(No Model.) 2 Sheets—Sheet 1.

H. J. FREUDENFELD.

COMPRESSED AIR WATER ELEVATOR.

No. 424,775. Patented Apr. 1, 1890.

Fig. 1.

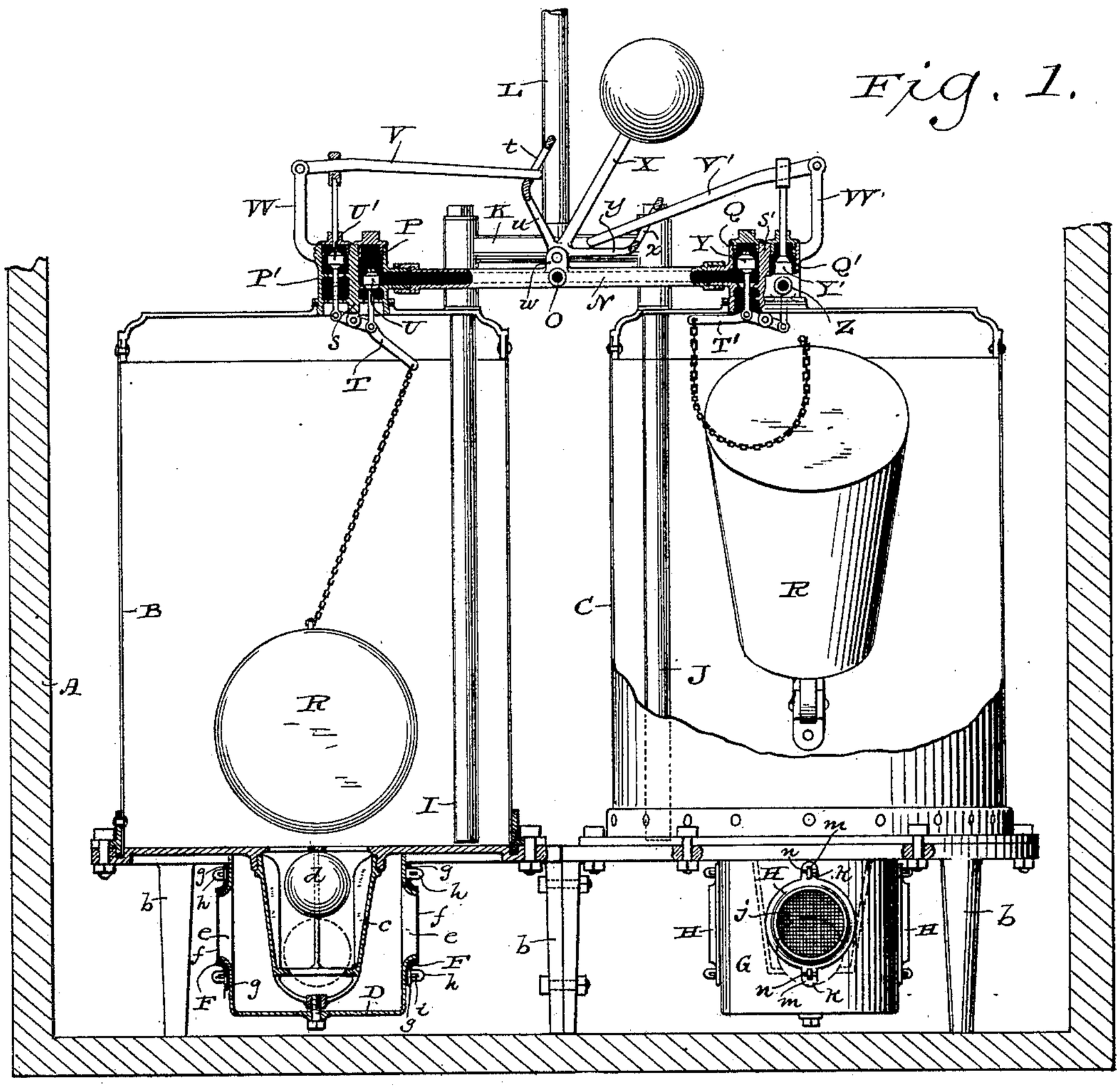
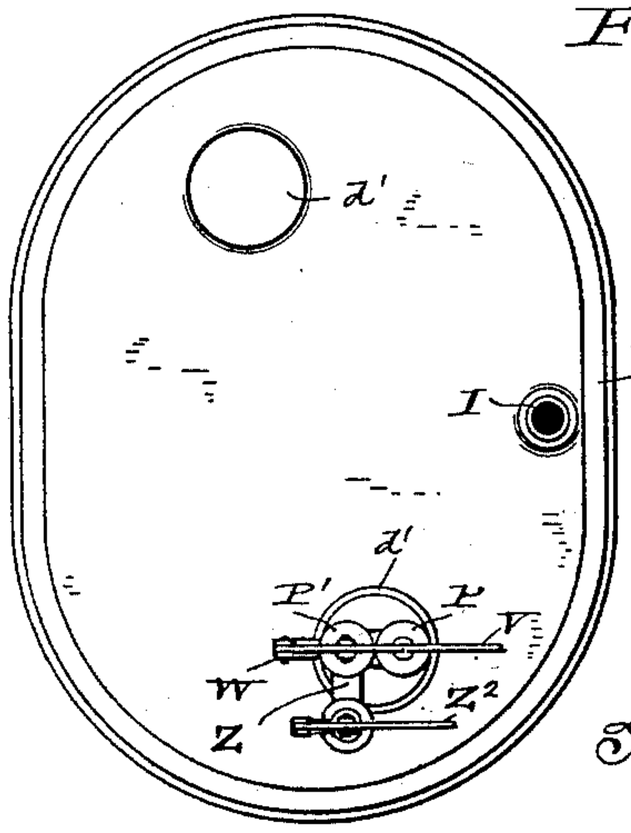


