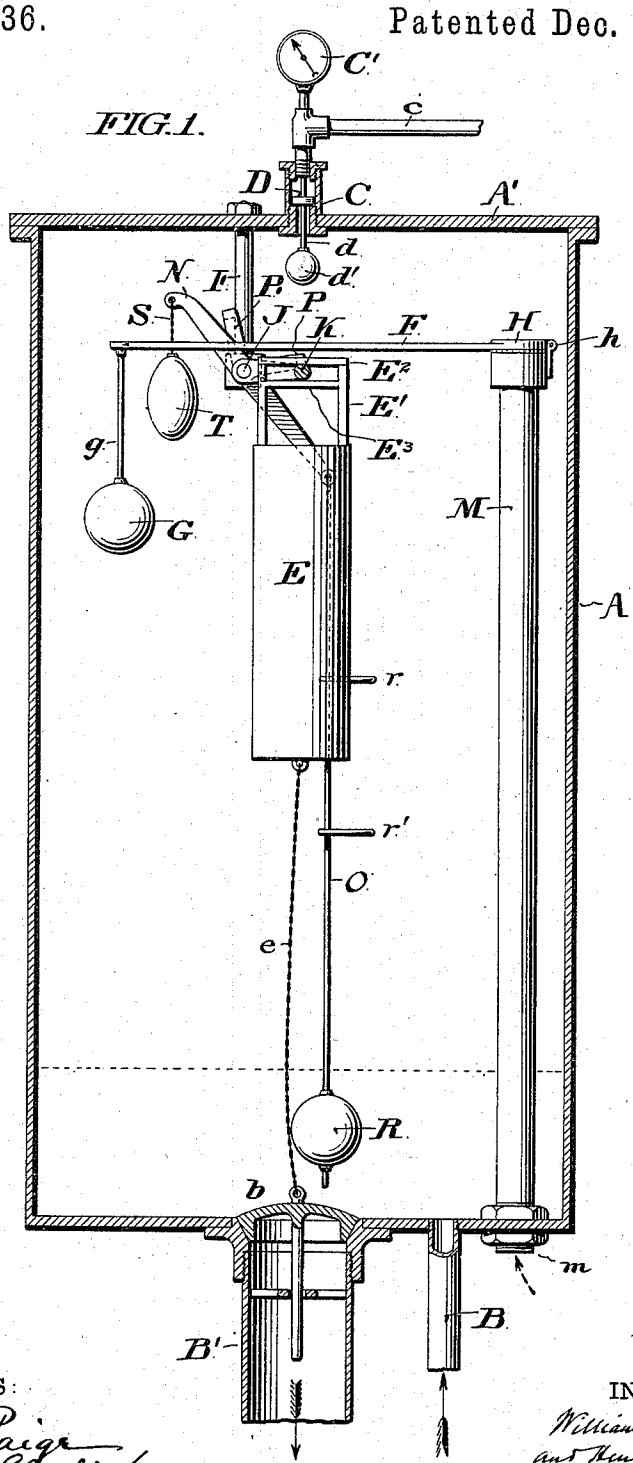
(No Model.) 2 Sheets—Sheet 1.

W. U. GRIFFITHS & H. NIEDERMAYER.

AIR COMPRESSING DEVICE.

No. 530,336. Patented Dec. 4, 1894.

FIG. 1.



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(No Model.) 2 Sheets—Sheet 2.

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FIG. 2.

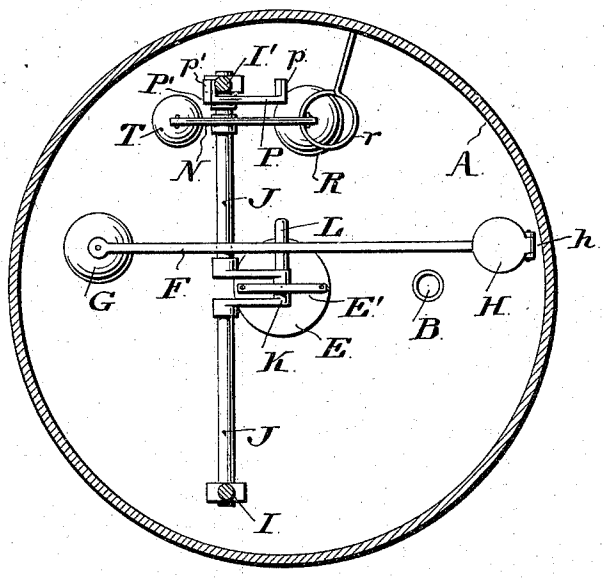
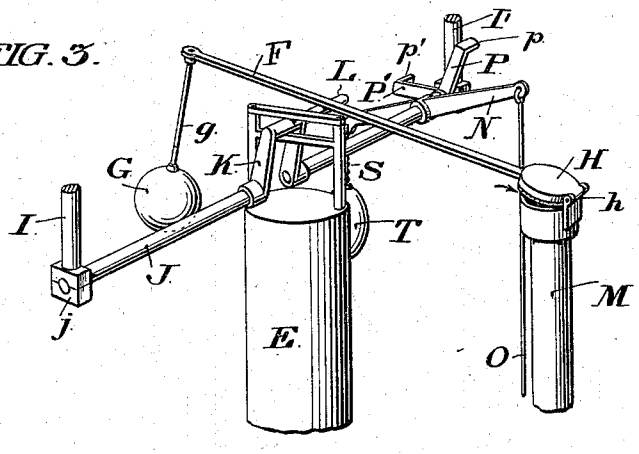


