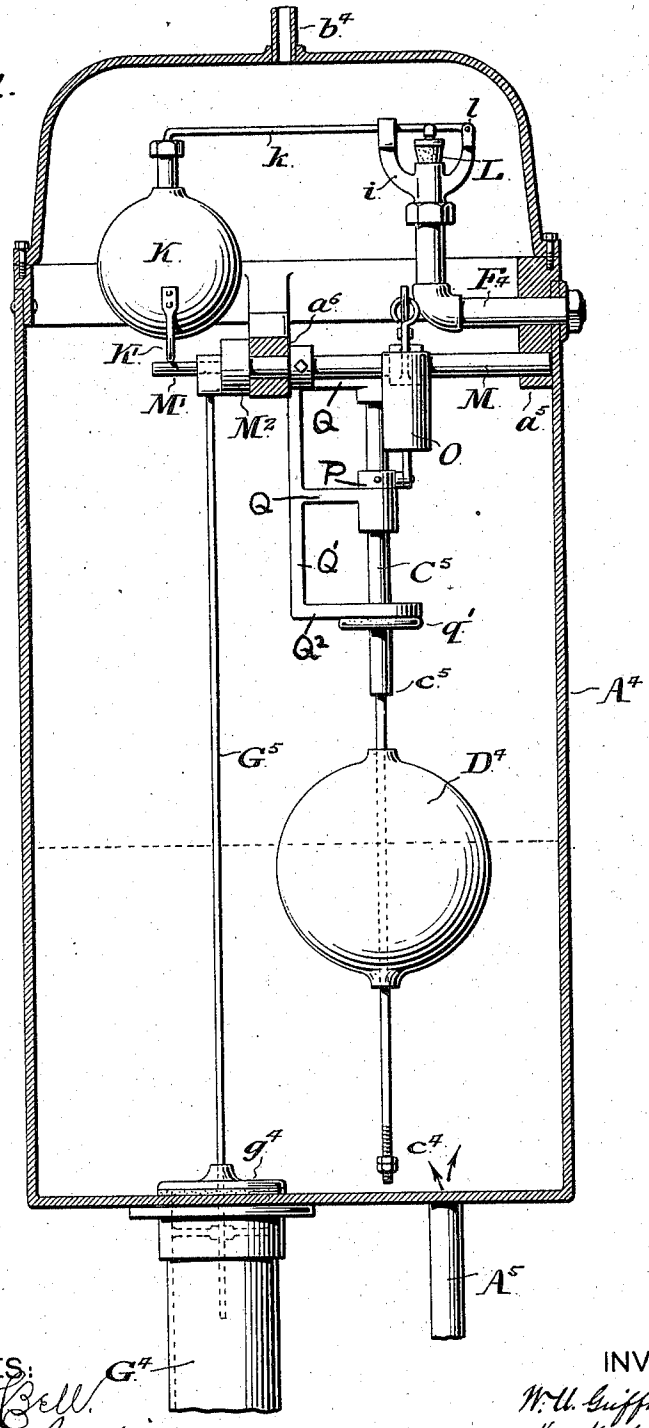
(No Model.) 2 Sheets—Sheet 1.

W. U. GRIFFITHS & H. NIEDERMAYER.

AIR COMPRESSING DEVICE.

No. 576,364. Patented Feb. 2, 1897.

FIG. 1.



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(No Model.) 2 Sheets—Sheet 2.

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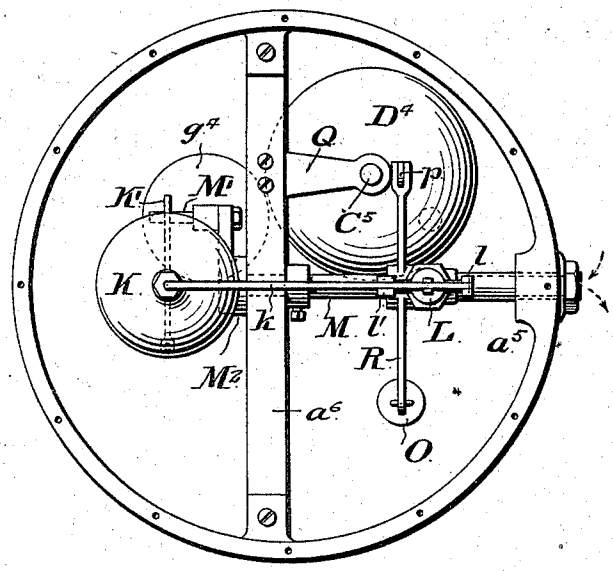
FIG. 2.