Fig. 2.



Witnesses
Geo. W. Young.
N. E. Oliphant

Inventor
Henry J. Freudenfeld
By H. G. Underwood
Attorneys

(No Model.) 2 Sheets—Sheet 2.

H. J. FREUDENFELD.

COMPRESSED AIR WATER ELEVATOR.

No. 424,775. Patented Apr. 1, 1890.

Fig. 3.

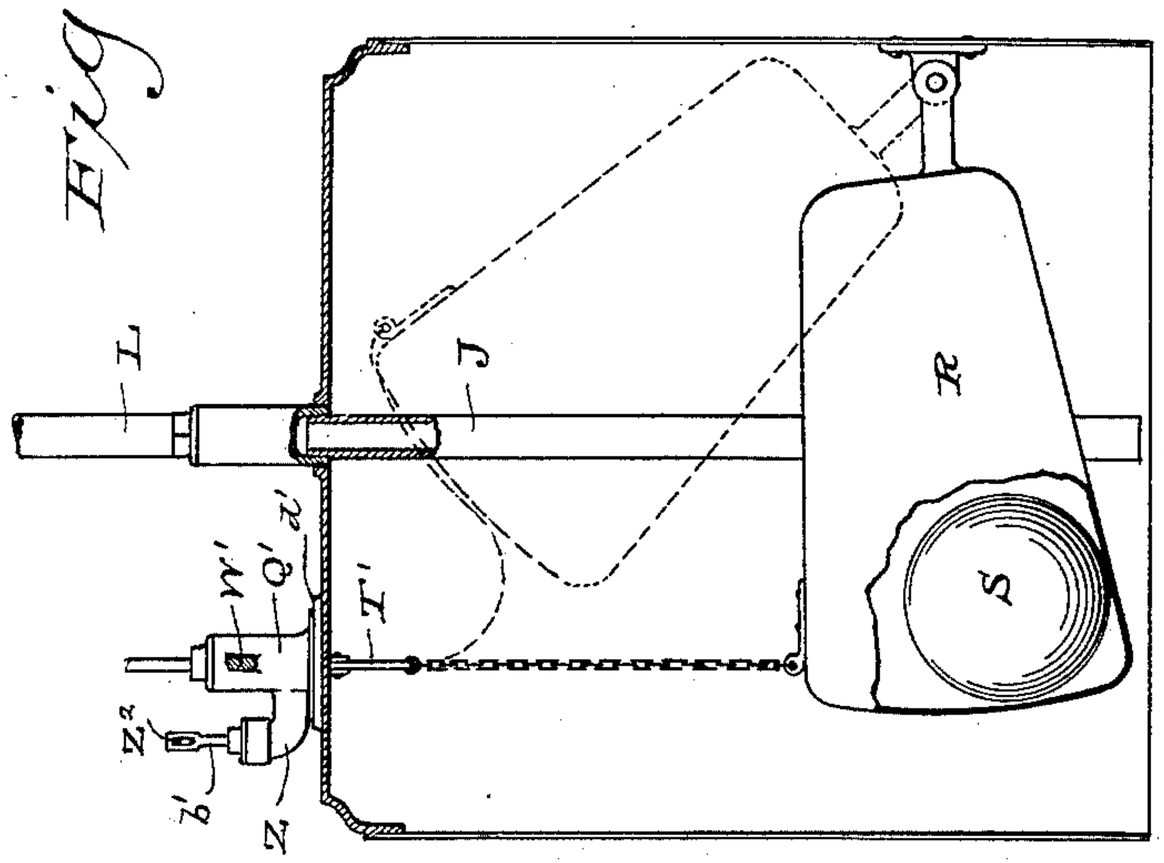


Fig. 6.

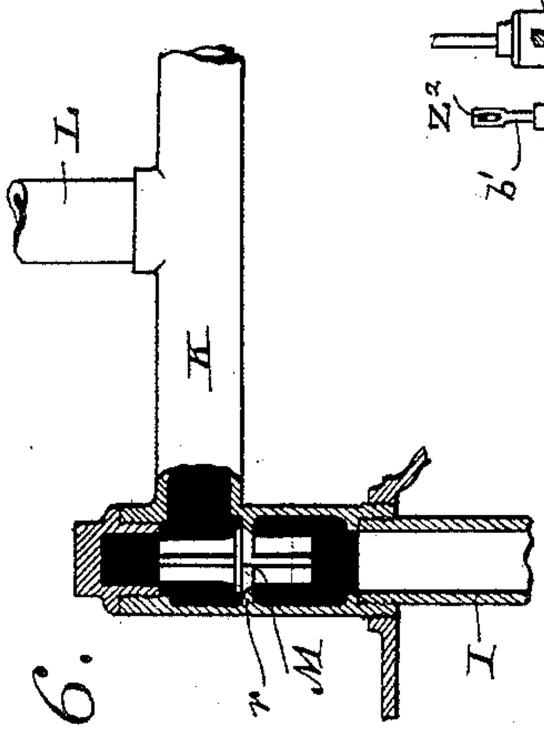


Fig. 4.

