(No Model.) 2 Sheets—Sheet 1.

A. H. SIMMS.

PNEUMATIC WATER ELEVATOR.

No. 484,255. Patented Oct. 11, 1892.

Fig 1

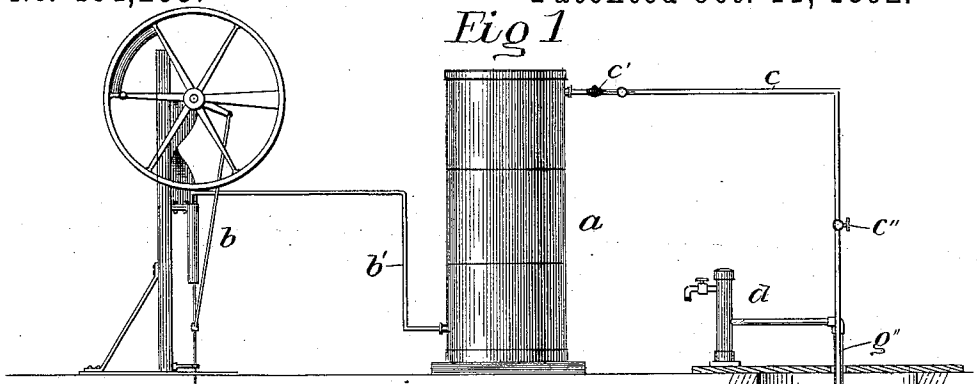
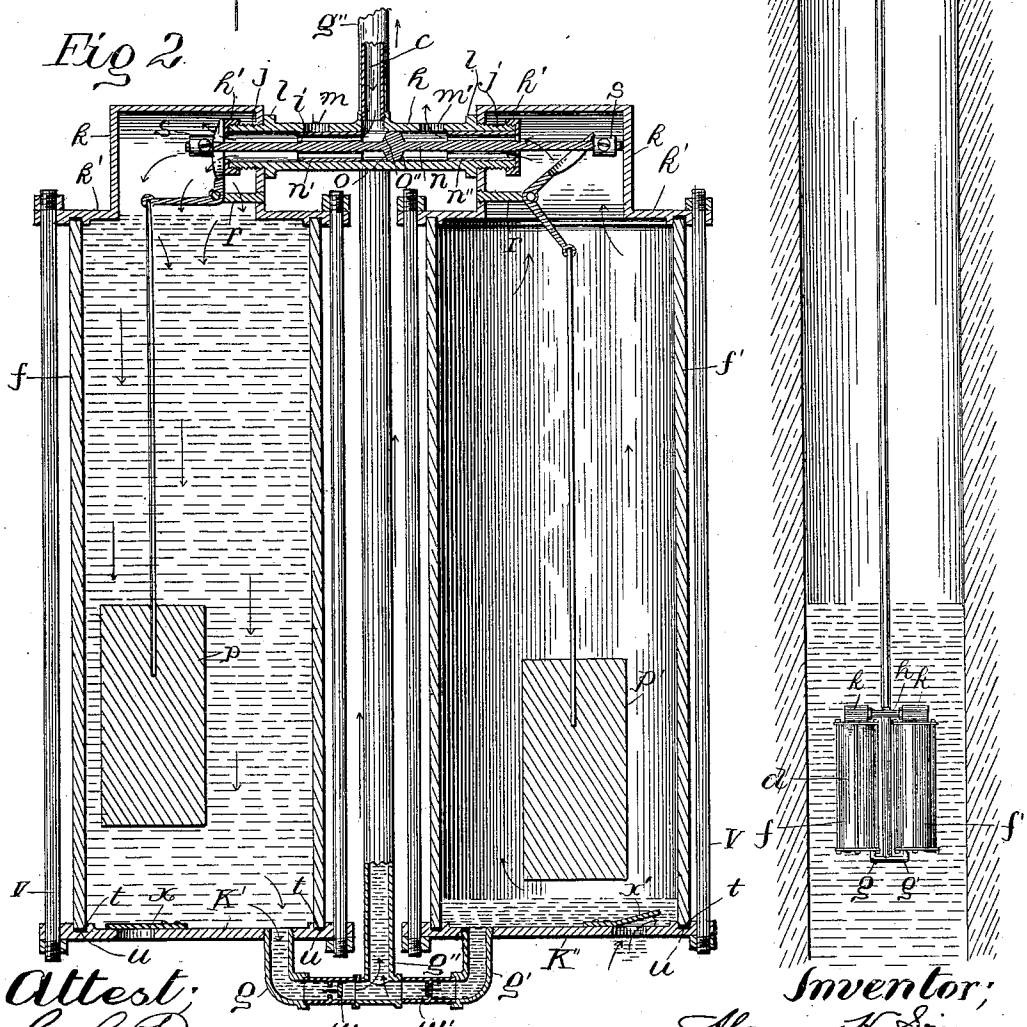


