Jan. 31, 1933. W. R. HEWITT 1,895,623

PUMP

Filed March 10, 1930

Fig. 1.

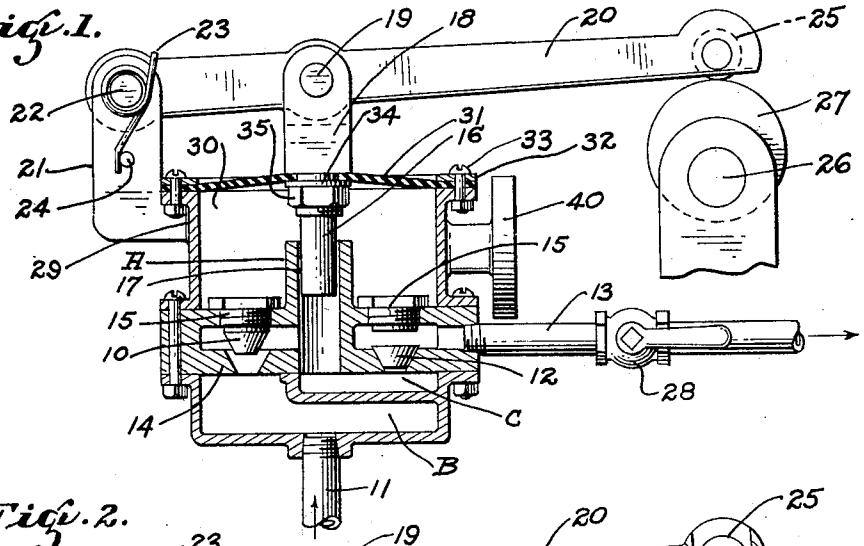


Fig. 2.

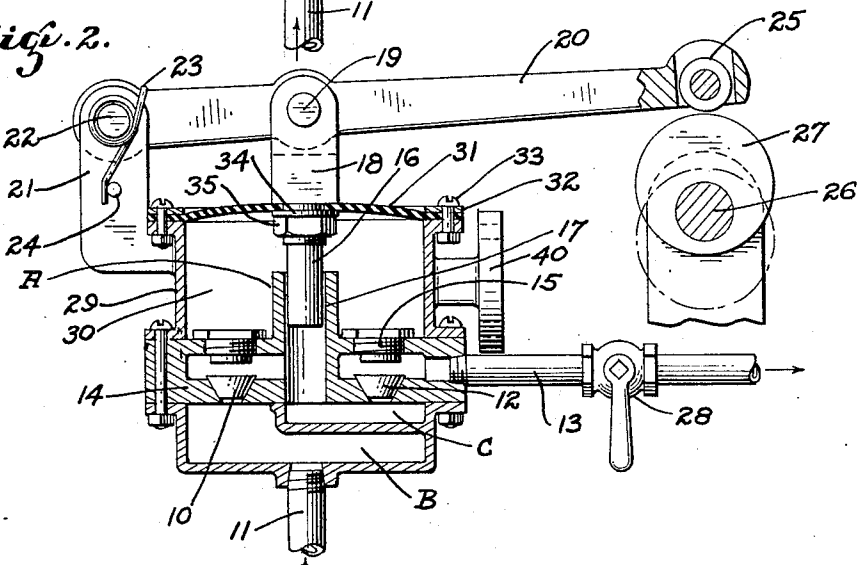
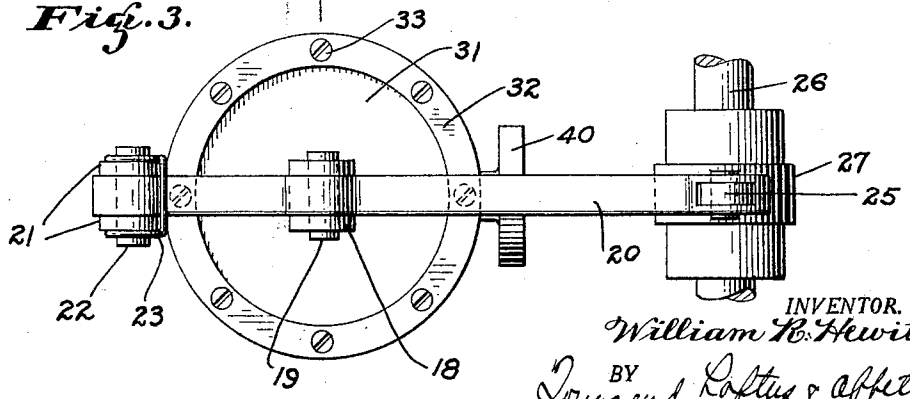


Fig. 3.



