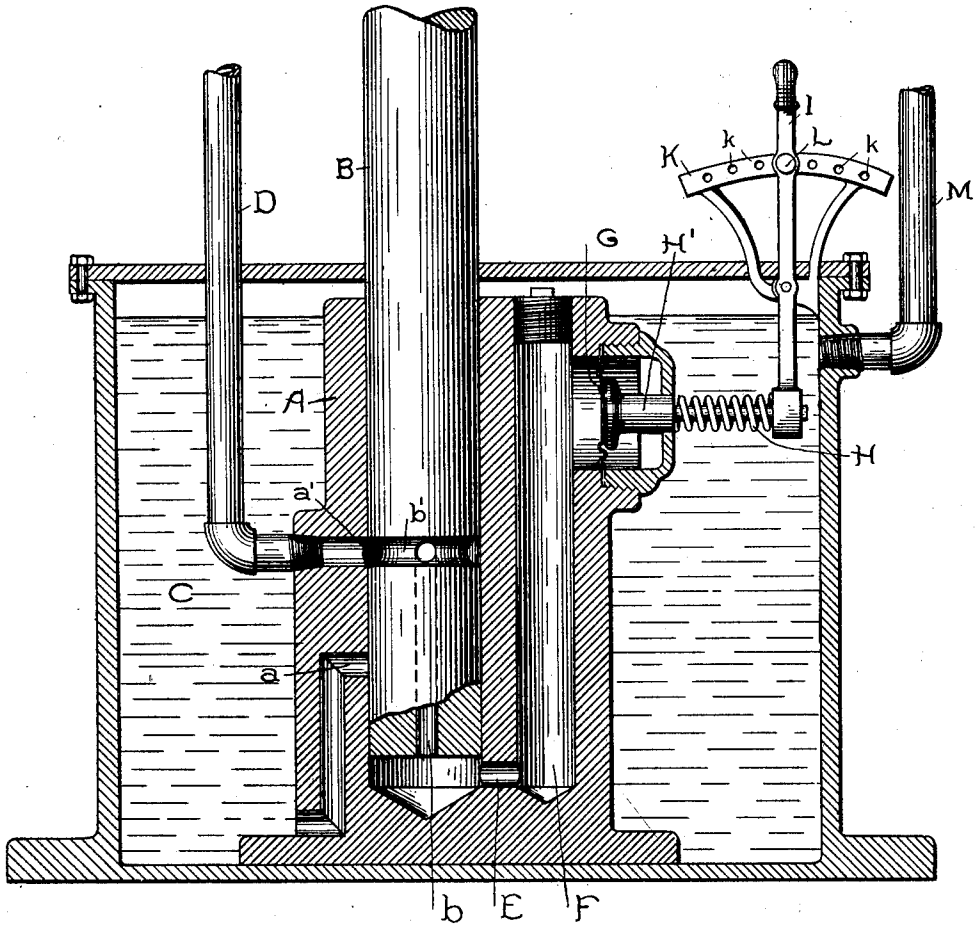
No. 732,169. PATENTED JUNE 30, 1903.

L. S. CHAPMAN.

VALVELESS PUMP.

APPLICATION FILED JULY 27, 1901. RENEWED MAY 4, 1903.

NO MODEL.



Witnesses.

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No. 732,169. Patented June 30, 1903.

UNITED STATES PATENT OFFICE.

LEWIS S. CHAPMAN, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

VALVELESS PUMP.

SPECIFICATION forming part of Letters Patent No. 732,169, dated June 30, 1903.

Application filed July 27, 1901. Renewed May 4, 1903. Serial No. 155,683. (No model.)

To all whom it may concern:

Be it known that I, LEWIS S. CHAPMAN, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Valveless Pumps, of which the following is a specification.

This invention relates to pumps, and especially to those used for feeding liquid fuel to hydrocarbon-engines, though the mechanism may be employed equally well in pumping liquid of any kind.

The object of the invention is to do away with all valves and produce a pump which can run constantly at a constant stroke whether feeding the liquid or not.

Under some circumstances it may be desirable to feed through a pressure-regulator. My pump will operate equally well whether the regulator permits the liquid to flow through it or not. It therefore requires little or no attention, as it can be connected positively with a constantly-running portion of the machine or motor.

The invention consists in a pump having a piston operating in a cylinder connected with an air-chamber or other pressure-governing device and having ports which are opened and closed by the piston itself.

The accompanying drawing is a sectional elevation of a pump embodying my improvements.

It is advisable to submerge the pump-casing in the liquid to be pumped in order to reduce the work and prevent air from leaking into the pump.

