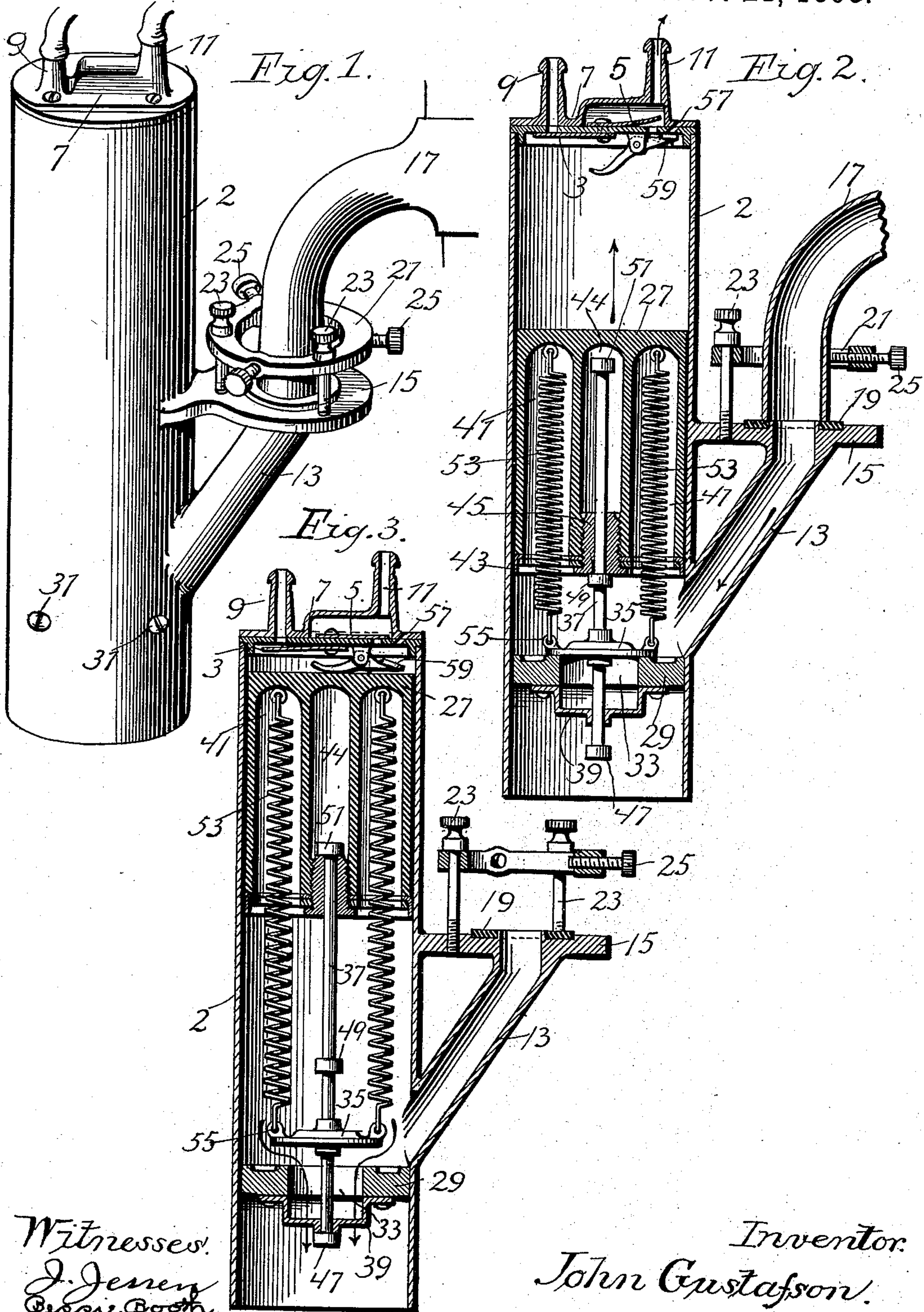


(No Model.)

J. GUSTAFSON.  
HYDRAULIC AIR COMPRESSOR.

No. 509,220.

Patented Nov. 21, 1893.



Witnesses:  
J. Jensen  
Berrie Booth

Inventor:  
John Gustafson.

By Paul M. ... atty



# UNITED STATES PATENT OFFICE.

JOHN GUSTAFSON, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-THIRD TO  
DANIEL ROLLINS BROWN, OF SAME PLACE.

## HYDRAULIC AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 509,220, dated November 21, 1893.

Application filed February 9, 1892. Serial No. 420,919. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN GUSTAFSON, of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Hydraulic Air-Compressor, of which the following is a specification.