Fig 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig 3

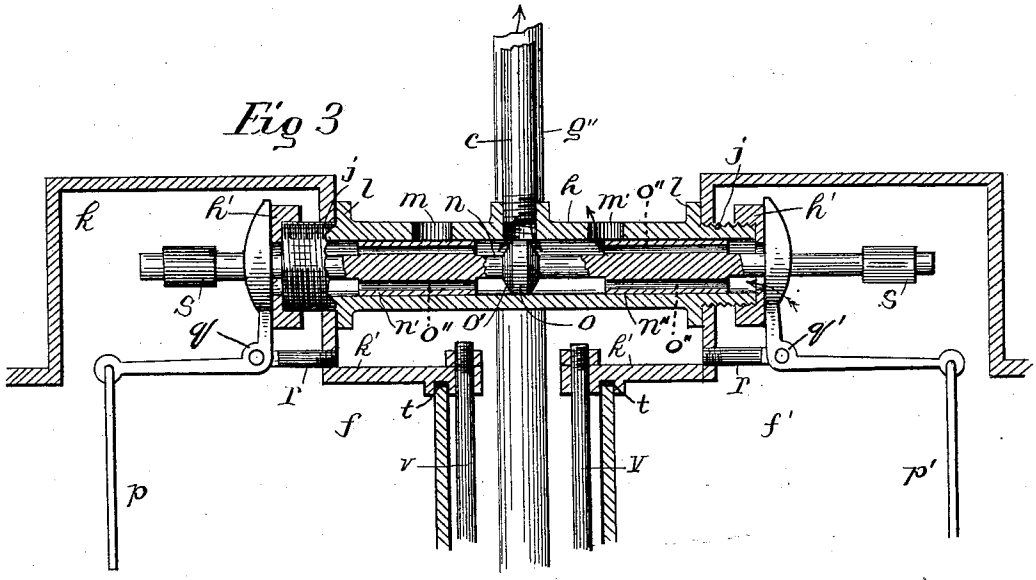
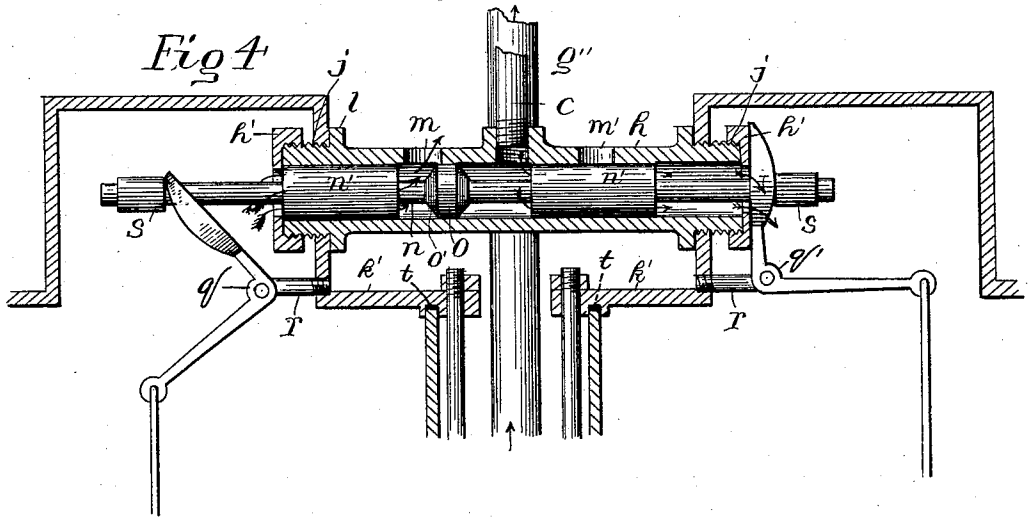


Fig 4



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UNITED STATES PATENT OFFICE.