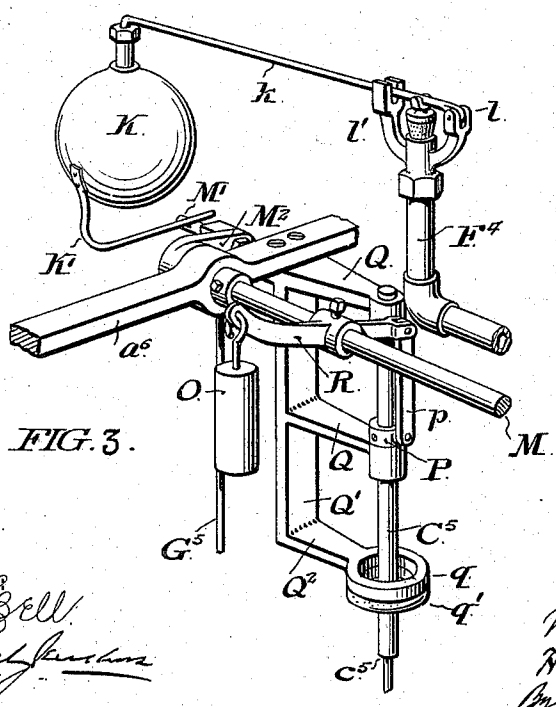


FIG. 3.

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UNITED STATES PATENT OFFICE.

WILLIAM U. GRIFFITHS AND HENRY NIEDERMAYER, OF PHILADELPHIA, PENNSYLVANIA.

AIR-COMPRESSING DEVICE.

SPECIFICATION forming part of Letters Patent No. 576,364, dated February 2, 1897.

Application filed April 15, 1895. Serial No. 545,739. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM U. GRIFFITHS and HENRY NIEDERMAYER, of the city of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Air-Compressing Devices, whereof the following is a specification, reference being had to the accompanying drawings.

Our invention is intended to obtain a series of charges of compressed air within a closed receptacle, the compressing agency being a stream of water admitted into the said receptacle and the device being automatic in its action, so that when the complete effect of one charge of water has been obtained the contents may be discharged and the operation repeated indefinitely.

Figure 1 is a vertical central section through one type of apparatus embodying the invention, Fig. 2 being a plan view of the interior thereof with the top removed, and Fig. 3 being a view in perspective of certain of the working parts.

The vessel A^4 is provided with a water-inlet A^5, a water-outlet G^4, controlled by a valve g^4, a compressed-air outlet b^4, and a valve-controlled air-inlet F^4. The float D^4 slides vertically upon a rod C^4, having a stop c^4 at its lower end. A similar stop to limit the upward motion of the float is formed by a shoulder c^5, from which point the rod C^4 is prolonged upward with an increased diameter, as indicated at C^5. This enlarged upper portion C^5 slides vertically in the guiding-arms Q, which extend horizontally from a downwardly-depending piece Q′, attached to a transverse bar a^6, extending across the tank near its upper end. Said piece Q′ also carries a third horizontal arm Q^2, terminating in an enlarged ring q, which encircles the rod, leaving a considerable interspace, and said ring q is provided on its under face with a rubber buffer q', the purpose of which is to prevent injury to the surface of the float D^4 when the latter rises into contact therewith.

The enlarged portion C^5 of the rod carries a collar P, rigidly attached thereto, to which is pivotally connected a link p, also pivotally connected to one end of a lever R, which is rigidly attached to a horizontal rock-shaft M, having bearings, respectively, in a boss a^5 on the inner face of the tank and in the bar a^6 above referred to. Said lever R carries a counterweight O, whose relation to the other parts will be explained hereinafter.

At one end of the rock-shaft M is attached a crank-arm M^2, having a projecting crank-pin M′. To said crank-pin is also attached a rod G^5, which is connected with the water-outlet valve g^4, a guide being provided, similar to that before described, for the lower end of said rod within the outlet-pipe G^4.

The air-inlet pipe F^4 is provided with a valve L, which is attached to a lever-arm k, pivoted at l in a bracket projecting upward from the top of the pipe F^4, said lever-arm k being guided in the bifurcated upper portion of another bracket l', also attached to the top of said pipe. The outer end of said lever-arm k carries a float K, from which depends a finger K′, within range of the crank-pin M′.

The cubic contents of the floats D^4 and K are respectively such and the counterweight O is so related to the weight of the other parts as that the buoyancy of the float D^4, though sufficient to raise the weight of the outlet-valve g^4 and the air-valve L and float K, is not sufficient to effect this against the additional pressure of the compressed air transmitted by the water to the top of the valve g^4. On the other hand, the counterweight O is sufficient to sustain the weight of the float K and its connected parts, and also the weight of the valve-rod G^5 and rod C^5 C^4, so long as the float D^4 is sustained by the water, but when the weight of said float D^4 is thrown upon its rod by the fall of the water-level the counterpoise O will be overcome.

