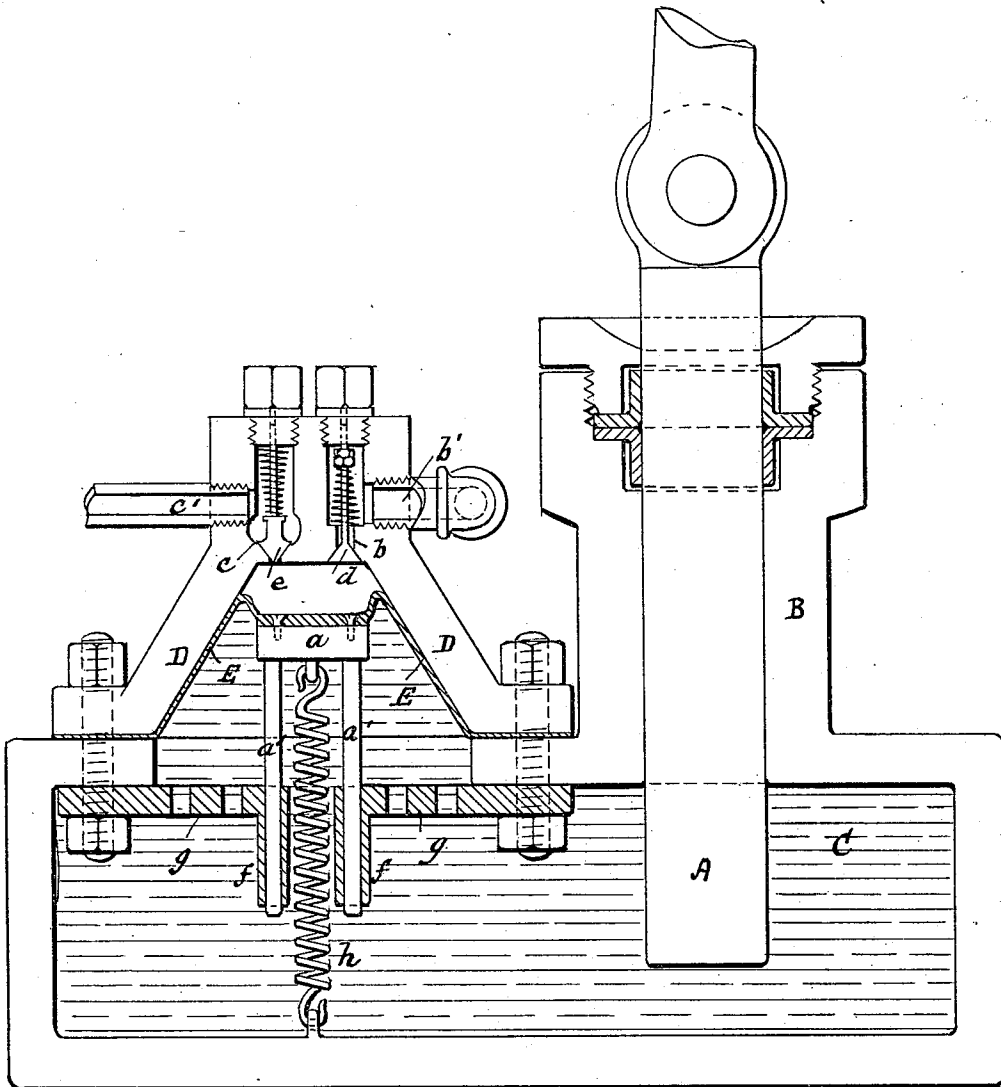


(No Model.)

W. F. JOHNSTON.
PUMP.

No. 250,253.

Patented Nov. 29, 1881.



Witnesses:
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Inventor:
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his atty.

UNITED STATES PATENT OFFICE.

WILLBUR F. JOHNSTON, OF CLIFTON, NEW YORK.

PUMP.

SPECIFICATION forming part of Letters Patent No. 250,253, dated November 29, 1881.

Application filed August 9, 1881. (No model.)

To all whom it may concern:

Be it known that I, WILLBUR F. JOHNSTON, of Clifton, Staten Island, New York State, have invented certain new and useful Improvements in Pumps, of which the following is a specification.

My invention has relation to a pump intended principally for compressing or forcing gases and other fluids. The apparatus may, however, be used for pumping any fluid, and, like many other pumps, may be used, with some modifications, as an engine. My main object is to obtain a gradual increase of power during the stroke, so as to compensate for the increased resistance offered by the fluid acted on. It is also my object to avoid churning or agitation of the liquid through the medium of which pressure is transmitted, and to prevent the same from intermingling or coming in contact with the gas or other fluid. To this end I put the inlet and outlet valves of the pump in communication with a conical or tapering chamber or chest, which is fitted with a diaphragm of leather or other suitable pliable material of a size and shape to line and be in contact with the walls of the chamber when extended. This diaphragm is drawn away from the walls of the chamber toward the larger end of the same when the pump-piston moves in one direction, and when the latter moves in the opposite direction is forced up into the chamber, so as to lie against the walls and smaller end of the same, thus forcing before it through the outlet-valve the gas or other fluid which was previously drawn into the space left vacant by the receding diaphragm. The pressure of the piston is communicated through a body of water interposed between the said piston and diaphragm. To the center part of the diaphragm is secured a head or plate of a size to fit the smaller end of the conical chamber, which acts to force out from said chamber all the gas or other fluid; and to this plate or head is secured a retracting-spring, which pulls on the head in a direction opposite to that in which it is moved by the piston in forcing the gas.