This invention relates to a new and useful air compressor designed especially for compressing air to be used for the atomization of liquids, and the objects I have in view are, first, to provide a device of this kind that can be readily attached to an ordinary faucet and fed by a supply of water therefrom while the water may at the same time be used for other purposes, the use of the compressor not interfering with the supply of water from other faucets in the same building.

Another object is to provide an air compressor that will be entirely automatic and which will cease its operation as soon as the egress of air from the compressor is checked and will automatically begin operating as soon as the egress of the air is again permitted.

Another object is to provide a device by which a supply of air sufficient for atomizing purposes will be furnished immediately upon turning on the water, and the loss of time ordinarily involved in filling a receiver by means of an air-pump be avoided.

Another object is to provide a device that will deliver through the atomizing pipes a continuous stream of air making a continuous spray under a constant and uniform pressure which is equal to the pressure of the water and can be maintained indefinitely.

Another object is to provide an air compressor with which the different atomizers, atomizing tubes and inhalers can be used with or without the intervention of a receiver.

Another object is to provide an air compressor that is adapted to compress and deliver purified air.

Other objects of the invention will appear from the following detailed description taken in connection with the accompanying drawings, in which—

Figure 1 is a perspective view of my improved air compressor. Fig. 2 is a central vertical section of the same showing also a portion of the faucet to which the device is

attached. Fig. 3 is a view similar to Fig. 2 but showing the plunger in its elevated position.

In the drawings, 2 represents a suitable tube or casing preferably of cylindrical form and having a lower open end and its upper end being closed and provided with an inlet valve 3 and an outlet valve 5. A suitable plate 7 is fastened to the end of the cylinder over these valves and is provided with projecting nipples 9 and 11 to which rubber tubes may be attached and through which the air may be delivered to the compressor and from which it may be conducted either directly to an atomizer, inhaler or other device with which it is to be used, or to a suitable receiver in which it is to be stored and from which it may be used as occasion requires. The valves 3 and 5 may be of any ordinary construction and arranged in any suitable manner. I have here shown small flat springs secured to the end of the cylinder so as to cover the inlet and outlet openings. The cylinder 2 is provided with the intake water pipe 13 and the upper end of this pipe is preferably connected to a plate or disk 15 which has its inner side for greater strength secured to the wall of the cylinder. The pipe 13 is preferably inclined as shown, and the device is adapted to be attached to an ordinary faucet so as to bring the open end of the faucet 17 in position to substantially coincide with the open end of the pipe 13. A washer or packing ring 19 may be arranged upon the upper end of the pipe 13 so as to form a closed joint with the end of the faucet.

Any suitable means may be provided for securing the device to the faucet. I have here shown a ring 21 secured to the plate 15 by a series of thumb screws 23 and with a series of radially arranged thumb screws 25 in said ring. By this means the ring 21 being slipped over the end of the faucet and the screws 25 tightened against it, and the screws 23 tightened so as to draw the plate 15 firmly against the end of the faucet, the device may be securely attached to the faucet, and this may be done very readily and the device may be as readily and easily detached.

Arranged in the tube or cylinder 2 is a piston or plunger 27 arranged to move length-



wise in said cylinder. One end of the cylinder 2 is preferably open and a partition or cross wall 29 is arranged therein between this open end and the point where the pipe 13 joins said cylinder. This partition may be fixed in the cylinder by any suitable means, as for instance, by the screws 31, shown in Fig. 1, which extend through the wall of the cylinder. The partition 29 is provided with an opening 33 and a valve 35 is arranged over this opening and is secured upon the valve stem 37. This stem may be passed through the cross bar 39 preferably arranged below the partition 29. The valve 35 when closed shuts the opening 33 and prevents the passage of water through the partition 29. The piston 27 is provided preferably on the side toward the partition 29 with a series of air chambers 41 extending for a considerable distance into said piston. This piston is also preferably provided with a suitable packing 43 forming a close joint with the wall of the cylinder 2. The valve stem 37 extends into an opening 44 in said piston passing preferably through a bushing or stuffing box 45. The valve stem is preferably provided with the three collars 47, 49 and 51. The collar 47 is arranged near the end of the valve stem and is adapted when the valve is opened the desired distance to strike against the cross bar 39 and limit its further movement. The collar 49 is upon one side of the threaded bushing or stuffing box 45, and the collar 51 upon the other, and within the opening 44 in said piston. The collars 49 and 51 limit the movements of said piston. A series of springs 53 is connected to the piston 27 and to the valve 35, projecting ears 55 being preferably provided upon said valve and to which said springs are connected. As the water enters the tube or cylinder through the pipe 13 it presses the valve 35 close to its seat and forces the piston to rise. The spiral springs 53 are distended and they are so adjusted that their tension is less than the minimum pressure exerted on the top side of the valve by the water, and hence they are not able to lift the valve off its seat until the piston is advanced so far as to cause the bushing 45 to come in contact with the collar 51 on the top end of the valve stem. The force exerted by the water against the larger area of the piston is greater than the one tending to hold the valve down, and the valve is thereby lifted off its seat and the pressure upon the valve so much reduced that the spiral springs are able to pull the valve up until the collar 49 on the bottom end of the rod comes in contact with the cross bar 39, in which position the valve will be held by the springs until the piston descends and pushes the valve down by striking the collar 49. To enable the piston to raise the valve the resistance of the compressed air above the piston must be reduced at the top of the stroke, and for that purpose the small outlet opening 57 is provided in the tube or cylinder and a pivoted lever or valve

