G. S. LANE.

PNEUMATIC PUMP.

APPLICATION FILED JULY 6, 1912.

1,067,613.

Patented July 15, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

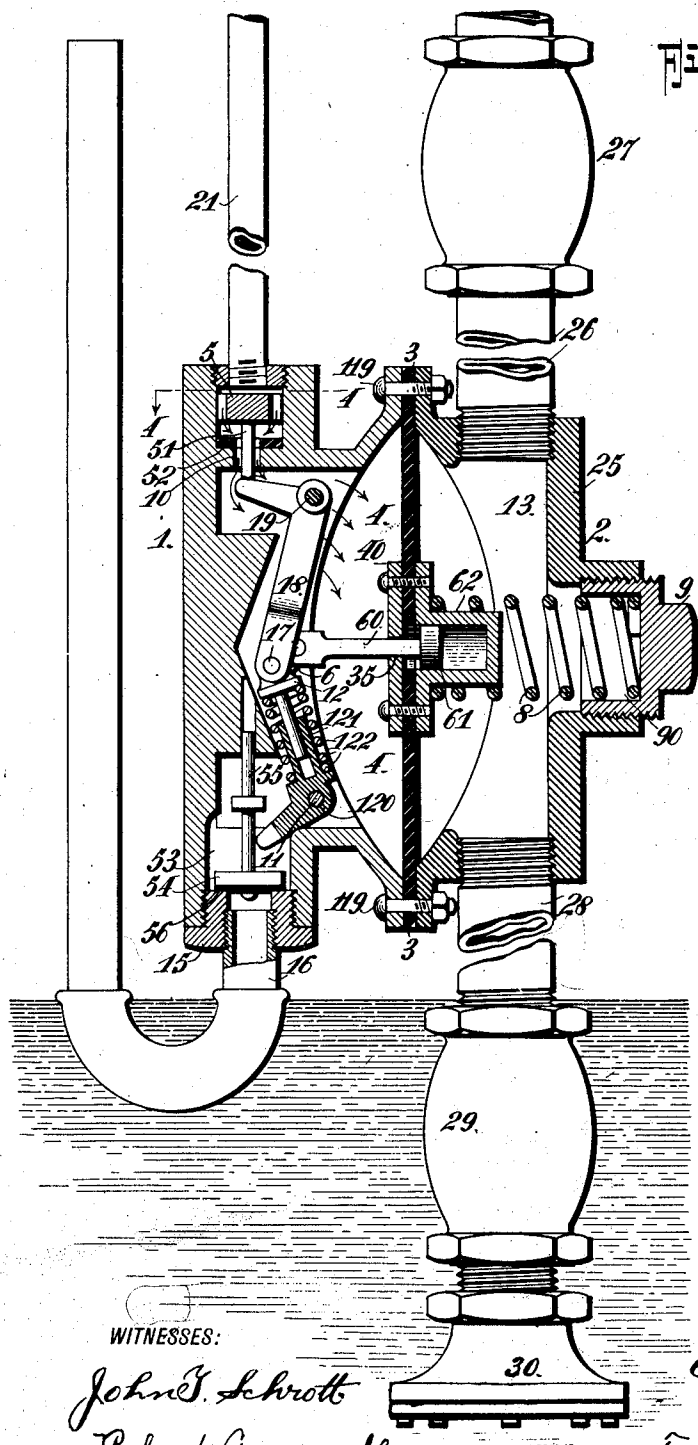
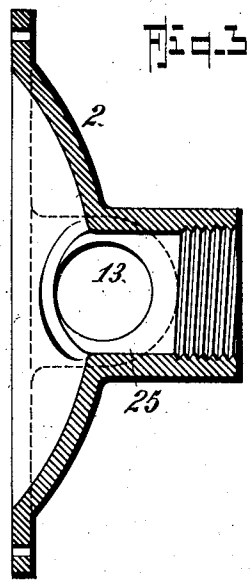


Fig. 3.



