2 Sheets—Sheet 1.

L. D. B. SHAW.

STEAM AND VACUUM PUMP.

No. 170,968. Patented Dec. 14, 1875.

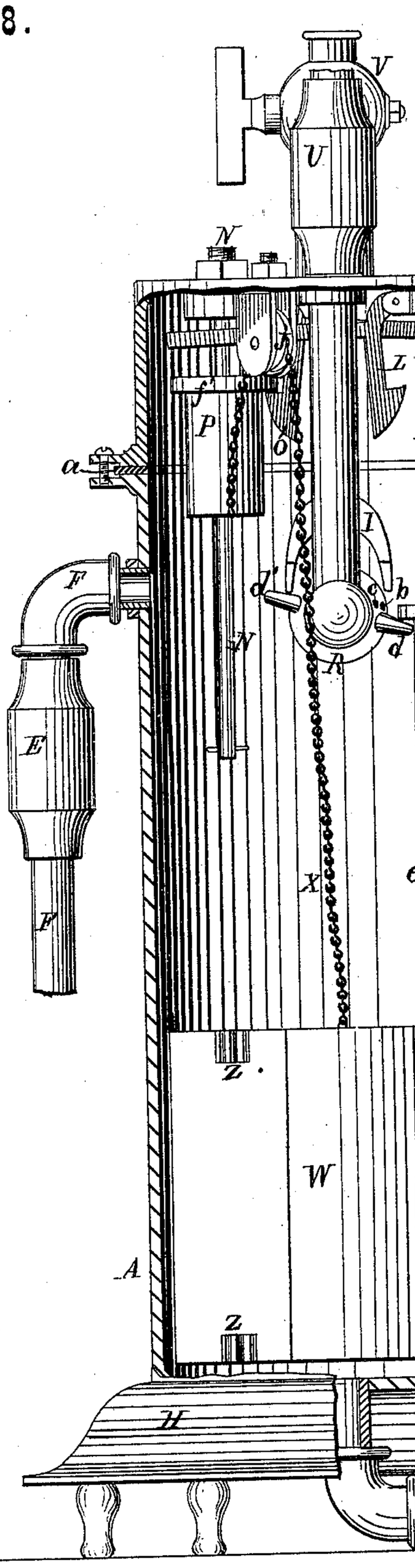

Fig. 1

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2 Sheets—Sheet 2.

