UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN MODES OF SUPPLYING AIR TO AIR-CHAMBERS.

Specification forming part of Letters Patent No. **57,412**, dated August 21, 1866.

To all whom it may concern:

Be it known that I, PETER HENDRISH VANDER WEYDE, of the city and county of Philadelphia, State of Pennsylvania, have invented an Improvement in the Air-Chambers of Pumps for Liquids, the purpose of which is to overcome the inertia of the water-column, which in the suction-pumps, by every stroke of the piston, has to be set in motion, and at the end of the stroke comes to perfect rest again.

The force-pump, as at present constructed, often presents the same difficulty. After the pump has worked for several hours, and large fresh quantities of water have continually passed along and partially in and out of the air-chamber, this vessel will be voided of air and full of water by reason of the power of most liquids to dissolve air, principally when this air is under pressure, as is the case in this kind of air-chambers. This causes the air-chamber to become useless and the pump to work under great disadvantages by reason of the inertia of the water, which then no more will be kept in continual motion by the elasticity of the air contained in the chamber, but by its intermittent motion and rest will cause a great loss of power.

The following is a correct description of this invention, which will enable all others skilled in the construction of pumps to make and use it, reference being had to the accompanying drawings.

Figure 1, A represents the pump-cylinder, and B the piston; C the customary valve at the base of the cylinder, and D the tube going down to the well; L, the second valve, through which the water is discharged in the tube T and moved upward through K. H is the usual air-chamber for compressed air. The parts thus far mentioned are common to most press and suction pumps.

My invention consists, first, in the addition of an air-chamber, F, for rarefied air, connected to the tube D, in which the water is made to ascend by suction. It is clear that when the piston B is moved upward, and consequently the valve L closed and C open, the water will ascend through the whole length of the tube D, provided it is not longer than thirty-four feet, (atmospheric pressure.) Every stroke of the piston must set the whole column of water (perhaps twenty or thirty feet long) in motion; but when we connect the top of the tube D with an air-chamber, F, the air contained there will expand and partially discharge through E during the first part of the stroke of the piston. After this stroke has been accomplished the air will contract again and some water will enter this chamber F, to go out again at the next stroke, and this will be continually repeated during the operation of the piston, the inertia of the water in the bottom of F and the elasticity of the air contained in F giving less resistance to the stroke of the piston than the inertia experienced by lifting the long column of water contained in the tube D. This will make the operation of the piston much easier, equalizing the resistance resulting from the inertia of the column of water in D, the expanding air in F acting like a continually-contracting spring.

The expansion of the air in F at every stroke of the piston may be taken advantage of to supply the air-chamber for compressed air, H, with small portions of fresh air by simply providing the top of F with a small stop-cock, G, to admit air if judged necessary. In this case the tubes may easily be so arranged that the air occasionally drawn out of the lower part of F passes through T in the air-chamber H, and keeps up its slowly but continually exhausted supply of compressed air.

But this supply may also be kept up by an independent arrangement represented, Fig. 2, consisting of a small cylinder or globe, Q, connected by a narrow tube, S, to the pump-cylinder, and by another similar tube, M, to the air-chamber H. This vessel is provided with a stop-cock, R, and a valve, P, giving entrance but no exit to air. At the end of the connecting tube M is a valve, N, giving entrance but no exit to the air in N.

During the first half of each stroke of the piston the air will be compressed in Q and H equally; but during the latter half of the stroke it will expand in Q and F equally, and if either of these vessels be provided with a stop-cock they will admit air if this is opened. The air thus collected in Q during each latter half of the stroke will be driven in H during the first half of the following stroke, and thus keep up its supply. In the position of the piston represented in the figure it will, by its downward motion, draw air into Q, and by its upward

motion admit this air to enter into the air-chamber H.

Fig. 2 represents a double-acting pump. The attachment of the tube S to the pump-cylinder A is made at its middle part for a single-acting pump, as represented in Fig. 1. This attachment of the tube S should be near the lower part of the cylinder, or even at that part of the tube T adjoining this cylinder. The connection M N may be at any part of the air-chamber H, either high or low. The reason for this is evident, as during the whole upward stroke the pump exerts suction it will draw air in the vessel Q; during the downward strokes it exerts pressure, and will allow the air to pass in the air-chamber H.

It must be observed that the stop-cock R must be small and so set as to admit only very small quantities of air, and that the vessel Q must be lower than the air-chamber H, as its air must be displaced by water at every stroke; also, that the capacity of this vessel must be very small in comparison to the air-chamber H.

The valves X and Z represented in both figures may be omitted, not being essential to the operation of the air-feeding. Also, the air-chamber F for rarefied air (represented in Fig. 2) becomes unnecessary, as far as this air-feeding is concerned, in case the apparatus Q, with its proper connections, is attached.

What I claim as my invention, and wish to secure by Letters Patent, is—

The combination of air-chambers H and F, the valves P and N, and stop-cocks R and G, all arranged in the manner described so as to supply the constant loss of air taking place in the air-chambers of force-pumps.

In witness whereof I have signed my hand.

P. H. VANDER WEYDE, M. D.

Witnesses:

LOUIS DE RONCERAY,

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