In such an engine it is important so to arrange the parts that the supply of fuel can be changed quickly and with certainty to meet the exact requirements of the operating condition. To this end, the rocker 26 is mounted on an eccentric, and by turning the eccentric the effective action of the pump can be changed. On the eccentric carrying shaft 30 is mounted a lever 35 which is provided with a handle 36 at its lower end. This handle cooperates with a segmental rack 37 having teeth on one side which engage a latch in the handle, which latch is controlled by the plunger 38. As the lever is moved to and fro on the rack, the angular position of the eccentric 29 will be changed. This means that the rocker will be constantly vibrated with a fixed stroke, but the region of vibration will change as the position of its fulcrum is changed. This also means that the pump plunger will be vibrated with a stroke of constant length but that the region of its vibration will vary with changes in the angular position of its fulcrum as determined by the position of the lever 35. To state the matter in another way, the plunger 20 always has the same length of movement up and down, but sometimes this movement causes all or practically all of the fluid to be discharged from the cylinder 10, and at other times only a small part thereof, due to the fact that on the downward stroke the plunger passes only a short distance below the lower edges of the ports 11.

In the figures thus far described, cylinder 10, which is glass hard, is provided with ports 11. I have found that it is difficult to get these cylinders properly made and hardened without cracking the metal around the ports. To overcome this objection, I have devised the arrangement shown in Fig. 4, in which 9 indicates the lining forming the pump barrel as before and is provided with one or more ports 9^a. 10 indicates a hardened cylinder which is forced into the lining from the under side and is fixed in position by a shoulder, as described in connection with Fig. 1. The upper end of the cylinder instead of being provided with ports is ground true in a plane perpendicular to the axis thereof. Situated above the cylinder and making a snug fit in the lining is a sleeve 39 which is held in place by a screw-threaded pin 40. Between the adjacent ends of the sleeve and cylinder is a space through which fluid freely flows from the lining ports 9^a. Located inside of the sleeve is a plunger 20 of uniform diameter throughout its length. This plunger is also hardened and makes a good working fit with the bore of the cylinder 10. By making the plunger of one diameter throughout its length, instead of two, as shown in Fig. 1, I am able to get much more accurate results, for the reason that it is difficult to grind two surfaces so that they will be exactly concentric. By omitting the ports 11 in the cylinder and making the top thereof perfectly flat, I avoid the difficulties incident to the formation of ports in the hardened cylinder.

It will be noted that my improved pump is extremely simple in construction and in operation, and that its output can be quickly and easily varied from maximum to minimum and vice versa by a simple movement of the hand lever. Pumps of this character are commonly required to deliver fuel at a pressure of 1000 to 1200 lbs. per sq. in., and hence the importance of accurately fitting all of the parts and hardening the plunger and cylinder and providing a simple means for varying the amount of fuel delivered by the pump cannot be over estimated.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. In a pump, the combination of a cylinder into which fluid is free to flow on the suction stroke, a reciprocating plunger, a discharge valve, a rocker for actuating the plunger which has a constant length of stroke, a pivot for the rocker, and a manually actuated means for moving the pivot to change the region of reciprocation of the rocker and plunger.

2. In a pump, the combination of a cylinder into which fluid is free to flow on the suction stroke, a discharge valve, a reciprocating plunger which has a constant length of stroke but variable region of reciprocation, a rocker for actuating the plunger, means having a constant length of stroke for vibrating the rocker, an eccentric pivot for the rocker, and means for turning the eccentric to change the region of vibration of the rocker and the plunger.

3. In a pump, the combination of a cyl-

inder into which fluid is free to flow on the suction stroke, a pressure actuated discharge valve, a reciprocating plunger, a spring for withdrawing the plunger from the cylinder on the suction stroke, a rocker that forces the plunger into the cylinder against the action of the spring on the working stroke, an actuator for the rocker which has a constant length of stroke in a fixed region, a pivot for the rocker, a lever for adjusting the pivot to change the region of vibration of the rocker and plunger, and means for locking the lever in its various positions.

4. In a pump, the combination of a casing, a lining therefor, a hardened cylinder that is located in a lining into which fluid is free to flow on the suction stroke, a spring pressed discharge valve that is seated in one end of the cylinder, a hardened plunger that displaces the fluid from the cylinder, and means for actuating the plunger.

5. In a pump, the combination of a casing, a ported lining therefor which is of the same bore throughout its length, a hardened cylinder which is inserted in one end of the lining, a sleeve that is inserted in the opposite end of the lining, said cylinder and sleeve having bores of the same diameter and separated at their ends by a space through which fluid freely flows into the cylinder through the port in the lining on the suction stroke, a plunger of uniform diameter that is guided by the sleeve, a discharge valve, and means for actuating the plunger.

6. The combination in a pump, of a member forming a pump barrel, said member having an opening through its side through which fluid is free to flow on the suction stroke, a hardened cylinder inserted in one end of the member, the end of said cylinder terminating adjacent said opening, a hardened plunger for the cylinder which is guided by the pump barrel, and means for operating the plunger.

In witness whereof, I have hereunto set my hand this 24th day of March 1913.

HERMANN LEMP.

Witnesses:

OTTO F. PERSSON,

ELIZABETH CONNELL.