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UNITED STATES PATENT OFFICE

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PUMP

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This invention relates to fluid pumps and more particularly to an improved type of plunger pump in which the degree of pressure existing at the discharge end regulates and controls the operation of the plunger.

The object of my invention is to provide a pump, the operation of which will be automatically regulated by the pressure in its discharge chamber or in other words an improved type of pump for delivering a fluid at a constant rate of flow as measured in terms of pressure.

I attain my object through the provision of a reciprocal type of pump having a cylinder and a loosely fitting plunger therein. The plunger is adapted to be reciprocated by an oscillatory lever which receives its oscillating motion from a cam mechanism. A pressure chamber surrounds the cylinder and is sealed by an elastic diaphragm interposed between the top of the cylinder and the lever and secured with relation to the plunger. Increase in pressure in the discharge chamber of the pump causes the fluid being pumped to escape past the loosely fitting plunger and into the pressure chamber where it acts upon the elastic diaphragm to force the lever out of communication with the cam mechanism by which it is driven thereby decreasing the stroke or discontinuing the operation of the pump until the pressure in its discharge chamber is reduced.

The invention is shown by way of illustration in the accompanying drawing, in which—

Fig. 1 is a vertical section of a pump embodying the advantageous features of my invention,

Fig. 2 is a similar view showing a different phase of the operation of the same pump, and

Fig. 3 is a plan view of the pump shown in Figs. 1 and 2.

Referring more particularly to the drawing, especially to Figs. 1 and 2, I show a pump cylinder A having an inlet chamber B and an outlet chamber C communicating therewith. An intake valve 10 in the inlet which may be of any suitable type is disposed between the cylinder A and a source of fluid supply indicated by a pipe 11. A discharge valve 12 in the outlet chamber is similarly disposed between the cylinder A and a discharge pipe 13. The valves 10 and 12 are carried by a valve chest 14 and bonnets 15 screwed into ports in the chest 14 directly above each of the valves limit their upward or opening movement.

The plunger 16 is reciprocably mounted in the cylinder A. It will be noticed that the plunger is slightly less in diameter than the internal diameter of the cylinder, providing an annular space between the plunger and the cylinder. A link 18 secured to the plunger is pivotally attached by a pin 19 to an oscillatory lever 20. One end of the lever 20 is pivotally attached to a supporting pillar 21 by means of a shaft 22. A spring 23 is fastened at its ends by a pin 24 extending through the pillar 21, is wound round the shaft 22 and bears downwardly upon the lever 20 as is best shown in Fig. 1. The tension of the spring 23 is sufficient to impart a downward stroke to the plunger 16 in the cylinder A. The opposite end of the lever 20 is provided with a roller 25.

A drive shaft 26 which is continuously rotated by any convenient source of power (not shown) carries an eccentric cam 27. The roller 25 on the lever 20 engages this cam and, as is obvious, the lever is oscillated about the axis of the shaft 22 by the opposing forces of the rotating cam 27 and the spring 23 and oscillatory motion of the lever imparts reciprocal motion to the plunger 16 through the link 18.

From the description so far it may be seen that the operation of the pump is as follows:

The drive shaft 26 and the cam 27 are rotated. Each revolution of the eccentric cam 27 imparts an upward stroke to the plunger 16 in the cylinder A through the lever 20 and the link 18. Upon the upward stroke of the plunger a suction is created in the valve chest 14 causing the discharge valve 12 to close and the intake valve 10 to open, whereby fluid may be drawn into the cylinder from the supply pipe 11. Between each complete revolution of the cam 27 the plunger is forced downwardly in the cylinder A by

means of the spring 23 bearing downwardly upon the lever 20. On the downward stroke of the plunger a pressure is created within the valve chest forcing the intake valve 10 to a closed position and opening the discharge valve 12. The fluid is in this manner forced into the discharge pipe 13.

