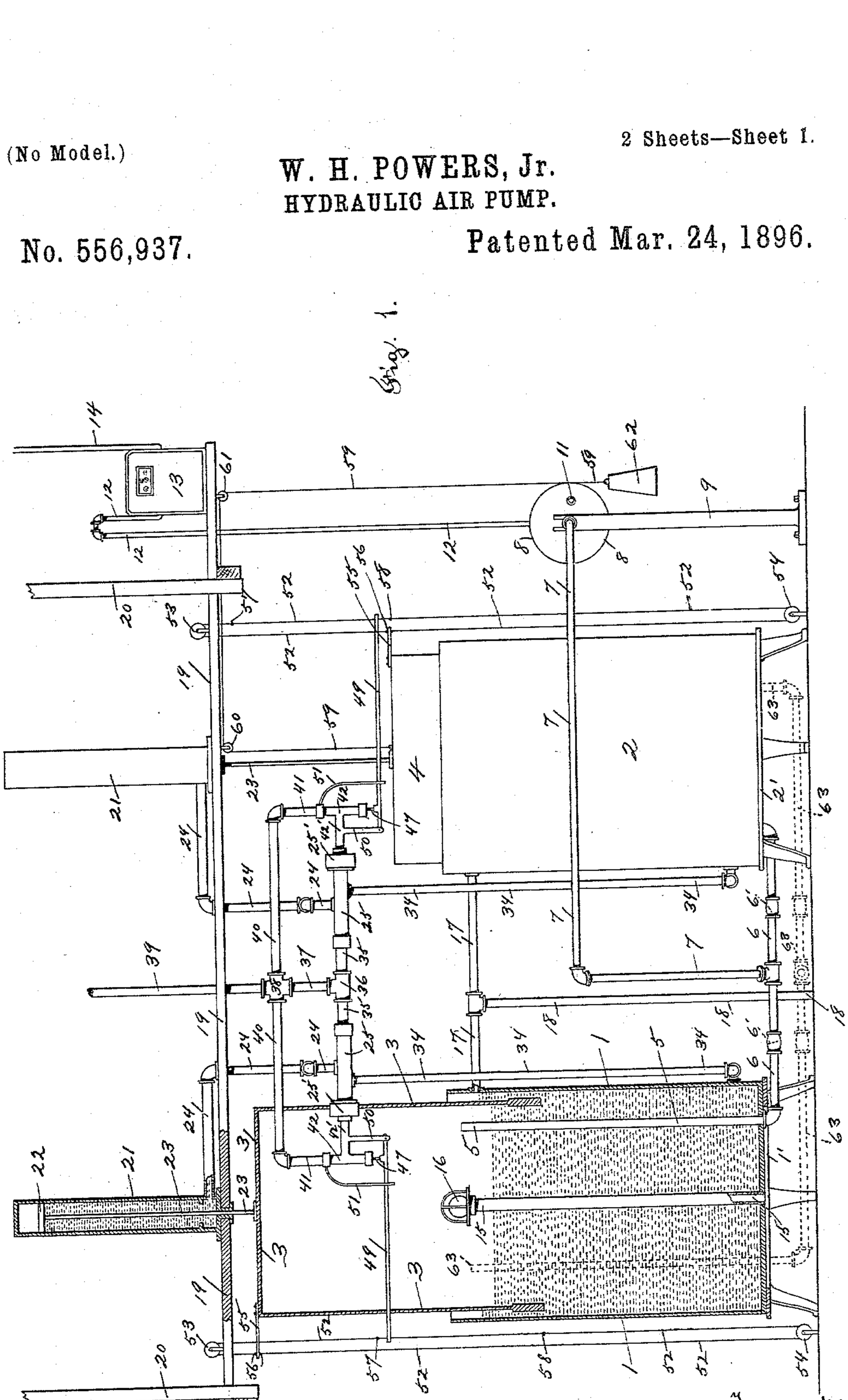
(No Model.) 2 Sheets—Sheet 1.

W. H. POWERS, Jr.

HYDRAULIC AIR PUMP.

No. 556,937. Patented Mar. 24, 1896.