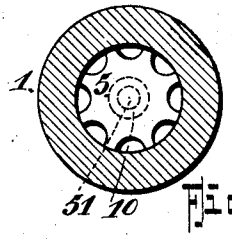


Fig. 4.

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2 SHEETS—SHEET 2.

Fig. 2.

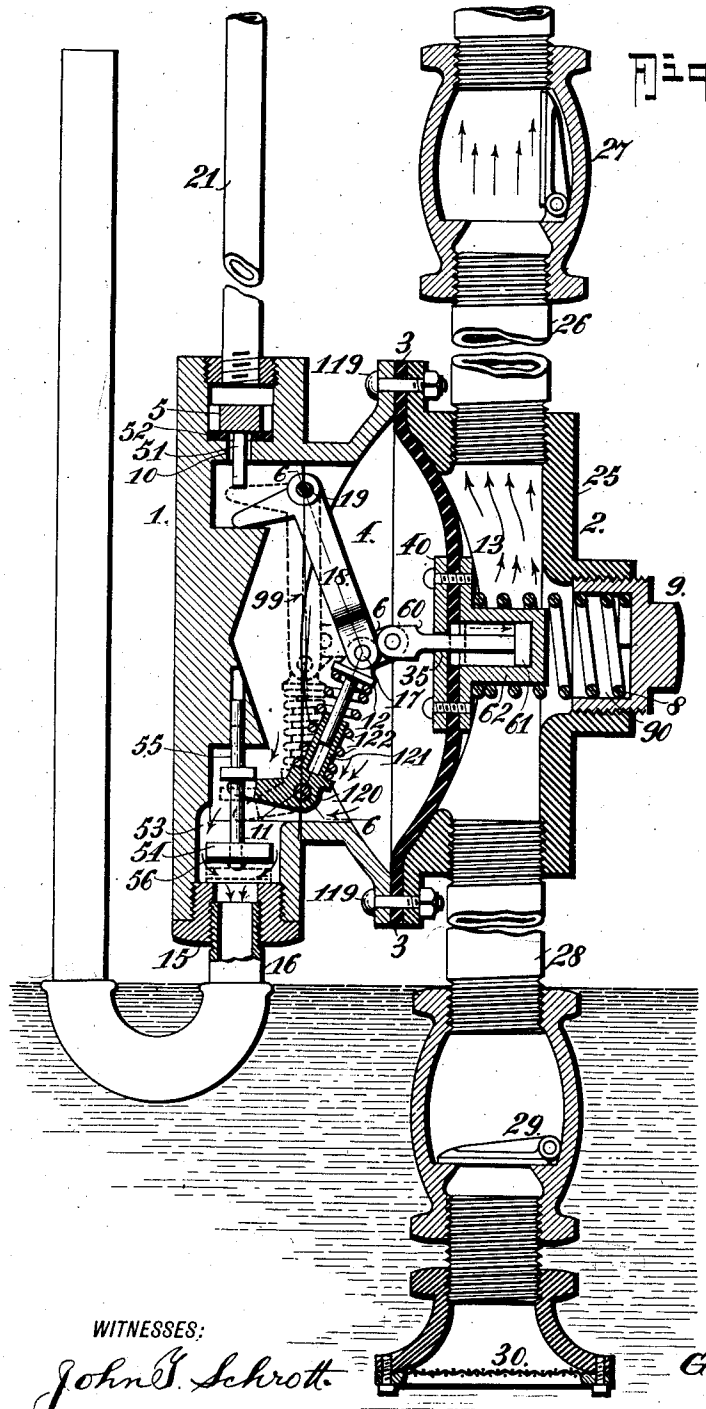


Fig. 5.

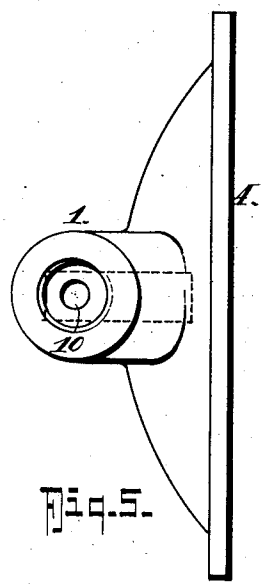
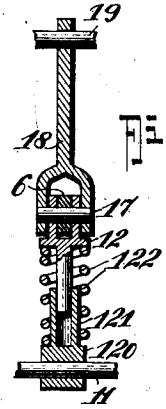


Fig. 6.



