(No Model.) 4 Sheets—Sheet 1.

J. G. POHLÉ & D. HILL.

PNEUMATIC WATER ELEVATOR.

No. 338,295. Patented Mar. 23, 1886.

Fig. 1.

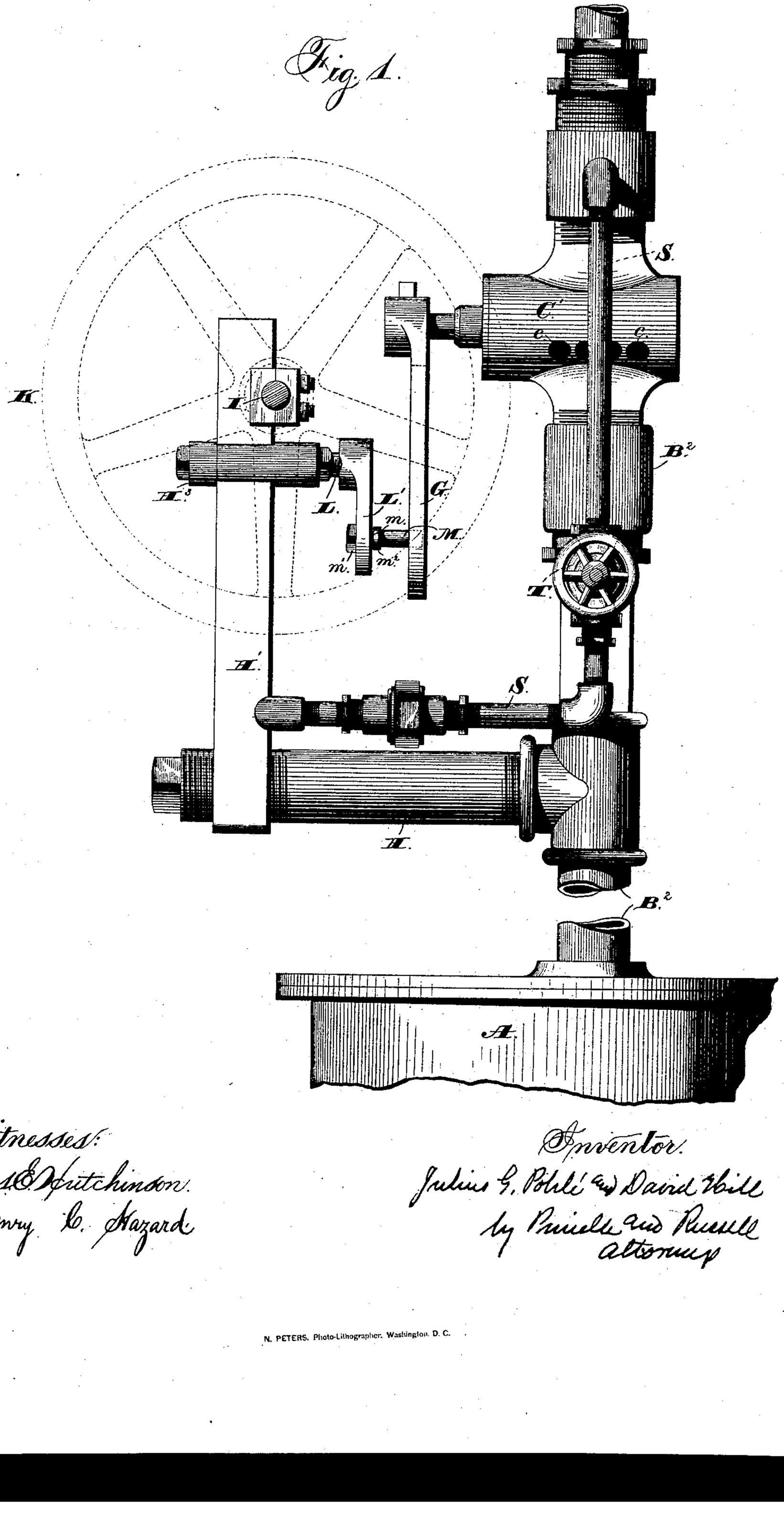

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Fig. 2.