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Fig. 2

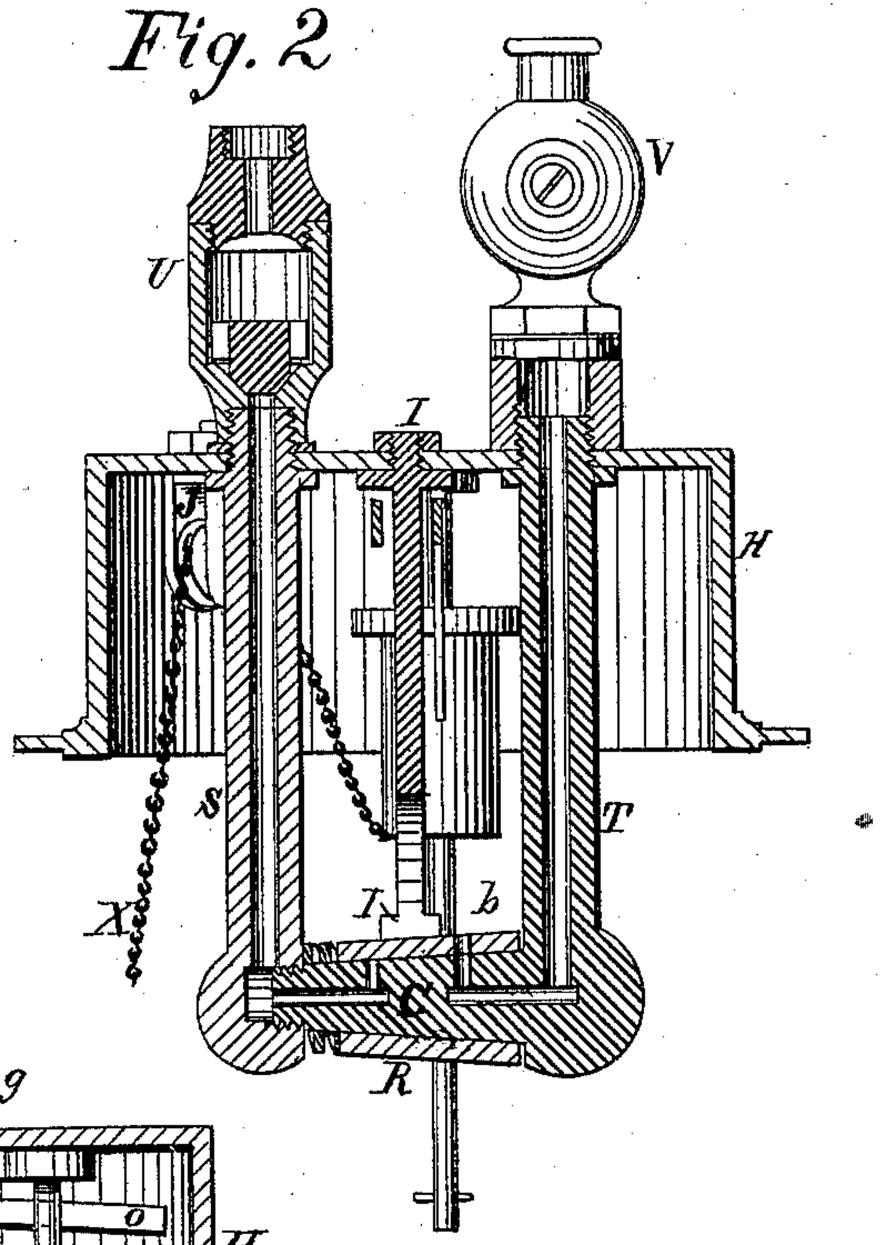