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PNEUMATIC PUMP.

1,067,613. Specification of Letters Patent. Patented July 15, 1913.

Application filed July 6, 1912. Serial No. 707,970.

To all whom it may concern:

Be it known that I, GEORGE S. LANE, residing at Portland, in the county of Multnomah and State of Oregon, have invented certain new and useful Improvements in Pneumatic Pumps, of which the following is a specification.

My present invention relates to that class of pumps employing a compressed fluid for displacing water held within a holding chamber to the surface, and it primarily has for its object to provide an improved means of the character stated, of a simple and inexpensive construction, in which the several parts are compactly arranged and designed for being readily replaced and for positively and effectively serving their intended purposes.

In its generic nature, my present invention embodies a water receiving chamber in communication with the water inlet and outlet members, and in which is included a movable wall which in its movement in one direction tends to displace the water contained within the said chamber and eject the same through the outlet and which, under a reverse movement, provides for refilling the said chamber, compressed fluid controlled means being combined with the said movable wall for effecting its movements, as stated.

My invention also embodies, in a pump of the character stated, a water displacement chamber having ingress and egress openings, and including a flexible wall that separates the said chamber from a compressed fluid receiving chamber in which is contained means for exhausting the said compressed fluid therefrom after each operation of extending the flexible wall or diaphragm for effecting the desired displacement of the water.

My invention further seeks to provide an improved pump operable by the introduction of fluid charge under compression, in which the several parts are so combined and operatively arranged whereby compressed fluid, air or gas, does not come into contact with the liquid pumped and in which the action of ejecting the water contained within the holding chamber and recharging the same with water is practically an instantaneous one.

With other objects in view that will be hereinafter explained, my invention in its more subordinate features consists in the peculiar construction and the novel arrangement of parts all of which will be hereinafter fully explained, specifically pointed out in the appended claims, and illustrated in the accompanying drawings, in which:

Figure 1, is a vertical section of my improved pneumatic pump mechanism, the parts being at the normal position, parts being in side elevation, the air inlet valve being open. Fig. 2, is a similar view, the flexible diaphragm or movable wall being shown at the inthrust or water displacement position. Fig. 3, is a horizontal section of the outer or abutment side of the main or body portion of the pump. Fig. 4, is a horizontal section of the air inlet end of the body portion taken on the line 4—4 on Fig. 1. Fig. 5, is a plan view of the power end of the said body portion. Fig. 6, is a detail vertical section of a portion of the toggle link devices taken on the line 6—6 on Fig. 2.

In the accompanying drawings, I have illustrated a preferred arrangement of parts embodying my invention, but I desire it understood that I do not restrict myself to the details shown in the said drawings, since in the practical application of my invention, the detailed arrangement of parts are determined by the particular requirements necessary to provide for the operative arrangement of features of my invention generally set out in the appended claims.

In the present drawing, I have shown the main or body portion of my pump composed of two opposing sections, one of which, 1, forms, what I term, the power end of the pump, and the other, 2, the abutment end thereof. The members 1 and 2 are dish shaped and have annular flanges for receiving the fastening bolts 119, that secure the two members together.

The abutment end 2, has an integral and vertically extended tubular-like portion 25, the upper end of which is threaded to receive the outlet pipe 26 that carries a casing in which is mounted the gravity dropped water outlet valve 27, the other, or other end being similarly threaded to receive the inlet pipe 28, that carries a casing in which is located the gravity dropped back check valve 29 and which also carries a strainer 30 at the lower or inlet end. Member 2 is also formed with a centrally disposed tubular boss that extends at right angles from the portion 25, and it is internally threaded to receive the

screw plug 9 that has a seat 90 to receive one end of a coiled spring 8, the purpose of which will presently appear.