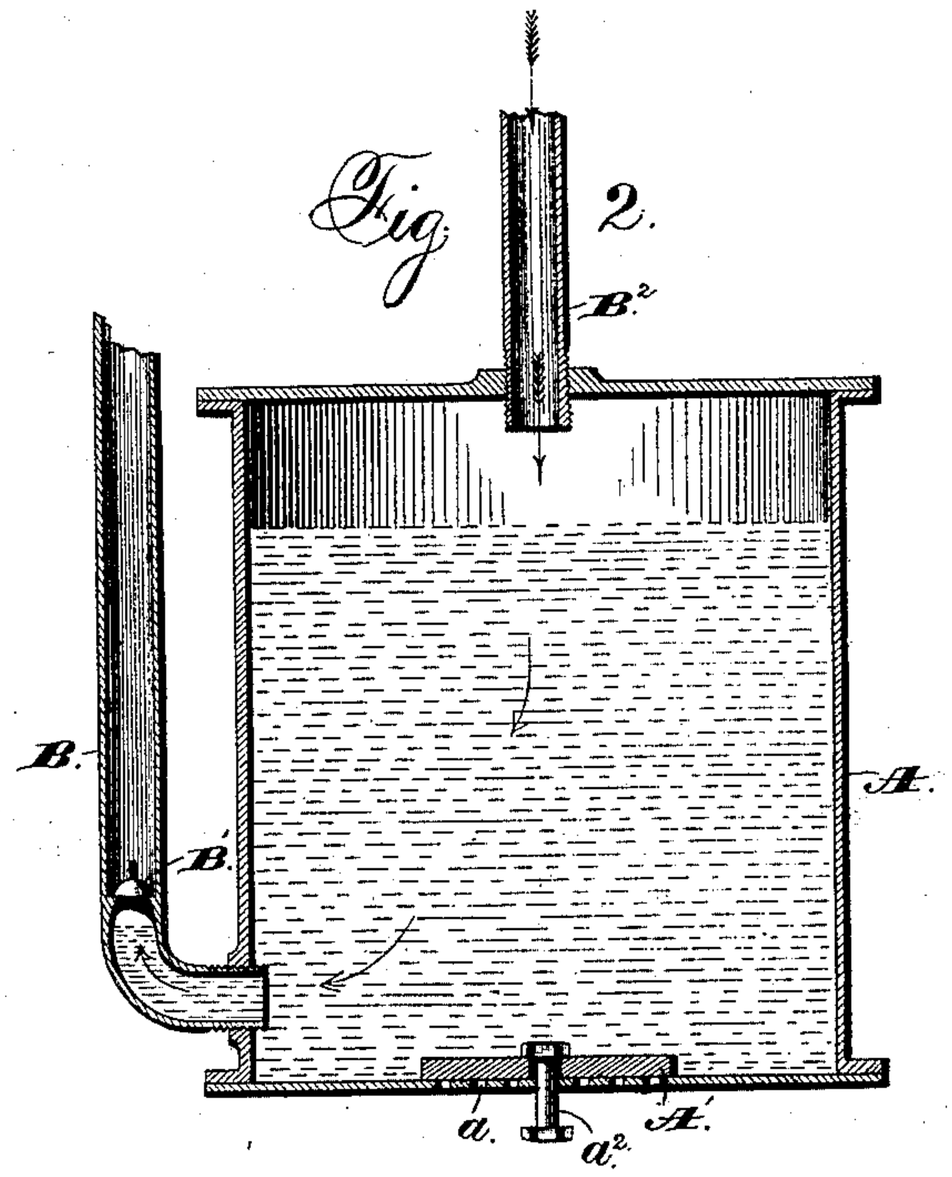

Fig. 3.