The cylinder A receives the plunger B and has at a certain point above its lower end a port *a*, communicating with the liquid-reservoir C. A short distance above the port *a* the cylinder is provided with an internal groove *a'* in a plane transverse to the axis of the cylinder. A delivery-pipe D communicates with this groove. A longitudinal passage-way *b* runs from the lower end of the plunger and at a suitable distance therefrom communicates with the outside of the plunger, preferably opening into a circumferential groove *b'*. The lower end of the cylinder communicates by a passage E with a closed chamber F, containing an abutment movable under pressure. I prefer to use a flexible diaphragm G, covering an opening in the wall of the chamber. The drawing is merely illustrative, since in practice the size of the diaphragm would vary under different conditions of pressure, stroke of plunger, capacity of chamber, and the like. To cause the diaphragm to yield only under strong predetermined pressure, a spring H is arranged with one end pressing against the diaphragm or against an intermediate follower H' and the other end against a tension-adjusting device, such as a lever I, moving beside a quadrant K, to which it can be locked in any suitable manner, or by a pin L and a series of holes *k* in the quadrant.

M is a pipe for filling the reservoir C.

The operation of my device is as follows: On the upstroke of the plunger the air in the cylinder and the chamber F is rarefied until the end of the plunger passes the inlet-port *a*, when the liquid rushes in and the air contracts to its normal volume and atmospheric pressure. On the downstroke of the pump the end of the plunger closes the inlet-port *a* and forces the charge of liquid into the chamber F. The air is compressed until the tension of the spring H is overcome, when the diaphragm yields outwardly. As soon as the groove *b'* registers with the groove *a'* the liquid is expelled by the combined pressure of the air and the spring through the passage *b* into the delivery-pipe. In case the delivery-pipe is fitted with a pressure-regulator and it has operated to shut off the feed through the pipe the pump simply works against the tension of the spring H, which is compressed at every downstroke and gives back at every upstroke the energy thus stored in it.

It will be seen that this pump is practically valveless, the inlet and outlet ports being controlled by the plunger itself. It can be driven at a constant speed and stroke, since it makes no difference whether the delivery-pipe is open or not. It thus makes a convenient pump for feeding liquid fuel to a hydrocarbon-engine, since it requires no attention, except, possibly, to adjust the tension of the spring from time to time, either to keep it

constant or to meet changed conditions of service. If the air originally confined in the pressure-chamber should be gradually absorbed by the liquid, the diaphragm and spring will yet afford sufficient play to insure the proper working of the pump, even with its chamber constantly full of liquid.

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 having inlet and outlet ports formed therein, a piston arranged to cover and uncover the ports, a chamber which is at all times in open communication with the cylinder-space and contains a body of air for expelling fluid from the cylinder, and a means whereby the cubical contents of the chamber can be adjusted.

2. In a pump, the combination of a cylinder having inlet and outlet ports formed therein, a piston arranged to cover and uncover the ports, a chamber which is at all times in open communication with the cylinder-space and contains a body of air for expelling fluid from the cylinder, a yielding medium which forms a part of the air-chamber, and a manually-actuated means whereby the capacity of the chamber can be adjusted.

3. In a pump, the combination of a cylinder having inlet and outlet ports formed therein, a piston arranged to cover and uncover the ports, a chamber which is at all times in open communication with the cylinder-space, and contains a body of air for expelling fluid from the cylinder, a diaphragm which forms a part of the wall of the chamber, a spring for adjusting the tension on the chamber, and a lever for adjusting the tension of the spring.

4. In a pump, the combination of a casing containing a cylindrical space and an air-chamber which are in free communication at all times, a diaphragm which is mounted on the casing in a manner to be acted upon by the pressure in the air-chamber, a yielding abutment acting on the diaphragm, a lever for adjusting the abutment, ports formed in the cylinder-wall, and a port or passage which extends longitudinally of the piston and communicates with the outlet-port in the cylinder when the piston reaches the inner end of its stroke, whereby the expansion of air in the chamber is permitted to force the fluid to be pumped outward.

5. The combination with a pump-cylinder having inlet and outlet ports, of a plunger controlling said ports and operating to open the delivery-port at the end of its stroke, and an air-chamber connected with the cylinder and having a yielding spring-pressed abutment, the air in said chamber being employed to discharge fluid from the cylinder.

6. The combination with a cylinder A having the inlet-port a and groove a' forming a part of the outlet-port, of a plunger B having a passage b and groove b', and an air-chamber F having a diaphragm G and spring H, the said chamber acting to discharge fluid from the cylinder.

7. In a pump, the combination of a cylinder having inlet and outlet ports formed therein, a piston which covers and uncovers the ports as it moves to and fro, and a yielding medium which coöperates with the piston to force fluid through the outlet-port when the latter is uncovered by the piston.

8. In a pump, the combination of a cylinder having inlet and outlet ports formed therein, a piston which covers and uncovers the ports as it moves within the cylinder, a chamber communicating with the cylinder, and a yielding medium which forms a part of the chamber and coöperates with the piston to discharge fluid through the outlet-port.

In witness whereof I have hereunto set my hand this 26th day of July, 1901.

LEWIS S. CHAPMAN.

Witnesses:
BENJAMIN B. HULL,
EDWARD WILLIAMS, Jr.