The accompanying drawing represents in vertical section so much of a pump as is needed to illustrate my invention.

A is the pump piston or plunger. B is the

cylinder therefor, communicating at its lower end with the box C, which is filled with water. In the top of the box is an opening surmounted by a conical or tapering chest or chamber, D, which is bolted tight to the box C, with its open lower end over the opening in the top of the box.

E is a diaphragm, of leather or other suitable material, which is of a size and shape to fit when fully extended against the side walls and smaller end of the conical chamber D, and is securely fastened at its outer edge to the lower end of the chamber, so as to form a diaphragm which shuts off the walls of the chamber from contact with the water or other liquid in the box C. To the center of the diaphragm, and on its under side, is fixed a metal plate or head, a, which is of such size and shape that when the diaphragm is fully extended it will fit and lie closely against the upper and smaller end of the chamber. In this end of the chamber are the gas-inlet opening b and gas-outlet opening c, which communicate with inlet and outlet pipes b' c', and are controlled by the automatic spring-valves d e. The head a is guided and centered in its up-and-down movement by guide rods or legs a' attached to it, and extending down through guide-sleeves f, formed in a perforated screen, g, which extends across the entrance from the box C into the chamber D. A spring, h, attached at one end to the plate or head a, and at the other end to box C, tends to pull the head in a direction opposite to that in which it is forced by the downwardly-moving piston A. The box C is filled with water or other suitable liquid to such an extent as to fill both box and chamber, except so much of the latter as is the equivalent of the water displaced by the reciprocating plunger or piston A.

The operation is as follows: The piston A, as represented in the drawing, has commenced to rise, and in this position the head a and upper part of the diaphragm E have receded from the upper end of the chamber, the head, by reason of the spring h, being drawn down in advance of the other portions of the diaphragm. As the piston rises the liquid in the box C previously displaced by the piston recedes, and the diaphragm E is drawn down, thus relieving the pressure and permitting the

gas or other fluid acted on to enter through the inlet-valve and fill the chamber D. This action continues during the upstroke of the piston. When the upstroke is finished and the piston descends it displaces the water in box C, and the diaphragm is thereby forced up into chamber D, driving before it and compressing the gas or fluid therein, and forcing it out through the outlet-valve *e*. The diaphragm, owing to the pliable material of which it is composed, is, in its upward movement, forced tightly against the inclined and converging walls of the chamber, and thus proportionately to its upward movement the area of pressure is reduced. The gas offers increased resistance proportionately to the upward movement, but as the area of diaphragm remaining to be acted on constantly diminishes, the piston exerts equal or even increased power as it approaches the end of the stroke, the diaphragm gradually following up the walls of the chamber until the head *a*, coming up against the end of the chamber, forces out the last vestiges of the gas through the valve *e*.

When the apparatus is used for compressing gases it is desirable to surround the chamber D by a water-jacket to carry off the heat of compression.

I have represented, in illustration of my invention, the best form of apparatus known to me at present for carrying the same into effect. I wish it to be understood, however, that I do not restrict myself to the particular arrangement and construction of devices herein shown; but

What I claim as of my own invention is as follows:

1. In apparatus for pumping gases or other fluids or liquids, the combination of a tapering chamber provided at its smaller end with valve-controlled inlet and outlet passages, a flexible or pliable diaphragm of a size and shape to fit when extended against the wall of said chamber, or substantially so, and means substantially as herein described, whereby said diaphragm is caused to move back and forth in said chamber, substantially as and for the purposes hereinbefore set forth.

2. The tapering chamber provided at its smaller end with valve-controlled inlet and outlet passages, and the pliable diaphragm fitted to said chamber, in combination with the water box or receptacle, and the reciprocating plunger or piston adapted to act upon said diaphragm through the intermediary of the water or other liquid contained in said receptacle, substantially as and for the purposes hereinbefore set forth.

3. The tapering chamber provided at its smaller end with valve-controlled inlet and outlet passages, in combination with the diaphragm, the central head or plate attached to the same, the guide therefor, the retracting-spring, and the water-receptacle and plunger or piston, substantially as and for the purposes hereinbefore set forth.

In testimony whereof I have hereunto set my hand this 29th day of July, A. D. 1881.

WILLBUR F. JOHNSTON.

Witnesses:

E. A. DICK,
N. C. LANE.