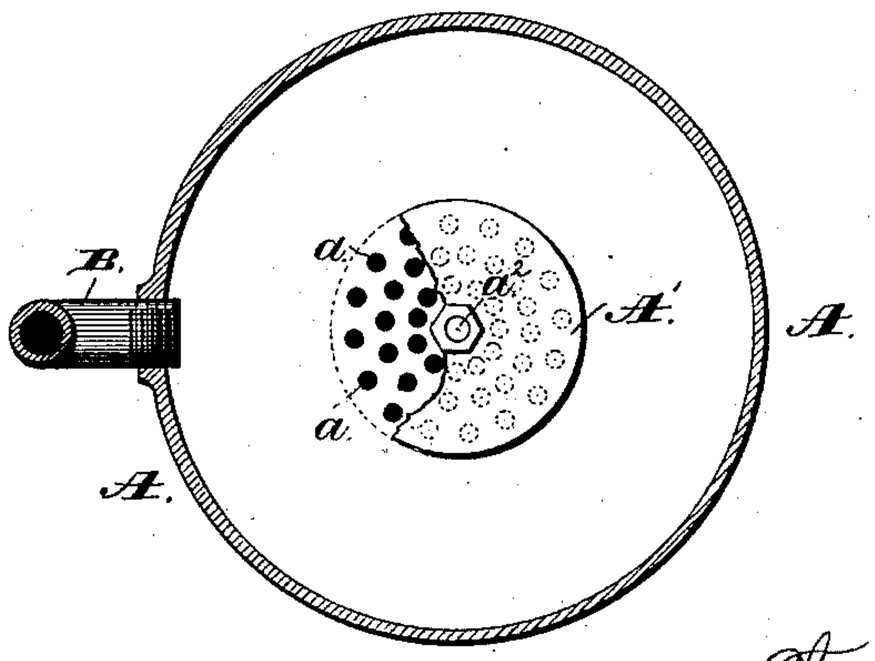

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Fig. 4.

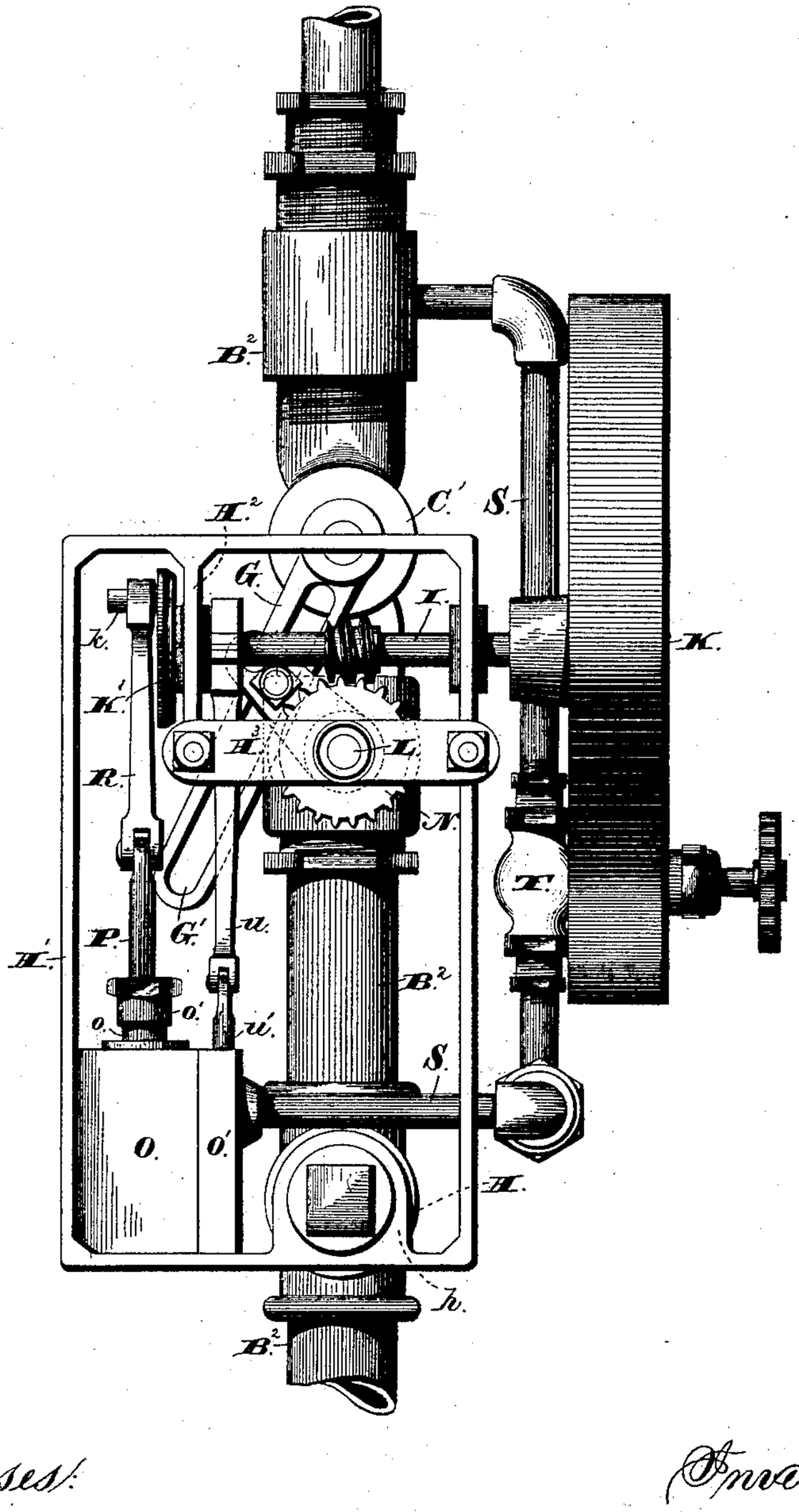

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Fig. 5.