3 designates a flexible diaphragm, in practice made of a high grade of rubber, and it is firmly clamped and secured between the flanges of the members 1 and 2, as shown.

It should be here stated that the diaphragm forms one side of a movable wall, as it were, of a water holding and displacement chamber 13 that is entirely formed in the abutment end of the main or body portion of the pump and by reason of the arrangement of the several parts, so far described, it is apparent that by expanding the diaphragm, under a suitable force against it, so it is driven back into the said chamber 13, the water therein becomes displaced and is ejected through the outlet pipe, the valve therein lifting under pressure, the check valve at the bottom being likewise held closed.

The expanding or forcing of the diaphragm or water displacing wall of the holding chamber in my construction is effected by means controlled by fluid under pressure, and the means shown and to be described in their general and specific nature form the essential features of my invention.

21 designates a feed pipe which, in practice, extends up and connects to a compressed fluid reservoir arranged in any approved manner, and the said pipe discharges into a valve chamber having a feed port 10 that opens into a working chamber 4 in the power end of the main or body portion of the pump. The feed port 10 is controlled by a fluted drop valve 5 (see Fig. 4) provided with a stem 51 that projects down through the port 10; 52 designates a rubber washer that forms a seat for the drop valve 5.

53 designates an outlet valve pocket for the working chamber 4, in which operates a drop valve 54 having a stem 55 guided in the wall of the member 1 and which is provided with a rubber washer or face 56 for seating over the exhaust 15 that leads to an offtake pipe 16 that extends up above the surface of the water being lifted.

11 and 19 are oppositely disposed pivot pins on the casing 1 and in practice they are placed in position by drilling the said casting or member 1 from the outside entirely through one wall and partly through the other wall, the drill hole after the pins are set, being tapped and plugged in any well-known manner.

18 designates a toggle or lever arm having a bell crank end for engaging the stem of the valve 5, and the said lever 18 is fulcrumed at the crank end on the pin 19.

A second toggle lever is fulcrumed on the pin 11 and it is composed of a crank member 120, that engages the stem of the exhausting valve, an automatically lengthening or shortening arm composed of a head 12 having a long stem that slides in a socket portion 121 formed integral with the crank 120, and a coiled spring 122 that takes around the portion 121 and engages the head 12 to normally force it to an extended position.

The toggle head 12 is pivotally connected to the lower end of the upper toggle lever 18 by the pivot pin 17 which also holds one end of a short link 6 that pivotally connects with the outer end of a toggle connecting or plunger rod 60 that passes through an aperture 35 in the diaphragm 3 and connects to a piston 61, that works in a chamber 62 mounted on the outer or pushing side of the diaphragm, the said chamber 62 being held air tight on the diaphragm by a plate 40 secured on the inner side of the diaphragm 3 and presently again referred to.

The spring 8 which acts to return the diaphragm and the toggle devices to their normal position when the pressure on the diaphragm is off, seats over the chamber 62.

The manner in which the mechanism so far described, operates to effect the displacement of the water within the chamber 13 and for recharging the said chamber, is best explained as follows: Assuming the parts as having been turned to the normal position, under the return spring 8, the toggle members now being seated on the inner or bottom wall of the working chamber 4, and the diaphragm at its retracted position forming now a straight wall between the chambers 4 and 13, the air inlet valve is now held open by the lever 18 and the exhausting valve at its dropped or closing position. By now admitting air under pressure through the inlet port 10, the same drives the diaphragm back toward the abutment side 2 of the body portion, and thereby forcing the water in the chamber 13 up past the outlet valve to the surface, it being understood the check valve in the water inlet pipe is now held closed. In moving over to the position shown in Fig. 2, the diaphragm plate 40, after moving a part of its distance, strikes the piston 61 and then pulls the toggles 18 and 12 out until they reach a vertically alined position, as shown in dotted lines on Fig. 2, and in so doing the tension is stored up on the coiled spring 122, it being understood that the action of pulling out the toggles does not occur until the compressed fluid charge has entered the working chamber and has exerted its energy against the diaphragm 3.

