(No Model.)

G. ROSS.

AIR PUMP.

No. 295,676. Patented Mar. 25, 1884.

Fig. 1.

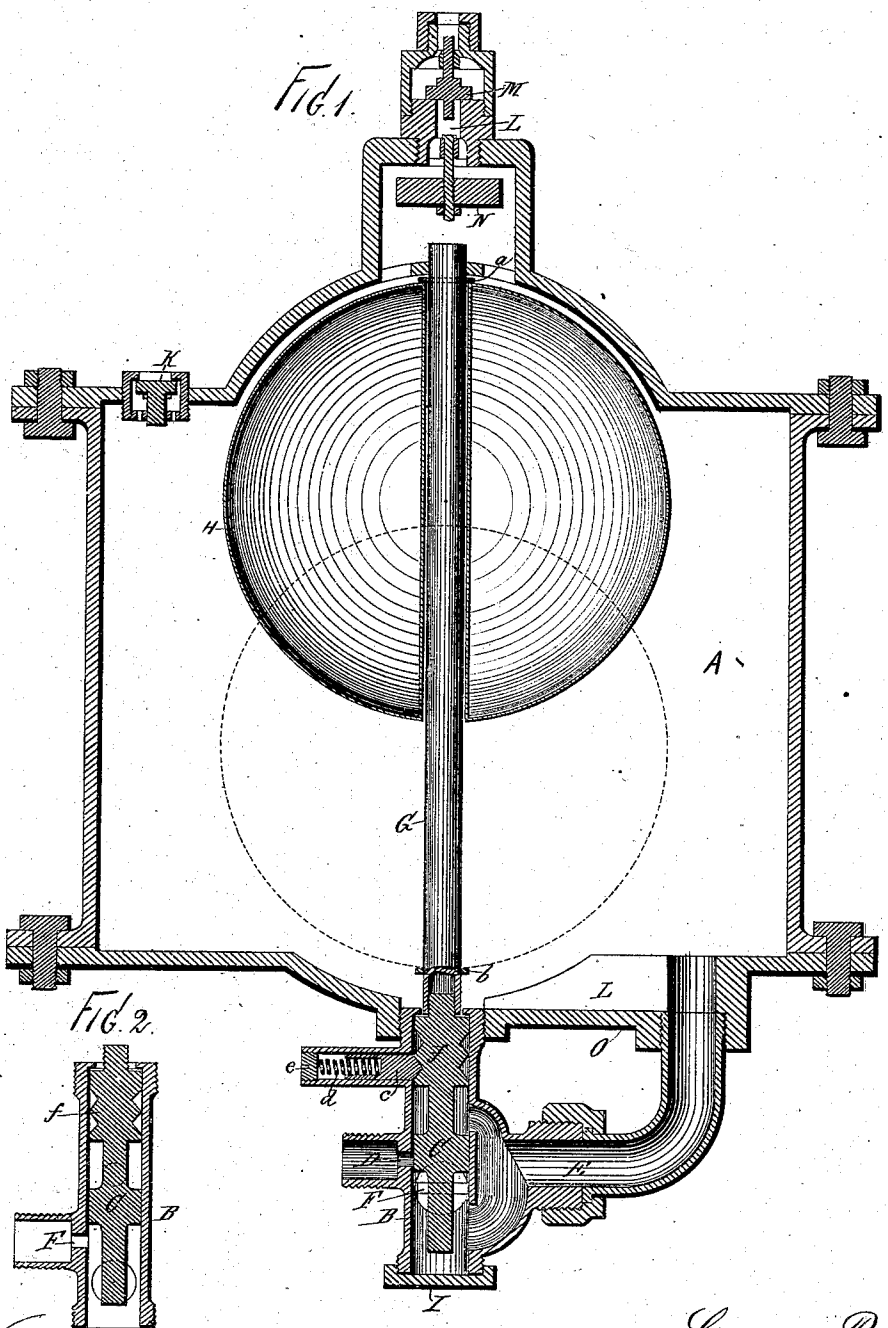

Fig. 2.

Witnesses:
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UNITED STATES PATENT OFFICE.

GEORGE ROSS, OF TROY, NEW YORK.

AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 295,676, dated March 25, 1884.

Application filed August 27, 1883. (No model.)

To all whom it may concern:

Be it known that I, GEORGE ROSS, of Troy, county of Rensselaer, and State of New York, have invented certain new and useful Improvements in Air-Pumps, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention has relation to that class of air-pumps or air-forcing apparatus wherein a column of water or other liquid under pressure is employed to produce a corresponding pressure in a volume of air, the compressed air being carried away to perform any useful work, as to force beer or other liquids from a lower to a higher level, to turn light machinery, &c.

The objects of my invention are to simplify and improve the construction and arrangement of the valve-operating mechanism, so as to make the required movements of the valve certain and effective without danger of the valve becoming set or centered; to simplify and improve the arrangement of the inlet and outlet ports and the valve governing the same, so as to insure freedom and accuracy of movement, compactness of structure, and ease of access to the valve and the ports for cleaning or repairing, and to provide an easy means of draining the water-tank. To accomplish all of this, my improvements involve certain novel and useful arrangements or combinations of parts, details of construction, and principles of operation, all of which will be herein first fully described, and then pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a sectional elevation of an apparatus constructed and arranged for operation in accordance with my invention and involving the principles thereof. Fig. 2 is a sectional elevation of the water-valve casing and contained valve upon a vertical plane at right angles to that of Fig. 1. In both these figures like letters of reference, wherever they occur, indicate corresponding parts.