ALONZO H. SIMMS, OF BIRMINGHAM, ALABAMA, ASSIGNOR OF ONE-HALF TO CHARLES E. ECKERLE, OF SAME PLACE.

PNEUMATIC WATER-ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 484,255, dated October 11, 1892.

Application filed August 17, 1891. Serial No. 402,833. (No model.)

To all whom it may concern:

Be it known that I, ALONZO H. SIMMS, a citizen of the United States, residing at Birmingham, in the county of Jefferson and State of Alabama, have invented certain new and useful Improvements in Pneumatic Water-Elevators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to that class of pneumatic water elevators or distributers in which an air-pump, reservoir, and immersed pumping-cylinders are employed.

The object of my device is to provide more simple, cheap, durable, easily-operated, and effective means than those formerly in use; and with this end in view my invention consists in the peculiar features and combinations of parts more fully described hereinafter, and pointed out in the claims.

In the accompanying drawings, Figure 1 represents a general view of my mechanism as applied to a cistern or well; Fig. 2, a vertical section of the pump proper, and Figs. 3 and 4 longitudinal vertical sections of the pump-valve mechanism.

The reference-letter *a* represents an air-reservoir or compression-chamber into which air is pumped through the medium, of an air-compressor *b* and pipe *b'*. An outlet-pipe *c*, provided with a back-pressure valve *c'* and cock *c''*, leads from the reservoir to the pump *d*, which is completely immersed in the water of a well, cistern, or other place. The pump proper *d* comprises a pair of vertical cylinders *f f'*, connected at the bottom by discharge-pipes *g g'* and at the top by a horizontal cylinder or chamber *h*, containing a reciprocating air-valve *i*. The opposite ends of the cylinder *h* are provided with external right and left screw-threads *j*, which screw into threaded openings in the sides of conical ante-chambers *k*, cast integral with the upper heads *k'* of the vertical cylinders *f f'*. These threaded ends of the valve-cylinder project a short distance into the conical ante-chambers and are provided with caps *h'*, which arrest the movement of the valve. Compressed air is fed to the cylinder through a pipe *c*, which enters the top of the cylinder at a point midway between its opposite ends, and air-exhaust ports *m m'*, are located at equal distances upon opposite sides of the feed-pipe.

The valve-cylinder is provided with stop-shoulders *l*, which are squared to receive a wrench for screwing it in place.

The valve proper *i* comprises a stem *n*, provided with elongated cylindrical cut-offs *n' n''*, between which is located a piston *o*, having beveled sides *o'*. The cut-offs are each provided with longitudinal perforations *o''*, through which the air passes.

In order to overcome dead-centers that might possibly occur in the pressure upon opposite sides of the piston *o*, the latter is located off a central point between the two cut-offs *n' n''* and about two-thirds the distance between the contiguous ends of the cut-offs, so that the air-chamber between the piston and cut-offs will be two-thirds larger upon the right of the piston than upon the left. Hence unequal pressure upon the piston will always ensue and equilibrium cannot be established to cause a dead-center. The cut-offs are timed to close one exhaust-port while the other is opened.

The valve *i* is actuated by a pair of alternating floats, forming weights *p p'*, suspended from bell-crank levers *q q'*, fulcrumed on the end of an arm *r*. The upper arm of each lever is forked to pass loosely astride the valve-stem *n* and engage the tappets *s* when moving away from the valve-cylinder. The lower ends of the vertical pumping-cylinders *f f'* are provided with removable heads K' K'', containing annular recesses *u* to receive the smooth ends of the cylinders and form a slip-joint. Suitable fibrous packing *t* is interposed to insure a tight joint. The heads K' K'' are locked tightly on the cylinder ends by bolts *v*, which construction greatly facilitates the work of connecting and disconnecting the parts by not requiring special tools, as would be the case were they screwed on the cylinders. The discharge-pipes *g g* are provided with check-valves *w w'* and empty into a vertical distributing-pipe *g''*, located between the cylinders. Water is admitted to the cylinders through the foot-valves *x x'* in the bottom heads, and these valves are of a size sufficient to allow one cylinder to fill before the other becomes empty.