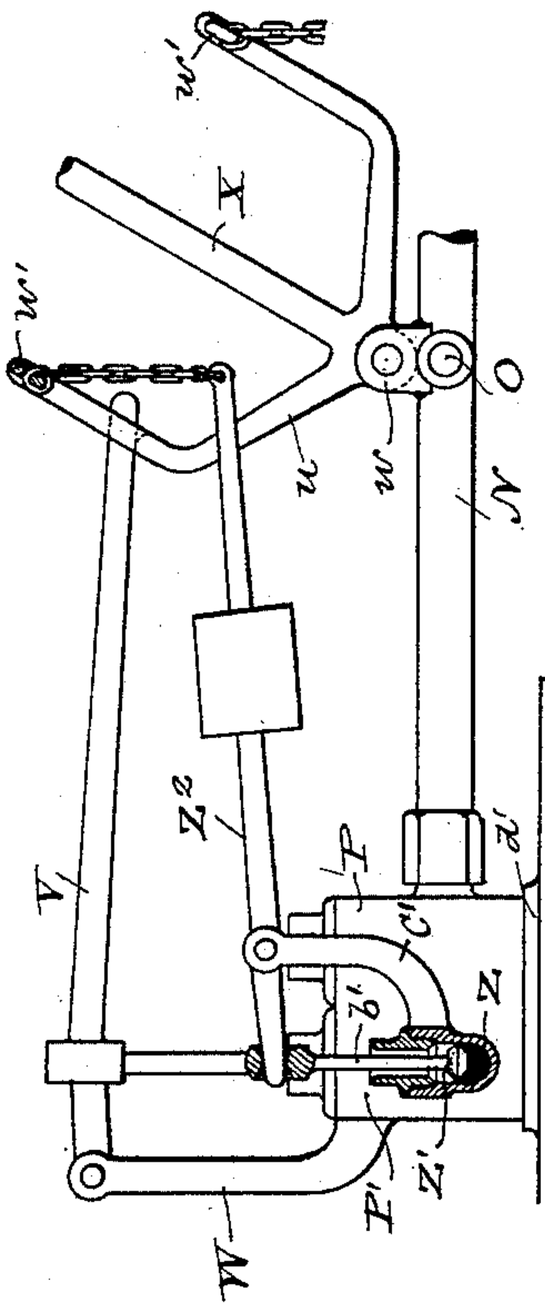
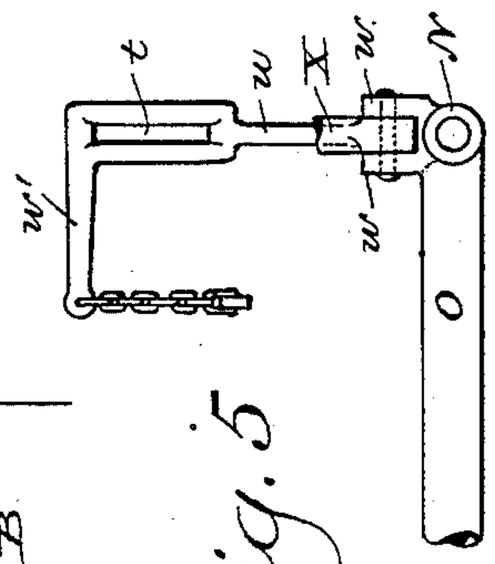


Fig. 5.



Witnesses
Geo. W. Young.
N. E. Oliphant

Inventor
Henry J. Freudenfeld
By H. G. Underwood
Attorney

UNITED STATES PATENT OFFICE.

HENRY J. FREUDENFELD, OF MILWAUKEE, WISCONSIN.

COMPRESSED-AIR WATER-ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 424,775, dated April 1, 1890.

Application filed January 27, 1890. Serial No. 338,213. (No model.)

To all whom it may concern:

Be it known that I, HENRY J. FREUDENFELD, of Milwaukee, in the county of Milwaukee, and in the State of Wisconsin, have invented certain new and useful Improvements in Compressed-Air Water-Elevators; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to compressed-air water-elevators; and it consists in certain peculiarities of construction and combination of parts, to be hereinafter described with reference to the accompanying drawings and subsequently claimed.

In the drawings, Figure 1 is an elevation of my device, partly broken away and partly in section; Fig. 2, a plan view of one of the cylinders embodied in my device; Fig. 3, a sectional view of said cylinder; Fig. 4, a detail elevation, partly in section, and illustrating a cut-off mechanism; Fig. 5, a detail view illustrating a fluke of a weighted rod that forms part of the cut-off mechanism, and Fig. 6 a detail sectional view illustrating a gravity-valve in the joint between horizontal and vertical pipes.

Referring by letter to the drawings, A represents a water-tank of any suitable construction, and arranged within the tank are twin cylinders B C, supported on legs *b*, as shown in Fig. 1.