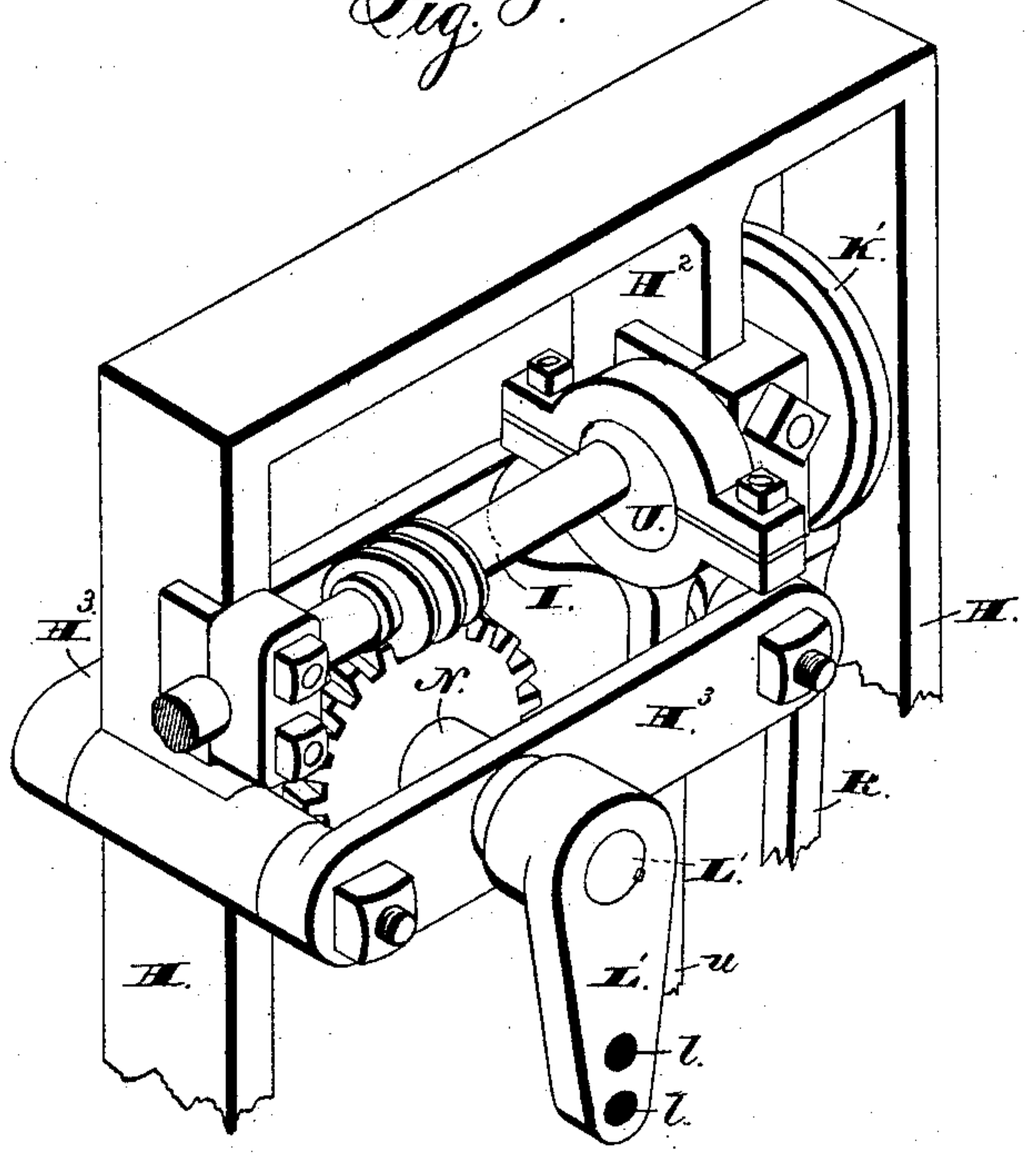