The operation of this type of apparatus is as follows: The apparatus being supposed to be free from water and full of air at atmospheric pressure water is admitted through the pipe A^5 and rises, compressing the air, and carrying with it the float D^4. The latter slides freely upon the lower portion C^4 of its rod until it strikes against the shoulder c^5. This arrests the upward movement of the float, and the water rises until it has completely submerged the float and reached the level of the auxiliary float K. Thereupon

the further rise of the water lifts said float and primarily opens the air-outlet valve L, permitting a momentary influx of water, which causes the floats D^4 and K to rise farther until the float D^4 strikes against the buffer q'. This movement of the float and its rod completely shifts the lever R and turns the crank M^2, so that the outlet-valve g^4 is fully opened to permit the discharge of the water, and the air-inlet valve L is also fully opened. As the water-level descends the float D^4 slides downward upon its rod, but since the counterpoise O is sufficient to maintain the rock-shaft in a fixed position the float K does not descend, being sustained by its finger K', resting upon the crank-pin M', so that during the descent of the water air is freely admitted at the air-inlet pipe F^4. When, however, by the nearly complete discharge of water from the tank the float D^4 brings up against the stop c^4, its additional weight is sufficient to overcome the counterpoise O, and thereupon the float and its rod descend, closing the outlet-valve G^4 and permitting the descent of the float K to close the air-valve L. The cycle of operations then recurs, and a series of impulses or charges of compressed air is obtained, as in the first instance.

We claim—

1. The combination, with the tank provided with a water-inlet, a valved water-outlet, an air-inlet valve and a compressed-air outlet; of a float-actuated opening and retaining mechanism connected with the water-outlet valve; an auxiliary float to impart initial opening movement to the air-inlet valve, to vent the tank; and operative connections between the main-float mechanism and the air-inlet valve to complete the opening thereof and hold it open so long as the water-outlet valve is held open; the main float serving to restore valve mechanisms to their closed positions, when the water reaches a sufficiently low level; substantially as herein shown and described.

2. The combination, with the tank provided with water and air inlets and water and air outlets, a rock-shaft, a valve-rod operated thereby and provided with a valve closing the water-outlet, a vertically-movable float-rod for rocking said shaft, a float sliding on the float-rod to raise and lower it, and means for holding the rock-shaft in the position given it by the upward throw of the float-rod; of a valve closing the air-inlet and provided with an auxiliary float to impart the initial opening movement thereto; and means for further raising the auxiliary float from the rock-shaft and holding it raised till the main float descends and reverses the rock-shaft to close the water-outlet valve; substantially as herein shown and described.

3. The combination, with a tank having a water-inlet, a compressed-air outlet, a valve-controlled air-inlet and a valve-controlled water-outlet, of a movable rod; a float sliding thereon; a counterweighted lever connected with said rod; a rock-shaft, carrying said lever; a crank upon said rock-shaft; a connecting-rod attached to said crank and to the water-outlet valve; and an auxiliary float operatively connected with the air-inlet valve and supported by said crank, substantially as and for the purposes set forth.

4. The combination with the tank having the water-outlet in its bottom, the air-inlet and the air-outlet in the upper end, and a water-inlet; a valve for the air-inlet, and an auxiliary float mounted on the valve-arm in the upper end of the tank, of a transverse counterweighted rock-shaft below and operatively connected with said float to fully raise it and hold it raised; a valve-rod depending from a crank on said shaft and having a valve on its lower end closing the water-outlet; a vertically-sliding rod operatively connected at its upper end with said rock-shaft, and provided with upper and lower stops; and a main float sliding on the rod between its stops; the whole operating substantially as herein shown and described.

5. The combination with the tank having the water-outlet in its bottom, the air-inlet and air-outlet in its upper end, and a water-inlet, a downwardly-closing valve for the air-inlet and an auxiliary float mounted on the valve arm or lever in the upper end of the tank, and provided on its lower portion with a finger; of a counterweighted rock-shaft having a crank provided with a pin engaging said finger; a rod depending from said crank and provided at its lower end with a valve for the water-outlet; a depending bracket having horizontal guide-arms; a vertical operating-rod sliding through apertures in said arms, said rod being linked to the rock-shaft to operate the same and being provided with an upper and lower stop; a main float sliding on said rod between its stops, and a buffer on the under side of the lowest guide-arm; substantially as herein shown and described.

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E. REESE.