Fig. 1.



Witnesses
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Inventor
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By his Attorney
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(No Model.)

2 Sheets—Sheet 2.

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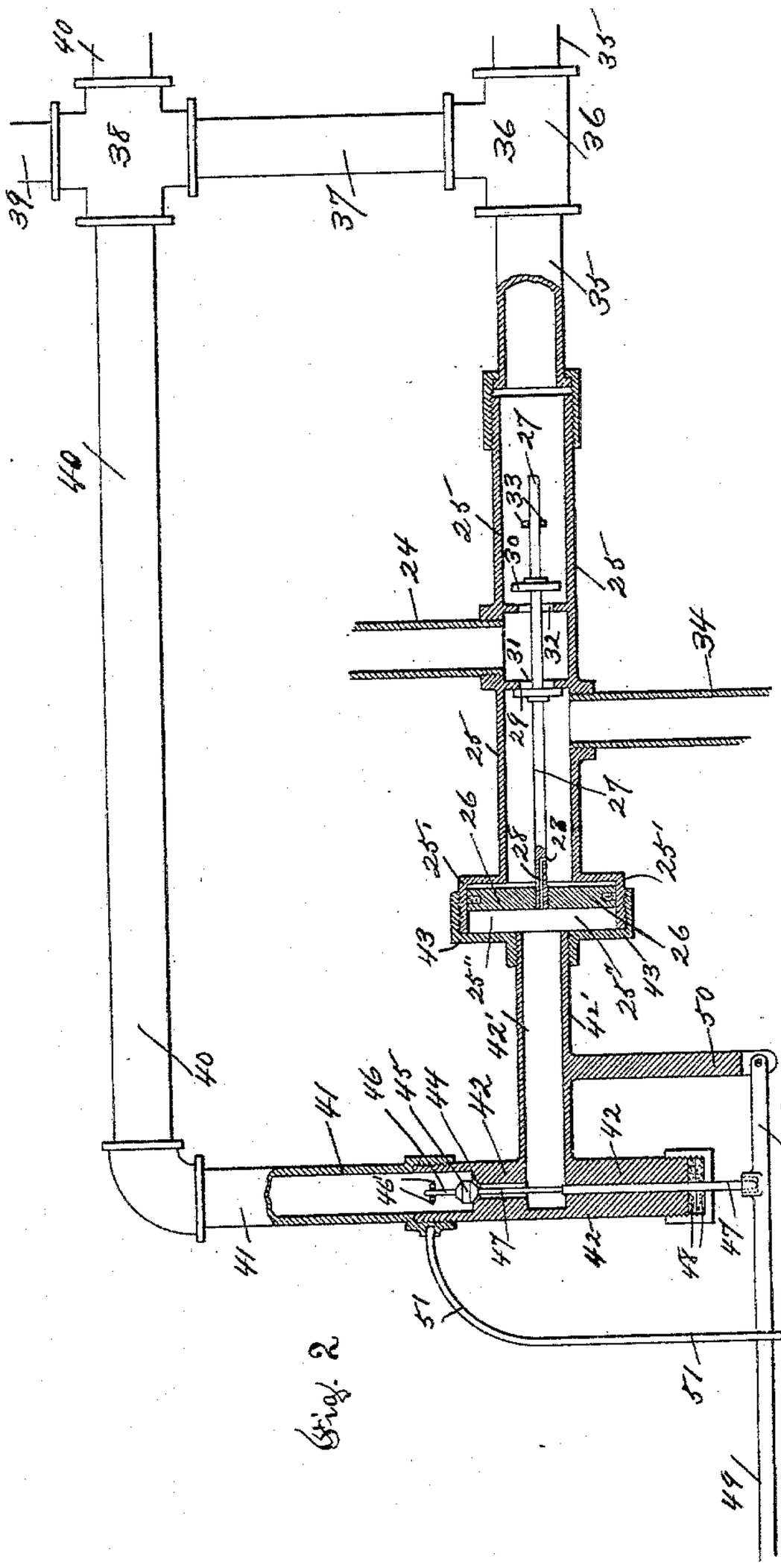