59 is arranged in the cylinder to close this opening. During the greater part of the up stroke of the piston the opening 57 is closed by the valve 59, but shortly before the valve 35 is to be opened the piston engages the valve 59 and moves it so as to open the small air vent thereby removing the air pressure from the top of the piston.

The air chambers 41 arranged in the piston are essential to a fast working hydraulic air pump of this kind. The air confined in these chambers serves as a cushion and prevents the jar which would result from the flow of water being shut off so quickly, thus enabling the stream of water to flow from the faucet almost uninterruptedly. The small escape valve 57 in the cylinder is also important as it makes it possible to compress air into a receiver up to the full static pressure of the water. Without this feature the simple valve arrangement therein shown could not be used.

It will be seen that this air pump or compressor is exceedingly simple consisting of but few parts, and it will not readily wear out or get out of order. As soon as the water is turned on the device begins operating and this continues as long as the water is running until there is a back pressure upon the piston that the pressure of the water will not overcome. The piston then remains stationary with the valve 35 closed so that none of the water can escape until the pressure in the receiver or exit tube is reduced when the device will again begin to operate.

I am thus enabled by using this device to maintain a constant and uniform pressure either in the outlet tube or in the receiver that is connected to the compressor, and the water may be constantly turned on to the device and the device will only operate when it has work to do.

I claim as my invention—

1. The combination in an air compressor, with a suitable cylinder or casing having air inlet and outlet openings, of a plunger arranged in said cylinder, a water valve in said cylinder connected with said plunger and arranged to be opened and closed as the plunger reaches the limits of its movements, springs 53 forming a positive, permanent connection between said valve and said plunger, and an inlet pipe connected with said cylinder at a point between said plunger and said valve.

2. The combination in an air compressor, of the cylinder, and air inlet and outlet openings and valves, a plunger arranged in said cylinder and arranged to be moved in one direction by hydraulic pressure, a water valve in said cylinder arranged to be opened and closed as the cylinder reaches the limits of its movements, and springs forming a positive, permanent connection between said valve and said plunger for holding the valve open and for moving the plunger in one direction after the valve has been opened and the pressure upon the cylinder removed.

3. The combination with the cylinder 2, of



the plunger 27 arranged therein and provided with a series of air chambers 41, the valve 35 arranged to close the opening in said cylinder, and connected with said plunger, springs 53 forming a positive, permanent connection between said valve and said plunger and the inlet pipe 13.

4. The combination with the cylinder provided with the reciprocating plunger 27 having the series of air chambers 41, of the valve 35 and its stem 37 provided with a series of collars 47 49 and 51, the springs 53 forming a positive, permanent connection between said valve and said plunger and the inlet pipe 13.

5. The combination with the cylinder, provided with the top having the air inlet opening and the air outlet opening, the flat spring valve arranged beneath the inlet opening, the flat spring valve arranged in the chamber above the outlet opening, the long plunger having the chambers 41 and the chamber 44, the springs 53 fastened within said chambers 41, the valve 35, the seat therefor, the stem 37 provided with the three stops 51, 49 and

47, the water inlet 13 and the pipe nipples 9 25 and 11, substantially as described.

6. The combination, with the cylinder having the open bottom, of the intermediate partition and valve seat 29, the stop 39, the valve stem 37 having the stops 47, 49 and 51, the valve 35, lugs thereon, the plunger to engage the stops on said spindle, the springs connecting the plunger with the lugs on said valve, the water inlet 13 between said partition and the plunger, the closed top of said cylinder having the valved air inlet and outlet openings, a direct escape opening 57 and the gravity valve 59 arranged to be opened by the plunger when raised to permit the direct escape of the small body of compressed air above 40 said plunger, all substantially as and for the purpose specified.

In testimony whereof I have hereunto set my hand this 6th day of February, 1892.

JOHN GUSTAFSON.

Witnesses:

E. W. HAVILAND,  
ROBT. D. LAIRD.