The preferred construction of my invention having been set forth, I will now proceed to describe its operation.

Assuming that the reservoir *a* has first been suitably charged with compressed air, the cock *c''* opened, and the pump-valve *i* shifted to the right, as in Fig. 2, the incoming air will pass through pipe *c* into the pump-cylinder *h*, and, being cut off from the right-hand portion of the cylinder by the piston *o*, goes through the perforations *o''* in cut-off *n'*, thence through the cylinder into ante-chamber *k*, where its force is exerted upon the top of the water in the filled cylinder *f*, forcing it out at the bottom through pipe *g*, check-valve *w*, and distributing-pipe *g''*, to any suitable point. The force of the water in passing out of pipe *g* closes check-valve *w'*, and prevents the water from passing into the other cylinder. While the water is thus escaping from the left-hand cylinder *f* the right-hand cylinder *f'* has been filling through the foot-valve *x'*, and in the filling operation the float *f'* is raised and the upper arm of the bell-crank lever thrown back against the cap on the end of the horizontal valve-cylinder *h*, in which position the lever remains until the water subsides and the float draws it back. When the lever *q'* is thus pushed back against the valve-cylinder, as in Fig. 3, it does not carry the valve with it, but leaves the opposite lever *q* the easy task of shifting the valve alone when pulled down by its weight *p*. Should the piston *o* by chance become left in the position shown in Fig. 3, it will immediately be shifted by reason of the unequal air-space upon its opposite sides. Now if the construction were such that both exhaust-ports *m m'* should be either open or closed when the piston *o* occupies a central position, as shown in Fig. 3, then the pressure would be equal on both sides and the valve of course would not move; but when in this position port *m'* is partially open. Consequently the air entering upon this side of the central piston *o* is reduced in pressure on account of the discharge through *m'*. The other exhaust-port *a* being entirely closed and no escape for the air entering upon this side of the central piston *o*, the air at once sets up expansion in the water-cylinder *f*, and by this expansion reacting upon the piston *o* the valve is thrown instantly to the right and sets the machine to work. This action only takes place upon starting the mechanism. Both chambers are supposed to be full, and both bell-crank levers thrown back against the ends of valve-chamber, as shown in Fig. 3, which is always the case, as the two weights are just buoyant enough to raise these bell-cranks when both chambers are full. This leaves the valve entirely free to be acted upon independently of the office of the weights just to accomplish this one movement of starting, after which the valve is controlled wholly by the weights alternately. As soon as the water recedes from the float *p* in the left cylinder and the weight of the float is brought to bear upon the bell-crank lever *q* the upper arm of the lever will shift the valve *i* to the left, as in Fig. 4, thereby closing the right exhaust-port *m'* and opening the left exhaust-port *m*, so that the air can escape from the left and allow the cylinder *f* to fill while the right cylinder is being emptied in precisely the same way the first cylinder *f* was.

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

1. In a pneumatic water-elevator, the combination of a compressed-air reservoir provided with a discharge-pipe leading to a valve-cylinder, a valve provided with cut-offs located in the cylinder, said cut-offs being provided with perforations, a piston located off a central point between the contiguous ends of the cut-offs, bell-crank levers, and weights attached to the levers, all arranged and adapted to operate in the manner and for the purpose set forth.

2. In a pneumatic water-elevator, a valve provided with cut-offs and a piston located off a central point between the cut-offs, in combination with levers attached to floats and arranged to act independently of the valve when moved in one direction and to actuate it when moved in the opposite direction, substantially as described.

3. In a pneumatic water-elevator, the combination of a compressed-air reservoir provided with a discharge-pipe leading to a cylinder containing a horizontally-movable air-valve provided with perforated cut-offs, a piston located off a central point between the cut-offs, and weights and levers for actuating the valve, all arranged and adapted to operate in the manner substantially as set forth.

4. The combination of a horizontal reciprocating valve provided with perforated cut-offs, a piston located off a central point between the cut-offs, and gravitating weights connected at the opposite ends of the valve to bell-crank levers, as and for the purpose substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

ALONZO H. SIMMS.

Witnesses:
I. B. OWENS,
R. G. DU BOIS.