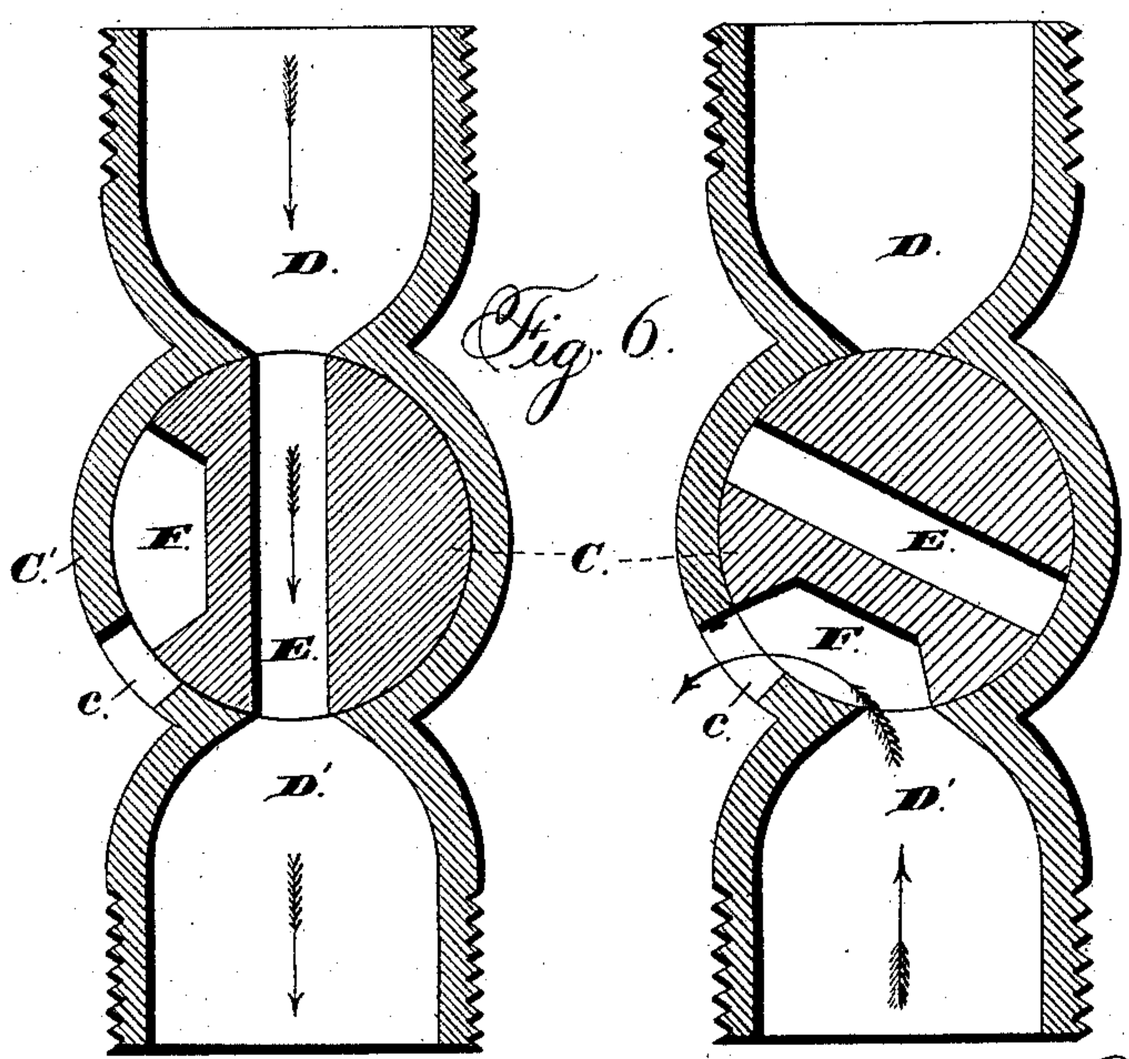