A valve 28 is shown in the discharge pipe 13 for purposes of illustration. By closing this valve a pressure is built up in the discharge pipe between the valve and the pump. The housing secured to the top of the valve chest 14 forms a chamber 30 surrounding the cylinder A. The top of the chamber 30 is sealed by an elastic diaphragm formed of rubber or any other pliable material that may be best used with the particular fluid being pumped. In case the pump is intended to handle oil, gasoline or any other fluid which has a deteriorating effect upon rubber, a flexible metal diaphragm would probably be employed. The diaphragm 31 is secured to the housing 29 by means of a ring 32 and screws 33 and to the lower end of the link 18 by means of a washer 34 and a lock nut 35. In operation, the chamber 30 will become filled with fluid escaping from the cylinder through the annular space 17 around the plunger 16. Communication is formed between the chamber 30 and the discharge pipe 13 by means of the annular space 17 in the cylinder A and the port of the discharge valve 12. If the valve 28 in the discharge line is closed as shown in Fig. 2 the pump will build up a pressure in the discharge pipe between the valve 28 and the pump and this pressure will be communicated to the chamber 30. Pressure in the chamber being exerted upwardly upon the diaphragm 31 forces the link 18 to which the diaphragm is secured upwardly. The link in turn moves the lever 20 upwardly and consequently the roller 25 on the end of the lever is moved away from the shaft 26 and the cam 27. As the roller 25 is moved away from the cam 27 the stroke of the plunger 16 is shortened. When the pressure within the chamber 30 is sufficient to move the roller entirely out of communication with the revolving cam as shown in Fig. 2 the operation of the plunger will cease. If the valve 28 is opened to relieve the pressure in the discharge line the pressure in the chamber 30 will be reduced simultaneously and the lever 20 will reassume its engagement with the cam 27 and the pump will resume its operation.

The bracket 40 extending from the housing 29 is shown as a means for attaching the pump to any device in co-operation with which it may be used. It should be understood that the valve 28 in the discharge line has been shown for the purpose of illustration only and in cases where the pump is used to maintain a predetermined pressure in a tank or other container supplied by the discharge pipe it is obvious that there would be no necessity for such a valve.

The pressure maintained by the pump depends upon the tension of the spring 23 and any conventional method of adjusting this spring may be employed to regulate the degree of pressure under which the pump will cease to operate.

While I have shown a preferred form of my invention it should be understood that various changes may be resorted to in the arrangement and design of its several parts without departing from the scope of the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. In a pump of the character described, a cylinder having a reciprocable piston therein, an oscillatory lever connected to said piston for imparting reciprocal movement to it, means for oscillating the lever, a discharge chamber communicating with the cylinder, an inclosed chamber surrounding said cylinder and communicating with said discharge chamber, and means whereby the oscillatory stroke of the lever and consequently the reciprocal stroke of the plunger will be increased or decreased in proportion to the pressure in said inclosed chamber.

2. In a pump of the character described, a cylinder having a loosely fitting plunger therein, an oscillatory lever, a link connecting said plunger and said lever, resilient means urging the lever in one direction, a rotating cam mechanism engaging one end of said lever and cooperating with said resilient means to oscillate the lever whereby reciprocal motion will be imparted to said plunger, a discharge chamber communicating with the cylinder, a second chamber surrounding the cylinder and an elastic diaphragm forming a closure for said second chamber interposed between said second chamber and said lever and connected to said link whereby pressure in the discharge chamber being communicated to said second chamber between the cylinder and the loosely fitting plunger will cause the lever to be disengaged from said cam mechanism.

3. In a pump of the character described, a cylinder having a loosely fitting plunger therein, an oscillatory lever, a link connecting said piston and said lever, a rotating cam mechanism engaging one end of said lever for imparting a suction stroke to said plunger, spring means for imparting a pressure stroke to said plunger, a second chamber surrounding the cylinder and an elastic diaphragm forming a closure for said second chamber interposed between said second chamber and said lever and connected to said link whereby pressure in the discharge chamber being communicated to said second chamber between the cylinder and the loosely

fitting plunger will cause the lever to be disengaged from said cam mechanism.

4. In combination with a pump including a cylinder and a reciprocable piston therein, a discharge chamber communicating with the cylinder, a fluid tight chamber surrounding the cylinder and in communication with the discharge chamber, a flexible diaphragm forming one wall of said fluid tight chamber, a connecting rod on the piston extending through said flexible diaphragm, a fluid tight connection between the connecting rod and the diaphragm, driving means for said piston and means whereby excessive pressure within said fluid tight chamber will distend said diaphragm and render said driving means ineffective.

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