S. L. WIEGAND.

Pump for Compressing Air and Gas.

No. 221,201. Patented Nov. 4, 1879.

Fig. 1.

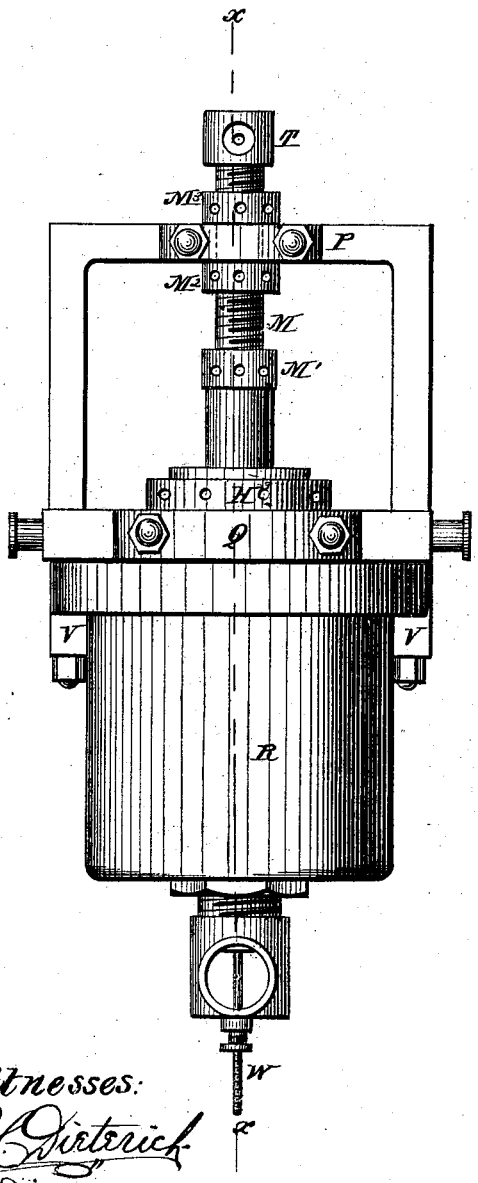
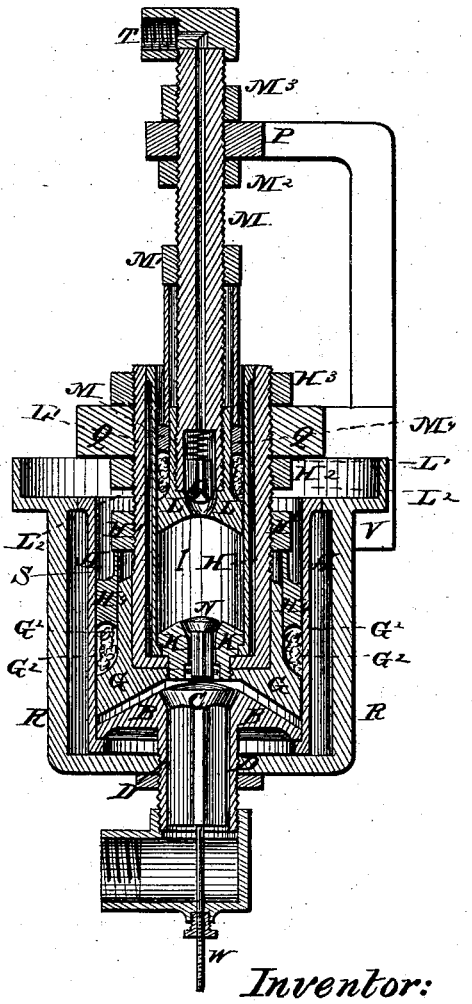


Fig. 2.



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IMPROVEMENT IN PUMPS FOR COMPRESSING AIR AND GAS.

Specification forming part of Letters Patent No. **221,201**, dated November 4, 1879; application filed February 18, 1879.

To all whom it may concern:

Be it known that I, S. LLOYD WIEGAND, of the city and county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Pumps for Compressing Air and Gas; and I do hereby declare the following to be a sufficiently full, clear, and exact description thereof to enable others skilled in the art to make and use the said invention.

The nature of my invention consists in so forming the barrels or cylinders and pistons of pumps that the packing is removed from close contact with the volume of gas undergoing compression, and thus protected from heat; in so forming the cylinder and piston ends that all of the gas is effectually displaced through the valves, and, the delivery of the gas being upward through a series of peculiarly-constructed valves, no re-expansion is possible within the cylinders; also, in a peculiar construction of framing and cylinders, enabling all parts to be readily inspected while working, and easily detached and replaced with but little labor and loss of time.

I will now proceed to more particularly describe the construction and operation of this invention, referring in so doing to the drawings annexed, making a part of this specification, by letters of reference marked thereon.

Figure 1 is an elevation, and Fig. 2 is a vertical section.

The same letters of reference apply to the same parts in both figures.

A represents a cylinder, made accurately true, and having a bottom, B, conical in form, and provided with an inlet-valve, C, opening upward, and guided in the tube D below its seat by wings, and prevented from lifting too high by a cross-bar applied to its lower end.