Fig. 6.



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UNITED STATES PATENT OFFICE.

JULIUS G. POHLÉ AND DAVID HILL, OF GEORGETOWN, COLORADO.

PNEUMATIC WATER-ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 338,295, dated March 23, 1886.

Application filed February 19, 1885. Serial No. 156,386. (No model.)

To all whom it may concern:

Be it known that we, JULIUS G. POHLÉ and DAVID HILL, of Georgetown, in the county of Clear Creek, and in the State of Colorado, have invented certain new and useful Improvements in Pneumatic Water-Elevators; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 shows a view in front elevation of our pneumatic water-elevator; Fig. 2, a vertical sectional view of the receiver or collecting-chamber; Fig. 3, a horizontal section of the same; Fig. 4, a detail view in side elevation of the valve-operating mechanism with the pipes and valve; Fig. 5, a detail perspective view, from the opposite side, of the valve-operating mechanism detached from the pipes; Fig. 6, a detail vertical sectional view of the valve in the compressed air-pipe, illustrating the operation of the same.

Letters of like name and kind refer to like parts in each of the figures.

The object of our invention is to provide an improved pneumatic water-elevator; and to this end it consists in the construction, arrangement, and combination of parts as hereinafter specified.

In the drawings, A designates the receiver or collecting-chamber, which, when the apparatus is in use, is placed where the water to be elevated will surround and have easy access to it. It is designed to be submerged in the water at any depth, while the mechanism for operating the valve to admit and shut off the compressed air or steam from the chamber, to be hereinafter described, can be placed at any desired place or height entirely removed from and out of reach of the water. As shown in the drawings, this receiving-chamber A is preferably cylindrical, though the shape is not essential. It is made of metal strong enough to stand the pressure of the air or steam to be admitted to it. In its bottom are several openings, *a a*, over which rests a valve, A′, of rubber, held in place by a bolt, a^2, passing through its center into the chamber-bottom. With this construction obviously water is free to pass up into the chamber through the holes *a a*, but cannot be forced out of the chamber down through them on account of the valve resting over their upper ends. From one side of the chamber, near its bottom, a pipe, B, extends upward to the point or place at which it is desired to discharge the elevated water. In the upright portion of this pipe, near its lower end, is a check-valve, B′, of the ordinary and well-known form, adapted to allow of the upward flow of water in the pipe, while preventing any downward flow or return of the same into the chamber. From the top of the receiver a pipe, B^2, extends upward, and is connected with a source of supply of steam or air under pressure. Situated in this pipe, or the connections by which it is connected with the source of compressed air or steam, is a valve, C, preferably of the rotary form, as shown. As indicated hereinbefore, this valve is to be placed above and out of reach of the water to be elevated. At one side, near its bottom, the valve-casing C′ is provided with a series of openings, *c c*, forming exhaust-ports. At its top and bottom the valve-chest has ports D and D′, communicating with the pipe from the source of supply, and with the pipe to the chamber A, respectively. An opening or passage, E, is made diametrically through the body of the valve. In one side of the valve-body is a recess, F, occupying about one-third of the peripheral surface of the body. This recess does not extend inward to the central passage, E, through the valve-body. On the valve-stem is fixed a crank-arm, G, provided with a longitudinal slot, G′. This arm is so fixed upon the stem that as it is swung out to one side the diametrical passage E through the valve-body will be brought into line with and will establish communication between the ports D D′, and as it is swung to the opposite side the recess F will be brought into coincidence with the port D′ and the exhaust-openings *c c* at the same time. With this construction, when the parts are in the former position the compressed air or steam is admitted to the pipe connected with the receiving-chamber A, and when the parts are in the latter position the steam or air from the source of supply is cut off and the exhaust-openings are, through the recess F, in communication with the pipe extending to the receiving or collecting chamber A, so that the air in such chamber and pipe can escape readily out through the exhaust-openings *c c*, for the purpose to be herein-

after set forth. Extending outward from pipe B^2, below valve C, is an arm, H. Upon this is supported a frame, H′, rectangular in shape. A loop or lug, *h*, on the frame, having a screw-threaded opening, is screwed upon the end of arm H, as shown in the drawings. In the upper portion of the frame is journaled a horizontal shaft, I, extending in a direction at right angles to the valve-spindle in a plane below the same. Upon one end of this shaft is fixed the balance-wheel K, and upon the outer end is fastened the crank-disk K′. One of the ends of the shaft is journaled in a box on the side of the frame-upright, while the other is journaled in a box on an arm, H^2, extending downward from the top of the frame at some distance from but parallel with the other upright side of the frame.

Two horizontal bars, H^2 H^3, attached at one end to the frame-side in which the end of the shaft I is journaled, and at the other to arm H^2, form a frame in which is journaled a counter-shaft, L, below and at right angles to shaft I. The crank-disk K′ on the latter shaft is situated just outside of the arm H^2 and between it and the frame side.

Upon the shaft L is a crank-arm, L′, preferably provided with two or more holes, *l l*, for the reception of the removable crank-pin M, so that the amount of throw or movement of the pin can be adjusted as desired. This pin is formed with the reduced portion *m*, adapted to pass through one of the holes *l*, and screw-threaded to receive the nut *m*′. A collar, m^2, is also formed on the pin to come in contact with the outer side of the crank when the nut is screwed up. This pin engages and plays in the slot G′ in the crank G on the valve-stem as the shaft L revolves, so as to swing the crank and turn the valve-stem first in one direction and then in the other. The shaft L is driven from shaft I by the worm-gearing consisting of the worm on shaft I, and the wheel N upon shaft L, having teeth meshing with the worm. With this construction the shaft I must revolve a number of times for each revolution of shaft L. With the worm-gear as shown in the drawings the former shaft must revolve twenty-eight times to cause the other to revolve once. The reason of this construction will be set forth hereinafter.