Fig. 2

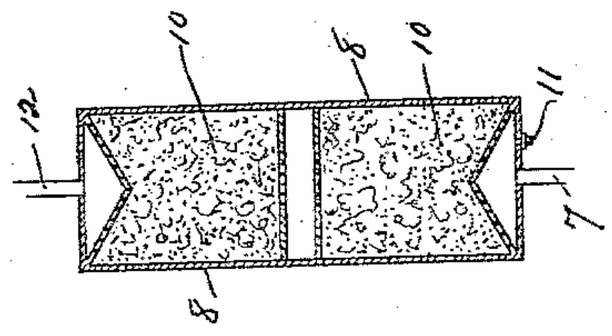

Fig. 3.

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UNITED STATES PATENT OFFICE.

WILLIAM H. POWERS, JR., OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO GEORGE PEIRCE, OF SAME PLACE.

HYDRAULIC AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 556,937, dated March 24, 1896.

Application filed January 6, 1896. Serial No. 574,469. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. POWERS, Jr., a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Machines for Lighting, &c., of which the following is a specification.

My invention relates to machines for lighting, &c.

The object of my invention is to provide an automatic gas-lighting machine of simple construction and operation; and my invention consists in certain novel features of construction and operation of my machine, as will be hereinafter fully described and the nature thereof indicated by the claim.

Referring to the drawings, Figure 1 is a side elevation and partial section of a gas-machine embodying my improvements. Fig. 2 shows on an enlarged scale a sectional view of a portion of the valve mechanism, and Fig. 3 is a sectional view of the carburetor.

In the accompanying drawings, 1 and 2 are stationary tanks or cylinders supported on the bases 1′ and 2′ and containing water or other fluid, and 3 and 4 are the movable cylinders which telescope into the cylinders 1 and 2 and produce the pressure on the air contained within the cylinders, by the descent of said movable cylinders, to force the air through a pipe 5 extending up through the stationary cylinders 1 and 2 and leading out from the bottom of the cylinders into the pipe 6, provided with automatic valves 6′, into the piping 7 leading into one end of the carburetor-cylinder 8, mounted to oscillate in stands 9 at one end of the machine.

The carburetor-cylinder 8 is filled with sponge or other fibrous material 10, as shown in Fig. 3, through which, saturated with gasoline poured into the carburetor-cylinder 8 through an opening 11, in this instance in one end thereof, the air from the cylinders is forced to impregnate the same with the gasoline, said air passing out of the opposite end of the carburetor-cylinder 8, through a pipe 12 leading to a meter 13 and through the delivery-pipe 14 leading to the burners.

Extending through the bottom of each stationary cylinder 1 and 2 is a pipe 15, open at its lower end and provided at its upper end with a ball-valve 16, through which pipe the air enters into the cylinder as the movable cylinders 3 and 4 are raised. Through a pipe 17, leading out from the upper part of the stationary cylinders 1 and 2, any overflow of water from the cylinders passes into the discharge-pipe 18, running to the sewer or other waste source.

I will now proceed to describe the valve mechanism which operates to regulate automatically the flow or pressure of water which raises the movable cylinders 3 and 4, and the discharge of the water, so that the cylinders can descend of their own weight to force the air through the carburetor.

The valve mechanism for each cylinder being similar, a description of one will answer for both.

On a beam 19 supported over the cylinders, in this instance by means of hangers 20, is an upright piston-cylinder 21, having a piston 22 therein, the stem 23 of which is connected at its lower end with the top of the movable cylinder.

Leading into the lower part of the piston-cylinder 21 is a pipe 24, and the lower end of said pipe 24 leads into the cylinder or valve-casing 25. One end of the casing 25 is enlarged, as shown at 25′, and a piston 26, secured to the lower end of the piston-stem 27, is adapted to move in the chamber 25″ in the enlarged end 25′ of the casing 25. The stem 27 has a small central opening 28 through the central portion thereof, at the piston end, leading out through the side of the stem, as shown in Fig. 2, to furnish a passage or leak-hole from the chamber 25″ into the other portion of the casing 25 when the piston 26 moves toward the outer end of the enlarged end 25′ of the casing 25.