A is the main chamber or tank of the apparatus, into which water is admitted and from which air is expelled. It may be of any size or material suitable for the purpose.

B is the valve-casing for the water-governing valve C, and D is the inlet or supply port to said casing.

E is a passage communicating with the tank, and serving to conduct water from the inlet to the tank while the latter is being filled, and to conduct it back to the outlet or discharge port F when the tank is being emptied of its contents. The inlet and outlet ports D and F are preferably located so close together that one valve, C, may be used to open and close them alternately, thus avoiding the necessity of using two valves for the purpose, and saving in the power required to shift the valve. The channels leading to the inlet and outlet ports, both in the same casing and one located above and the other below the valve, make the pressure upon the valve practically equal upon both faces at all times, so that the valve is balanced, and thus more easy to be shifted than would otherwise occur. Upon the stem of the valve is secured a pipe or rod, G, which extends up into the tank, and upon this is mounted a float, H, of metal or other suitable material, the same being arranged so as to rise and fall with the water in the tank. The buoyancy and the weight of this float are employed to shift the valve. Upon the rod or pipe G are two stops or abutments, represented at *a* and *b*, one at top and one at bottom, against which the float strikes as it rises and falls.

In former constructions wherein a float is employed to shift the valve, it is observed that at times the float comes to a rest, or the valve is centered and stopped at a point where it will permit admission and discharge of the water at the same time, thus destroying the action of the pump as an air-compressor. To obviate this and to insure a positive shifting of the valve to its extreme limit in either direction by the rising and falling float, I employ a spring-latch so arranged that it will arrest the float at a point a little short of the extreme travel to which it might otherwise attain, and hold it there until its weight or its buoyancy is sufficient to overcome the resistance of the latch as well as the friction of the valve on its seat, and when this resistance is overcome, compel the float and the valve to complete the stroke by a sudden and complete movement.

The simplest form of latch which I have

been able to devise is that shown in the drawings at *c*. It is governed by a light spring, *d*, which may be adjusted to any tension by a screw-plug, *e*. The opening in the casing of the latch may be packed against leakage of water in any suitable way. The latch enters the valve-casing at a point below the connection with the tank, and engages with the inclined faces of a boss or ledge, *f*, turned upon the valve-stem, as plainly shown. This operates as follows: When the water is receding from the tank, the float follows down upon the central pipe or rod until it reaches the stop *b*, where it is arrested, being held up by the latch. The water continues to flow out until the weight of the float is sufficient to overcome the power of the latch when the valve-stem is carried suddenly down. This movement will open the inlet and close the outlet ports. Water then flows into the tank and the float rises until it strikes the stop *a*, where it is held until the buoyant effort of the water thereon is sufficient to overcome the holding power of the latch, when the rod and the valve are carried suddenly upward, opening the outlet and closing the inlet port, when the water flows out again, and the movements are so continued. This latch is very efficient for the purposes intended. Its form and arrangement may be variously modified and still accomplish the same results within the limits of my invention. I make the channel in the casing leading to the outlet port larger than that leading from the inlet, so that the tank may be discharged more rapidly than it is filled.

At I is an ordinary screw-cap, by unscrewing which the valve and stem may be withdrawn for cleaning or repairing. The valve may be packed or not, as may be desired. By withdrawing the valve and allowing water to rush through the casing the latter may be readily freed of sediment or other matters which may collect therein. As water flows out of the tank air is admitted through any ordinary check-valve, as at K. This valve is firmly closed as soon as the pressure on its under face is increased. As the water enters the tank it compresses the air therein and forces it out through an air-opening, as at L, from whence it may be conducted away for any useful purpose. A check, M, at this opening prevents return of air therethrough as the water recedes. At the lower mouth of L is a float-valve, N, arranged to close the air-escape passage as soon as it is seated upon the mouth thereof, so that in case of an overfilling of the tank water could not find an escape through the air-conduit. The top and bottom of the tank are to secure economy of water-space, recessed as shown, for the accommodation of the float at its limits of travel; but this feature has no effect upon the workings of the other parts. The water-way at the bottom of the tank is located in a boss, O, within which is a channel communicating with the lowermost part of the tank, so that the tank may be thoroughly washed out whenever required. The water-valve casing is located entirely outside of the tank, so that it is readily accessible for adjustment or repairs. Being so constructed and arranged, the improved apparatus is found in practice to admirably answer the purposes or objects of the invention, as previously set forth.

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

1. In an air-compressing apparatus, the detent or latch, combined with the float and valve, and arranged for holding the float until its weight or buoyancy is sufficient to overcome the resistance of the detent or latch, and to shift the valve, substantially as shown and described.

2. In an air-compressing apparatus, the water-valve balanced in its casing, said valve having its stem extended directly into the tank, and operated by a float, substantially in the manner and for the purposes set forth.

3. In combination with the valve-casing located outside of the tank, and having the valve and latch or detent therein as specified, the removable cap applied upon the bottom of the casing, the whole being arranged so as to permit withdrawal of the valve and washing of the casing, substantially as shown and described.

4. In an air-compressing apparatus, the valve-case having the inlet and outlet channels and ports therein, one above the other, the balanced valve, the latch or detent and the screw-cap, combined and arranged substantially as shown and described.

5. In combination with the tank containing the float, the boss for attachment of the water-conduit leading to the valve-casing, said boss being provided with a channel leading from the lowermost point of the tank to facilitate cleaning, substantially as shown and described.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of two witnesses.

GEORGE ROSS.

Witnesses:
JOHN BUCKLER,
WORTH OSGOOD.