Fastened to and upon the lower horizontal portion and one of the upright sides of the frame H′ is the cylinder O, having the valve-chest O′ attached thereto, provided with the ordinary form of slide-valve in use in steam-engines. This cylinder is at its upper end provided with an extension or neck, *o*, through which the piston-rod P works, and by which it is guided and steadied. Upon this neck is screwed the packing-cup *o*′.

To the upper end of the piston-rod is pivoted one end of the pitman R, which, at its upper end, is pivoted upon the crank-pin *k* on the crank-disk or pitman-wheel K′.

The piston-rod is provided with any desired form of piston within the cylinder.

Connected with the inlet-opening of the valve-chest is the small pipe S, communicating with the pipe from the source of supply of steam or compressed air at a point above the valve C. This small pipe is provided with a stop-cock or valve, T, to shut off or regulate the amount of the steam or air passing from the main pipe to the valve-chest O′.

The valve in the chest is operated to admit the steam or air and shut it off from the cylinder at the proper times by the eccentric U on shaft I, the eccentric-rod *u*, of ordinary construction, and the valve-stem *u*′, pivotally connected with the eccentric-rod. With this construction, if steam or air be admitted to the valve-chest through the small pipe, the pitman R will be driven continuously, so as to rotate the crank-disk and shaft I.

Instead of the form of motor shown and described for rotating this crank, any other of the well-known forms of motors adapted to be operated by steam or compressed air can obviously be used without departure from the spirit of our invention.

As a connection between the two shafts, we prefer the worm-gearing shown and described; but any other form of gearing can of course be used, as desired, for the same purpose. Whatever the form of gearing used, it should be so constructed and proportioned that the main shaft should make a number of revolutions in causing one rotation of the counter-shaft.

If desired, instead of being supported entirely upon the arm from the pipe, the frame carrying the valve-operating mechanism can be attached to any suitable support by bolting or otherwise.

The operation of our apparatus is as follows: The receiving or collecting chamber A being submerged in the water to be elevated, and the pipes and frame for the valve-gearing being suitably fixed or supported, so that said gearing and the motor driving it shall be above or out of reach of the water, the main supply-pipe is connected with a source of supply of compressed air or steam. As the chamber or tank A is submerged, the surrounding water will raise the valve A′, and, rushing in through openings *a a*, will fill the chamber. While this filling is going on the valve C is turned so that the recess in its body forms a communication between the pipe leading to the top of the tank and the exhaust opening or openings *c* in the valve-casing. The air forced out of the tank by the influx of the water then can escape readily through such opening or openings. If, now, the valve or stop-cock in the small pipe leading from the air-supply pipe to the valve-chest of the motor be opened, said motor will be put in action to drive the shaft I continuously, as set forth hereinbefore. Through the connecting-gearing shaft L is driven from this shaft. As shaft L and the crank thereon rotate, the pin on the crank, engaging the slot in the crank on the valve-stem, swings it, so as to rotate the valve. The valve-body is thus turned, so as to cut off the connection between

the exhaust-openings and the pipe to the receiver, and bring the passage E into line with the upper and lower ports, D D′, in the valve-casing, thus establishing communication between the supply-pipe and the receiver. The compressed air or steam then rushes down into the chamber and forces the water out of it up the discharge-pipe B, as that is the only way by which the water can escape, the valve A′ preventing its flowing out through openings *a a* in the chamber-bottom. As the shaft L is only rotated once for twenty-eight rotations of the shaft I, the valve is operated slowly enough to allow sufficient air or steam to enter the chamber to force all or the greater portion of the water therein out through pipe B. By the continued rotation of shaft L the valve is then rotated back again to shut off connection between the ports D D′ and establish communication again, as before, between port D′ and the openings *c c*. The pressure in the chamber being then relieved by the escape of the confined air up and out through such openings, the water in which the chamber is submerged will rush in and fill the latter again. The water which may be in pipe B when the pressure in the chamber is relieved is prevented from flowing back by the check-valve B′. The communication between port D′ and the openings *c* is kept up long enough to allow the chamber A to become filled or nearly filled by the water. By the continued rotation of shaft L and the pin on its crank engaging the slot in the valve-crank the valve is then rotated to cut off this communication between port D′ and openings *c c*, and bring the passage E into line with ports D and D′ again.