Depending from the cylinder B is a chamber *c* for a spherical valve *d*, and surrounding this chamber is a shell D, provided with inlet-ports *e*, covered by wire-gauze strainers *f*, these strainers being held in place by rings F, having slotted ears *g*, that engage lugs *h* on the shell and are opposed by pins *i*, passed through openings in said lugs. In a like manner the cylinder C is provided with a chamber for a spherical valve, this chamber being surrounded by a shell G, having inlet-ports and wire-gauze strainers *j*, the latter being held in place by rings H, provided with slotted ears *k*, that engage lugs *m* on said shell and are opposed by pins *n*, passed through openings in said lugs.

Pipes I J pass through the tops of the cylinders B C and extend down to within a short distance of the bottoms, these pipes being joined at their upper ends by a horizontal pipe K, the latter pipe being connected to a delivery-pipe L of any desirable length. Each joint between the pipe K and the pipes I J is provided with a seat *r* for a check-valve M, the latter being illustrated in Fig. 6.

A cross-head N of a pipe O has one end thereof connected to a valve-chamber P on the top of the cylinder B, and the other end of the cross-head is connected to a valve-chamber Q on the top of the cylinder C, as is best illustrated in Fig. 1.

The pipe O is designed for connection with a source of compressed-air supply, and when the compressed air is being admitted to one of the cylinders it is cut off from the other by the means to be hereinafter described. Pivotally connected to the inside of each cylinder is a hollow float R, and arranged within each float is a loose ball S, of iron or other heavy material.

The float in the cylinder B has its outer end flexibly connected to a yoke T, pivotally secured to the lower end of a partition *s* between the valve-chamber P and another valve-chamber P′ on said cylinder, and likewise connected to the yoke on opposite sides of the partition are the stems of valves U U′, respectively arranged in said chambers. The valve U controls that end of the cross-head N that communicates with the chamber P, and the valve U′ closes on its seat in the chamber P′ to prevent the escape of air around that portion of its stem that extends in an upward direction and connects with a lever V, the latter having one end thereof fulcrumed to an arm W, that rises from said chamber P′, the other end of the lever being engaged with a slot *t* in a fluke *u* of a weighted throw-rod X, pivotally connected to ears *w* on said cross-head.

The float in the cylinder C has its outer end flexibly connected to a yoke T′, pivotally secured to the lower end of a partition *s*′ between the valve-chamber Q and another valve-chamber Q′ on said cylinder, and likewise connected to the yoke on opposite sides of the partition are the stems of valves Y Y′, respectively arranged in said chambers. The valve Y controls that end of the cross-head N that communicates with the chamber Q, and the valve Y′ closes on its seat in the

chamber Q′ to prevent the escape of air around that portion of its stem that extends in an upward direction and connects with a lever V′, the latter having one end thereof fulcrumed to an arm W′, that rises from said chamber Q′, the other end of the lever being engaged with a slot *x* in a fluke *y* of the weighted throw-rod X, that is pivotally connected to said cross-head.

The valve-chambers P′ Q′ on the cylinders B C are individually provided with an exhaust-nozzle Z, having a seat for a valve Z′, and the stem *b′* of this valve is connected to a weighted lever Z^2, the latter being fulcrumed to an arm C′, that extends up from said exhaust-nozzle. The levers Z^2 are flexibly connected to arms *w′* on the flukes of the weighted throw-rod X.

As shown in Fig. 2, the top of each cylinder may be provided with two taps *d′*, diametrically opposite each other, and thus the valve-chambers and exhaust-nozzle on the top of said cylinder may be either to the right or left of the water-outlet.