G is a piston-head, made to fit accurately in the cylinder A, and to correspond in form on its lower surface with the cylinder-bottom B. The piston-head G is firmly secured upon a hollow rod, H, containing another smaller cylinder, I, similar in form at the bottom K to the cylinder-bottom B, and provided with a piston, L, fitting the cylinder I and bottom K in the same manner that the piston-head G fits the cylinder A and its bottom B. The piston L is provided with a hollow rod, M. A valve, N, guided by wings similar to those on the valve C, opens upward, and permits fluid communication between the cylinders A and I. A valve, O, opening upward, is placed at the bottom of the hollow piston-rod M, and differs from the valves C and K in having the guides upon the upper side of the valve-seat.

The piston-rods M and H both have screw-threads cut on their upper portion, and are each provided with three nuts. (Marked H′, H^2, and H^3 on the lower large rod, H, and M′, M^2, and M^3 on the upper smaller rod, M.)

Under the nut H′ is placed a collar of metal, H^4, fitting closely in the cylinder A and upon the rod H, and grooved upon its lower surface, so as to press upon a molded leather cup or collar, G′, resembling in section an inverted capital letter **U**. The groove in the leather G′, and the space between it and the piston-head G, between the rod H and cylinder A, is filled with soft packing G^2, preferably cotton-yarn. The nut H′, being screwed downward, presses the leather G′ upon the packing G^2, and causes it to fit tightly in the cylinder A.

The collar M^4 is placed similarly under the nut M′, and is provided with a leather collar, L′, and a soft packing, L^2, fitting in the small cylinder I. The nuts M^2 and M^3 are, respectively, placed below and above a stationary bearing, P, through which the piston-rod M passes, and serve to adjust the height of the piston L and determine its clearance upon the cylinder-bottom K. The nuts H^2 and H^3 perform a like function upon the rod H in securing and adjusting it vertically in the cross-head Q, from which it receives motion.

The cylinder A is inclosed in a jacket, R, which supports it and furnishes a chamber surrounding the cylinder, through which water circulates and cools the cylinder A.

Reciprocating motion definitively limited is imparted to the cross-head Q most conveniently by a crank and pitman.

The piston-rod H contains a chamber, S, surrounding the cylinder I, in which chamber S water is circulated.

The jacket R is supported in a bearing, V, which is divided vertically, so that it can be opened, as is also the cross-head Q and bearing P, to permit the easy removal of the cylinders and pistons.

The operation of the pump is as follows: Gas is admitted at the pipe D and valve C. As the cross-head and piston G and other parts thereto connected rise, it fills the cylinder H. Upon the upward motion of the piston ceasing the valve C closes. As the piston descends the gas inclosed in the cylinder A is forced through the valve K into the cylinder H, and when the piston G reaches the bottom B of the cylinder A a small amount of any incompressible fluid, such as water, expels every bubble of compressed gas from the cylinder A to the cylinder H by reason of the conical or inverted funnel-shaped piston bottom G, directing the bubbles to the valve. During this compression the latent heat of the gas becomes sensible, and is absorbed by the water circulating around the cylinders. The volume of the gas being reduced from that of the large cylinder A to that of the small cylinder H, its pressure is correspondingly augmented, and it is discharged through the valve O, through the hollow piston-rod M at the outlet T, into suitable receptacles, the conical cup in the bottom of the piston L performing the same function in the cylinder H at the termination of the upward stroke as has been described in relation to the piston G in the cylinder A at the termination of the descending stroke. The high pressure being only upon a piston of small area, a waste of power in journal friction is avoided.

In operation the packings are submerged in water, permitted to flow into the open tops of the cylinders A and H, and any leakage of pistons is easily detected by the bubbles appearing in the water.

By separating the cupped leather collars G′ and L′ by means of the soft packings G^2 and L^2 from the metallic piston bottoms they are kept cool and lubricated even when the pumps are worked rapidly.

I am aware that pump-pistons having cavities fitting over projections of the valves in the base of the pump-cylinders, and without chambers for retaining a displacing fluid, have been made and used for pumping air, and an incompressible fluid proposed to be used in conjunction therewith, and such pistons I do not claim as a part of this invention; but

Having described my invention and the mode of operating the same, what I claim as my invention is—

1. A gas-compressing pump having a cupped leather piston-packing submerged in fluid in contact with it, and insulated from the metallic piston-head, substantially as and for the purposes set forth.

2. The combination of the concave piston bottom, and convex pump bottom having an annular space for retaining a displacing fluid, with inlet and outlet valves, arranged substantially as and for the purpose set forth.

3. The combination of divided bearings P and V, and divided cross-head Q with the adjusting-nut M^2 and M^3 and H^2 and H^3, and screw-threaded pistons H and M, as and for the purpose set forth.

4. The combination of large and small cylinders telescoping with each other, provided with a series of valves opening upward and surrounded by cavities for retaining inelastic displacing fluid, and concave piston bottoms adapted to collect and expel air or gas by means of such fluid through the outlet-valves, substantially as set forth and described.

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