On the stem 27 is secured two disks or valves 29 and 30, which are adapted to seat alternately on the openings or valve-seats 31 and 32 in the casing 25. The end of the stem 27 extends between guide-pins 33, located in the casing 25.

Leading out from the casing 25 is a pipe 34, which leads into the lower part of the stationary cylinder. (See Fig. 1.) Through the pipe 34 the discharge from the piston-cylinder 21

passes into the stationary cylinder and furnishes a supply for the same.

One end of the casing 25 is coupled to a pipe 35 leading to a T 36. A pipe 37 leads from said T 36 to a double T 38. Into the double T 38 a pipe 39 leads, through which the water supply passes to operate the valve mechanism. From each side of the double T 38 a pipe 40 leads to a pipe 41, to the lower end of which is attached one arm of a T-pipe 42. Another arm 42′ of the T-pipe 42 is provided with an enlarged end 43, which is secured to the enlarged end 25′ of the casing 25.

In the upper portion of the vertical part of the T-pipe 42 is an opening or valve-seat 44, on which a ball-valve 45 is adapted to seat. The valve 45 is provided with a guide 46, which extends between guide-pins in the pipe 41, and a valve-stem 47 extends down through a central opening in the vertical portion of the T-pipe 42 and through packing-washers 48 at the lower end thereof, and the lower end of said stem 47 is secured to a lever 49 pivoted at its inner end on a downwardly-projecting arm 50, in this instance made integral with the T-pipe 42.

A guide-rod 51, secured at its upper end to the pipe 41, and provided with a loop at its lower end, through which the lever 49 extends, acts to guide the lever 49 and holds it in its proper position. The outer end of the lever 49 is provided with a hole through which an endless cord 52, passing around pulleys 53 and 54, mounted on the beam 19 and the floor, respectively, passes.

Extending out from the top of the movable cylinder 3 is an arm 55, provided with a hole at its end through which the cord 52 passes. A knot 56 or other device just above and below the arm 55 in the cord 52 causes the cord to move as the cylinder is raised or lowered. Two other knots 57 and 58 are made in the cord 52 at such a point that the upper one, 57, when the movable cylinder is in its highest position, will engage with the end of the lever 49 on its upper side to move down the lever and through the stem 47 draw down the valve 45 onto its seat 44 to close the valve and prevent the water entering through the pipe 41 into the horizontal arm 42′ of the T-pipe 42 to operate the piston 26.

The lower knot 58 in the cord 52, as the movable cylinder reaches its lowest point, engages the end of the lever 49 on its lower side and raises said lever, and through the stem 47 raises the valve 45, to allow the water to enter through the opening below the valve into the portion 42′ of the T-pipe 42 to move the piston 26 and open the valve 30 to allow the water from the supply-pipe 39, through the pipe 37 and pipe 35, to pass into the casing 25, and through the valve-opening 32 and pipe 24 into the lower end of the piston-cylinder 21 to raise the piston 22, and through the stem 23 the movable cylinder, as shown in Fig. 1.

From the above description, in connection with the drawings, the automatic operation of the valve mechanism for regulating the flow of water to raise the movable cylinders will be readily understood by those skilled in the art.

Supposing the movable cylinder at the right to be in the position shown in Fig. 1, the water is still entering the piston-cylinder 21 through the pipe 24, as above described, and at the same time the water is entering through the pipe 40 and the pipe 41, through the open valve 44, into the pipe 42′ of the T-pipe 42, and pressing against the piston 26 to keep the piston in its position with the valve 30 open, as shown in Fig. 2, to allow the water to enter through the opening 32 into the pipe 24.

When the piston 22 is forced by the water nearly to the top of the cylinder 21, the knot 57 on the cord 52 will engage the lever 49 upon its upper side, as above described, and operate said lever to close the valve 45 (see Fig. 2) and shut off the water entering through the opening under said valve to operate the piston 26. The pressure on the piston being relieved, and the water being allowed to escape through the passage 28 in the piston and piston-stem 27, the pressure of water entering through the pipe 39 and pipe 37 into the pipe 35 will force the valve 30 back onto its seat 32 and close the opening therein. At the same time the valve 29 will be raised from its seat 31, leaving an opening through which the water running out of the piston 21, as the movable cylinder descends, through the pipe 24, will pass into the pipe 34, and from there into the stationary cylinder. The movement of the valves 30 and 29, as above described, will of course move the piston 26 to its outward position.