Fig. 4

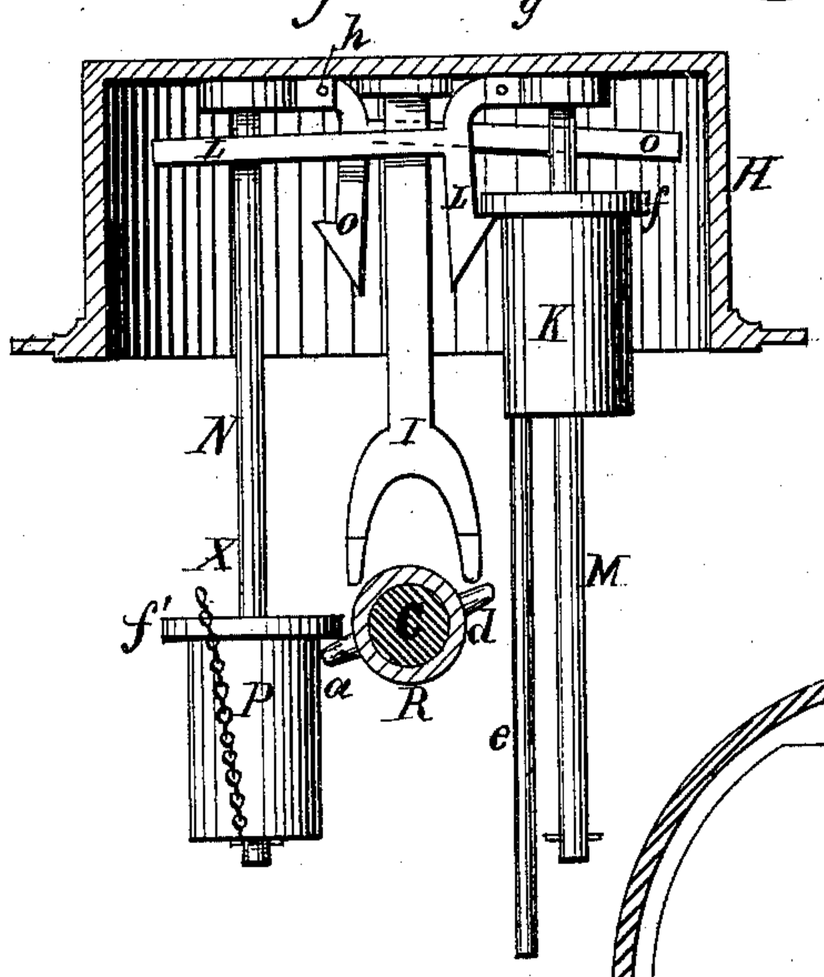
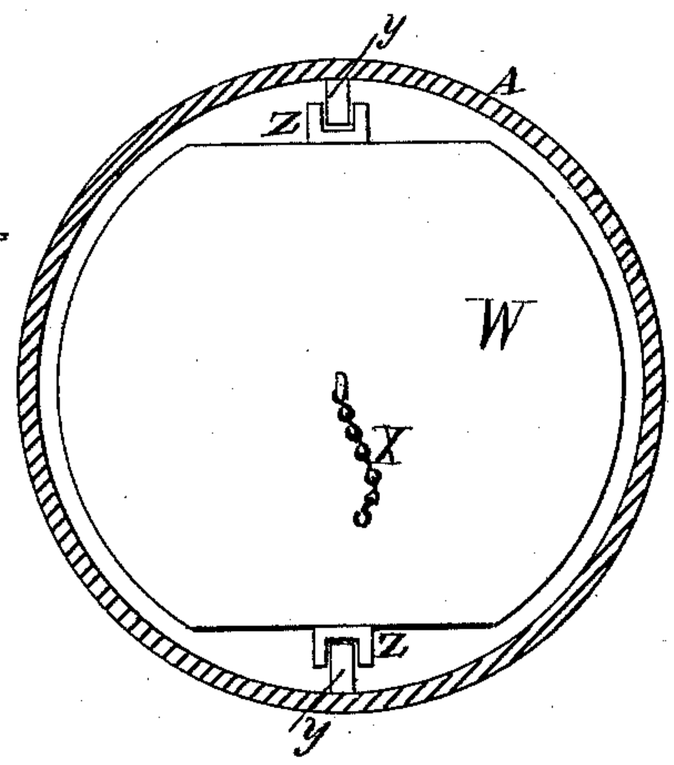