In the operation of my device we will assume that the tank A is filled with water and the several parts in the position shown by Fig. 1. Such being the case, the cylinder B is empty and the one C filled by the rise of the water through the ports in the shell G and the valve-chamber therein. The float in the latter cylinder being raised on its pivot to slacken the flexible device that connects it with the yoke T′ and the weighted throw-rod X being moved on its pivot in the proper direction, the lever V′ is depressed by the fluke *y* of said throw-rod to seat the valve Y′ and unseat the valve Y, while at the same time the flexible device connecting the weighted lever Z^2 and arm *w′* of said fluke is slackened to allow said lever to seat the valve Z′ in the exhaust-nozzle Z, and thereby prevent the escape of compressed air let into the cylinder C, it being understood that the corresponding devices relative to said cylinder B are in the reverse of what has just been described, in order that the compressed air in the latter cylinder may escape. The compressed air being cut off from the cylinder B and admitted to the one C, the water in the latter is forced up the pipe J into the pipes K L, and as this operation takes place the float in the latter cylinder swings down on its pivot, the ball therein falling toward the outer end to increase the leverage, and thus operate the yoke T′ to shut off the air at the time said latter cylinder is emptied. When the yoke T′ is pulled down by the action of the weighted float, the lever V′ is elevated to raise the throw-rod X, and the greater portion of the weight thereon being moved beyond the pivotal center of said throw-rod the latter is automatically carried over toward the cylinder B to depress the lever V, and thus unseat the valve P. The valves P′ Z′ belonging to said cylinder are seated by the same operation. The inflow of water through the ports *e* in the shell D elevates the float in the cylinder B to slacken the flexible connection between said float and the yoke T prior to the time the throw-rod X moves toward said cylinder, and thus there is no opposition to the power of the lever V. The parts being in their new position, the compressed air enters the cylinder B and the water in the latter is forced up through the pipe I into the pipes K L, while at the same time the cylinder C is being refilled with water from the supply-tank, and the operation above described is carried on indefinitely.

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

1. The combination of twin cylinders having valve-controlled inlets and outlets for water and compressed air, levers connected to the air-valves, a pivotal throw-rod having flukes connecting with said levers, pivotal yokes also connected to the air-valves, and floats flexibly connected to the yokes, substantially as set forth.

2. The combination of twin cylinders having valve-controlled inlets and outlets for water and compressed air, the valves for the air inlets and outlets arranged to move in opposite directions, pivotal yokes arranged within the cylinders and connected to the stems of the air-inlet valves, floats also arranged within the cylinders, flexible devices connecting the yokes and floats, levers arranged upon the outside of the cylinders and connected to the yokes, a pivotal throw-rod having flukes connecting with the levers, and a lever mechanism connecting the throw-rod flukes with the stems of the air-outlet valves, substantially as set forth.

3. The combination of twin cylinders having valve-controlled inlets and outlets for water and compressed air, valves for the air inlets and outlets arranged to move in opposite directions, pivotal yokes arranged within the cylinders and connected to the stems of the air-inlet valves, a hollow float pivotally connected to the inside of each cylinder, weights loosely arranged within the floats, flexible devices connecting the yokes and floats, levers arranged upon the outside of the cylinders and connected to the yokes, a pivotal throw-rod having flukes for engagement with the levers, and a lever mechanism connecting the throw-rod flukes with the stems of the air-outlet valves, substantially as set forth.

4. The combination of twin cylinders having valve-controlled inlets and outlets for water, twin chambers arranged on each cylinder, a compressed-air pipe having a cross-head connected to one chamber in each pair, a valve arranged in each chamber, a pivotal yoke connected to the valve-stems, a lever connected to one of the valve-stems, a pivotal throw-rod having a fluke engaged by the lever, an air-exhaust nozzle leading from one of said chambers, a valve arranged in the nozzle, a lever-connection between the stem of the lat-

ter valve and said fluke of the throw-rod, a float arranged in each cylinder, and a flexible device connecting the float with said yoke, substantially as set forth.

5. The combination, with a cylinder provided with a depending chamber containing a valve, of a shell surrounding the valve-chamber and provided with ports, lugs on the shell, strainers covering the ports, rings arranged against the strainers and provided with slotted ears engaging the lugs on the shell, and pins passed through the lugs in opposition to the ears on the rings, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand, at Milwaukee, in the county of Milwaukee and State of Wisconsin, in the presence of two witnesses.

HENRY J. FREUDENFELD.

Witnesses:
N. E. OLIPHANT,
WM. KLUG.