It will be noticed, particularly by reference to Fig. 2, the link connection that joins the pivotally connected ends of the toggle levers 12 and 18 and the plunger rod 6, and the fulcrums 19 and 11 for the toggles, is

such that so soon as the pivotal connection passes the dead center line, see 99, Fig. 2, the tension of the spring 122 will cause the plunger rod 60 to quickly move outwardly, its piston moving in the pocket therefor, and in so doing, the crank ends of the levers 18 and 12 shift, the crank of the member 18 moving away from the valve for the inlet while at the same time, the crank of the other toggle engages and lifts the exhaust valve thereby thoroughly exhausting the chamber 4.

From the foregoing description taken in connection with the drawings, the complete construction, operation and advantages of my invention will be readily apparent.

The construction is such that a number of the pumps can be connected in series if capacity of one pump is not sufficient to accommodate the work desired.

One of the distinct advantages of my construction of pump is that the working chamber is instantaneously exhausted of the spent fluid charge after the diaphragm has been distended to eject the water in the holding chamber, this result being provided for by the storing up of a spring power under the air charge against the diaphragm that is utilized for effecting the instantaneous shifting of the toggles to change the relative positions of the inlet and the exhausting valves.

What I claim is:

1. In a pump as described, a container having two distinct compartments, a diaphragm separating the said compartments, one of said compartments being a water container and the other a compressed fluid receiver, said diaphragm acting to displace the water in the chamber under a charge of the compressed fluid into the receiver, independent valves controlling the inlet and exhaust for the receiver, means for instantly shifting the two valves to close the inlet and open the exhaust, said means including devices for storing up the power for effecting the said instantaneous shifting of the valve actuated by a partial out-thrust or displacement movement of the diaphragm, said devices including toggle levers and a coiled spring, a plunger connected to the joint of the toggle levers, said levers being oppositely fulcrumed and means on the diaphragm for engaging the plunger, a spring whose tension is increased as the plunger is pulled outwardly by the diaphragm, and adapted when the toggles reach a predetermined position to instantly return the toggles to their inner and normal position.

2. A pump, comprising a body having an internal chamber, a flexible diaphragm dividing said chamber into a water and an air compartment respectively, means for admitting water into said water compartment, means for passing water out of said water compartment, an air inlet to said air compartment, a valve for controlling the admission of air, an air outlet for said air compartment, an outlet valve for controlling the exhaust of air from said air compartment, a bell crank lever for actuating each of said valves, a connection between said bell crank levers which includes a resilient member adapted to move said bell crank levers to either side of their "dead center" position, and a dash pot connection between said levers and said diaphragm, in virtue of which the movement of said diaphragm will actuate said levers and permit of a limited lost motion between said diaphragm and levers, and a spring in said water compartment for continuously tending to force said diaphragm against the air pressure.

3. In a pump, a body formed of two sections, and a flexible diaphragm secured between said sections to inclose two distinct compartments, one of said compartments serving as a water compartment and the other as an air compartment, means for admitting water to and exhausting water from said water compartment, a valve controlled air inlet, and a valve controlled outlet for said air compartment, each including a valve having a stem projecting into said air compartment, a bell crank lever pivoted in said air compartment for each valve to cooperate with the stem of the same, one of said bell crank levers having a socket, a pin slidable in said socket and pivotally connected with the other bell crank lever, a spring interposed between said pin and said socketed bell crank lever for continuously tending to separate the same to move said bell crank levers when off their "dead center", a member carried by said diaphragm and including a cylinder portion, a piston operating in said cylinder portion, a piston rod carried by said piston and a connection between said piston rod and said levers in virtue of which the movement of said diaphragm will be transmitted to said levers, the connection between said diaphragm and levers being such as to allow of limited lost motion, and a spring continuously tending to move said diaphragm to a normal position.

GEORGE S. LANE.

Witnesses:
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FRANK A. PAULSON.