Fig. 3



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UNITED STATES PATENT OFFICE

LORENZO D. B. SHAW, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN STEAM AND VACUUM PUMPS.

Specification forming part of Letters Patent No. **170,968**, dated December 14, 1875; application filed May 26, 1875.

To all whom it may concern:

Be it known that I, LORENZO D. B. SHAW, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Steam and Vacuum Pumps; and I do hereby declare the following to be a full and correct description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical section of my improved vacuum-pump. Fig. 2 is a vertical section of the supply and exhaust steam and air pipes and valves. Fig. 3 is a horizontal section of the cylinder, showing a plan or top view of the float. Fig. 4 is a vertical section of head H, with a side view of the weights and the devices for operating them.

The same letter indicates the same part wherever it occurs.

My invention consists in the construction of a vacuum-pump which is automatic, requiring no engine to operate it; which is self-balanced, causing no vibration or pounding while in operation; which protects the steam from contact with the surface of the cold water in the pump-cylinder, thus greatly economizing steam and fuel; and which, by the saving of friction in the working parts, is little liable to wear or to get out of order, or to be injured by water holding gritty substances in suspension, all as hereinafter more particularly set forth.

In the accompanying drawings, A marks the pump-cylinder, provided with heads H H′, bolted to its flanges, and made tight by rubber packing *a*. Most of the mechanism of the pump is contained in the cylinder. It is connected with the well or source of water by the supply-pipe F, controlled by a check-valve at E, which prevents the return of water to the well. The delivery from the cylinder is made through the exhaust-pipe D, provided with a check-valve at B. The steam for creating the vacuum is admitted through the inlet-pipe T, controlled by the globe-valve V, and the expelled air escapes through the exhaust-pipe S, controlled by the check-valve U. The entrance of steam and escape of air and relief of pressure are regulated by the reciprocating rotatory movement of a jacket, R, which fits upon the cone C, and covers the lower openings of the inlet and exhaust pipes T S. Holes *b c* in the jacket R are alternately brought to coincide with one or the other of said lower openings, so as to bring the said inlet and exhaust pipes alternately into communication with the interior of the cylinder. The movements of the jacket R are produced by two weights, K P, whose flanges *f f′* alternately engage the pins *d d′*, which project from the sides of the jacket. A stop-motion, I, serves to limit the movement of the jacket, in either direction, at the proper points to open the inlet or exhaust pipe at the required times. The weight K slides vertically on the guide-rod M, and the weight P on the rod N. W is a large hollow float, which rides up and down in the cylinder A as the water rises and falls. It is kept from turning in the cylinder by the notched projections Z, which receive the guides *y*, attached to the inside of the cylinder. To the float W is attached a chain, X, which passes up over a pulley, J, attached to the cylinder-head, and is fastened to the weight P. When the float W descends to the bottom of the cylinder the weight P is raised to its highest position, as shown in Fig. 1. A rod, *e*, attached to the bottom of weight K, projects downward nearly to the top of the float W when in its lowest position, so that when the float rises it will raise the weight K, while leaving the weight P free from the suspending action of the chain. A hook, L, having a long arm projecting over weight P, is pivoted at *g* to the cylinder-head, and engages with and supports the weight K by its flange *f*, when the weight is in its upper position. A similar hook, O, pivoted at *h*, performs the same office for the weight P. The weight K is released from the hook L by raising the extreme end of the hook-arm. The weight P is similarly released by raising the end of arm O. As each weight attains its highest position it releases the hook of the opposite weight, and suffers that weight to fall.

The operation is as follows: Steam is admitted to the cylinder by turning valve V, so as to permit it to flow through inlet T and the orifice *b* in jacket R, and fill the space above the water and float W. It forces the water in the cylinder out through pipe D and valve B into a tank or reservoir placed

at a suitable height to receive it. As the water is driven out the float W descends and raises the weight P until it comes into contact with the arm L, raises it, and releases the weight K, the flange *f* of which, as the weight falls, strikes the pin *d* on jacket R, closes the inlet-opening, and opens the exhaust or pressure-escape opening by bringing the hole *c* in the jacket directly over the lower opening of the exhaust-pipe. The steam immediately escapes through that pipe past the check-valve U, and as that valve prevents the entrance of air a vacuum is formed in the cylinder. To relieve this vacuum water from the well enters through pipe F past check-valve E, check-valve B preventing the return of water to the cylinder through pipe D. As the cylinder fills the float W rises, and, by means of rod *e*, raises weight K till it comes in contact with arm O, raises it, and releases weight P, which, in falling, strikes pin *d'* on jacket R, closes the exhaust or pressure-escape pipe, and opens the steam-supply pipe T, closing check-valve E, forcing down the float, opening valve B, and driving the water from the cylinder through pipe D into the tank or reservoir, as before. The float W not only prevents the steam from coming into contact with the surface of the cold water and becoming rapidly condensed, but its upper portion soon becomes hot, and thus aids in retarding the condensation. This effects an economy of steam, and consequently of fuel. By the peculiar action of the jacket R the relief of pressure takes place at the same instant that the steam is shut off, producing the vacuum at once, and making the action of the pump very quick.

The float or piston not fitting the cylinder tightly, there is no liability to wear of either by reason of any grit that may be in suspension in the water. The only part of the apparatus where there are moving parts in close contact is the cone C, on which the jacket R fits and turns, and that is not brought into contact with the water in the cylinder, and is therefore not liable to be injured by the grit it may contain.

Having thus described my invention, what I claim and desire to secure is—

1. The combination of the steam-inlet pipe T, pressure-exhaust pipe S, cone C, and jacket R, provided with the openings *b c*, all constructed and operating substantially as specified.

2. The jacket R, provided with the lugs *d d'*, in combination with the float W, chain X, pulley J, weights P K, hooks L O, and stop I, all constructed and operating substantially as described.

3. A vacuum-pump in which the admission of steam and the relief of pressure are controlled by valve mechanism operated by the alternate fall of two weights, which are alternately raised to their highest position by the rise and fall of a float resting on the water in the pump-cylinder, all substantially as set forth.

The above specification of my said invention signed and witnessed, at Boston, this 5th day of May, A. D. 1875.

LORENZO D. B. SHAW.

Witnesses:

SIMON WING,

SAMUEL P. ABBOTT.