When the movable cylinder reaches its lowest point, the knot 58 on the cord 52 will engage with the under side of the arm 49 and through said arm raise the valve 45 to allow the water passing through the pipe 40 and pipe 41 to enter through the opening under the valve into the pipe 42′ and force the piston 26 inwardly to close the valve 29 and open the valve 30, thus allowing the water through the pipes 39, 37, and 35 to enter into the pipe 24 and into the lower part of the piston-cylinder 21 to raise the piston 22 and the movable cylinder, as above described.

It will thus be seen that the valve mechanism is automatically operated at the proper time to allow the flow of water, through the pressure thereof on the piston 22, to raise the movable cylinder.

It will be understood that two or more stationary tanks and two or more movable cylinders are employed to maintain a continuous pressure on the air passing through the carburetor, the movable cylinders working alternately, and when one movable cylinder, as 3, is moving up the valve 6′ at the left in Fig. 1 will be closed and the valve 6′ at the right will be opened, as indicated by dotted

lines, and when the cylinder 3 is descending the valve 6′ at the left will be opened and the valve 6′ at the right closed.

It is desirable to communicate an oscillating motion to the carburetor-cylinder 8 to cause the air passing through the same to be thoroughly carbureted or impregnated with the gasoline contained in the carburetor, and I have in this instance provided for this oscillating motion by means of a cord 59, attached at one end to the top of the movable cylinder 4 and passing over two pulleys 60 and 61, and then several times around the carburetor-cylinder 8 to a weight 62, attached to the free end of the cord 59, so that as the cylinder 4 is raised an oscillating motion will be communicated to the cylinder 8 in one direction, and as the cylinder 4 is lowered an oscillating motion will be communicated to the cylinder 8 in an opposite direction.

I may use my machine for providing cold air, or hot air under pressure, for any purpose, if desired.

I have indicated in Fig. 1 of the drawings, by dotted lines, pipes 63 leading out of the stationary tanks to a refrigerator or heater (not shown) or other device for cooling or heating the air which is forced through the refrigerator or heater, to be delivered as desired.

The advantages of my improvements in machines for lighting, &c., will be readily appreciated by those skilled in the art.

My machine is very simple in construction and entirely automatic in its operation, and by utilizing the water-service which is almost always to be found in towns and cities I am enabled to automatically operate the machine with very little waste of water, thus operating the machine at a minimum cost.

It will be understood that the details of construction of my machine may be varied, if desired, and it may be put to any use for which it may be adapted. I may use more than two stationary cylinders and movable cylinders to secure constant pressure.

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

The combination with a stationary tank or cylinder, containing water or other fluid, and provided with an air-inlet, and also with an air-outlet, and a movable cylinder adapted to telescope into said stationary tank or cylinder to compress the air, said movable cylinder provided with a piston working in a piston-cylinder, and adapted to be operated by water-pressure, of valve mechanism for automatically regulating the flow of water into the piston-cylinder, to raise the piston, and also the flow of water out of the piston-cylinder, to allow the piston to descend, said valve mechanism consisting of a cylinder or casing provided with two valve-seats therein, and a delivery-pipe leading out from said casing between said seats, to the piston-cylinder, a piston working in the enlarged end of said casing, and a piston-stem carrying two valves to seat alternately on said valve-seats, and a discharge-pipe leading out from said casing between the piston and one of the valve-seats, an opening leading from a delivery-pipe to the chamber below the piston, and a valve adapted to close said opening to shut off the pressure on said piston, said valve having a stem connected with a pivoted lever, and said lever adapted to be operated automatically as the movable cylinder moves up and down, to open and close the valve in the delivery-pipe, and to regulate the flow of water which operates the piston connected with the movable cylinder, substantially as set forth.

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Witnesses:
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