Our valve-operating mechanism being operated directly by the compressed air or steam used in elevating the water will be driven more quickly or slowly, according as the pressure is greater or less. The advantage of this is that where the pressure is greater a shorter time is necessary for the discharge of the water from the tank. As the valve mechanism is not, as heretofore, operated by the rise and fall of the water in the tank, and the consequent raising and lowering of a float therein, it can be placed in any convenient position and location, not only out of reach of the water, but where it can be seen and easily and readily got at for cleaning, oiling, or regulating. Where, as heretofore, the valve mechanism was either wholly or partly submerged in the water, it became rapidly foul and clogged, especially where the elevator was used in mines or tunnels. In our elevator the only movable portions touched by or subjected to the action of the water are the valve at the bottom of the receiving-chamber and the check-valve in the discharge-pipe, neither of which is liable to become clogged or injured by the water, however foul and dirty it may be.

We do not claim as our invention a motor for actuating the valve to cut off or admit the compressed air or steam to the collecting or receiving tank driven by compressed air from within such tank. Our valve-actuating motor, as set forth in the claims, is driven by the air or steam taken directly from the supply-pipe itself before it reaches the receiving tank or chamber, and so before the air or steam has come into contact with the water in the tank, which, where the apparatus is used for discharging water from mines and the like, is exceedingly foul.

Having thus described our invention, what we claim is—

1. In a water-elevator, in combination with the pipe for supplying compressed air or steam to the receiving and collecting chamber, the valve in the pipe for regulating the admission of the air or steam to the chamber, and a motor operated and driven by air or steam taken from the supply-pipe above such valve, substantially as and for the purpose described.

2. In a pneumatic water-elevator, in combination with the supply-pipe and the valve adapted to admit compressed air to the collecting tank or chamber and to allow the escape of air therefrom, the pipe connected with the supply-pipe above such valve, the motor adapted to be operated and driven by the air taken from the supply-pipe by such connecting-pipe, and mechanism, substantially as described, driven by the motor and adapted to operate the valve, substantially as and for the purpose described.

3. In a water-elevator, in combination with the collecting or receiving tank, the pipe for conveying compressed air or steam thereto, the three-way cock or valve in the pipe, a motor continuously driven by compressed air or steam taken from the supply-pipe above the valve, and connecting means or gearing, substantially as described, whereby the valve is intermittingly operated from the motor, all substantially as and for the purpose described.

4. In a water-elevator, in combination with the pipe from the source of supply of compressed air or steam, and the pipe connected with the collecting tank or chamber, the rotary valve between the pipes adapted to alternately establish communication between the two pipes and between the pipe to the tank and an exhaust-opening, the slotted crank on the valve-stem, the rotating shaft, the crank thereon, the pin on the crank, engaging the slot in the valve-crank, a motor driven by the compressed air or steam from the source of supply, and connecting gearing between the motor and crank-shaft, substantially as and for the purpose described.

5. In a pneumatic water-elevator, the rotary valve for admitting the compressed air or steam to the collecting-tank and for shutting off the same and allowing the air or steam in the tank to escape, the slotted crank on the valve-stem, the shaft, the crank on the shaft, the pin on the crank engaging the slot in the valve-crank, the worm-wheel on the shaft, the shaft provided with a worm meshing with the

wheel, the motor driven continuously by the compressed air or steam from the source of supply, and connecting means, substantially as described, between the motor and the worm-shaft, as and for the purpose set forth.

6. In a pneumatic water-elevator, in combination with the rotary valve adapted to admit the compressed air or steam to the collecting-tank, and to shut off the same and allow the air or steam to escape from the tank, the motor having the reciprocating piston and rod and the slide-valve, the pipe between the air or steam supply pipe and the valve-chest of the motor, the pitman, the shaft, the pitman wheel or crank thereon, the eccentric on the shaft, the eccentric-rod connected with the slide-valve, the balance-wheel, the worm on the shaft, the counter-shaft, the worm-wheel and the crank thereon, the crank-pin, and the slotted crank on the rotary valve-stem, substantially as and for the purpose described.

In testimony that we claim the foregoing we have hereunto set our hands this 19th day of January, A. D. 1885.

JULIUS G. POHLÉ.
DAVID HILL.

Witnesses:
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GEORGE H. BARRETT.