FIG. 3.



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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. 530,336, dated December 4, 1894.

Application filed July 14, 1894. Serial No. 517,535. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM U. GRIFFITHS and HENRY NIEDERMAYER, of Philadelphia, in the 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 relates to that class of apparatus in which a continuous current of water compresses the air contained within a closed chamber, and the primary object of our invention is to provide means whereby, after the maximum effect of the current has been obtained for one compressing operation, the apparatus may be automatically freed from the accumulated water and prepared for a repetition of the operation. While therefore the action of the device, as a whole, is in one sense intermittent, in that there is a period of non-action, so far as the compressing effect is concerned, between two successive compressing operations, yet practically the device is continuously operative, so long as the water current is maintained.

In the accompanying drawings, Figure 1 represents a vertical central section through the casing of the apparatus, showing the working parts within. Fig. 2 is a plan view of the interior with the top removed. Fig. 3 is a view, in perspective, of a portion of the working parts.

The compression chamber, or cylinder, is indicated at A, and the top thereof at A′. At the bottom is a water inlet pipe, B, which is in communication with a constant water supply, and at or near the center of the bottom is a water outlet, B′, of much greater area than the inlet. Said water outlet is closed by a valve or stopper, *b*, which is connected by means of a chain, *e*, with a float, E. The cubic contents of the float are such as to give it a buoyancy sufficient to raise the stopper, *b*, against the pressure of the water, when the water level within the chamber has approached nearly to the top of the float.

At the top of the float, E, is a yoke, E′, having two cross-bars, E^2, E^3, respectively, with an opening between, in which a crank, K, engages freely, said crank being mounted upon a rock-shaft, J, having bearings at *j*, in the rods, I, I′, depending from the top, A′, of the cylinder.

Near one end of the shaft, J, a lever, N, is rigidly attached thereto, said lever carrying at one end a weighted ball, T, suspended by a chain, S, and at the other end a rod, O, which extends down between guiding loops, *r*, *r*′, to a point near the bottom of the cylinder, A, where it terminates in a float, R, which we term the balance-float.

Adjacent to the lever, N, the rock shaft is provided with a pair of stop arms, P, P′, which are respectively provided with stops, *p*, *p*′, adapted to engage with the rod, I′, when the rock-shaft, J, is in either of its extreme positions of oscillation.

An air-pipe, M, is secured to and extends through the bottom of the cylinder, A, terminating in an outlet, *m*, open to the outer air. Said pipe is provided at its open top with a valve, H, pivoted at *h* to the upper end of the pipe and connected with a lever, F, which extends across above the rock-shaft, J, and terminates in a downwardly depending rod, *g*, carrying a ball-float, G.

The crank, K, of the rock-shaft, J, is provided with a laterally projecting arm, L, arranged beneath the lever, F, in such relation thereto that when the crank is in its uppermost position (as shown in Fig. 3) the lever, F, will be lifted by the arm, L; but when, by the oscillation of the rock-shaft, the crank, K, is turned down, the arm, L, will clear the lever, F, and thus allow the valve, H, to remain closed upon its seat.

The relations of the several actuating members are as follows: The float, G, has sufficient buoyancy to raise the valve, H, against the internal air pressure, before the water level reaches the top of the float, E. The weight of the ball, T, when the lever, N, is in the position shown in Fig. 3, is sufficient to balance the actual weight of the float, E, chain, *e*, and valve, *b*, so long as the balance-float, R, is submerged, but when the latter is out of water, the additional weight thus thrown upon the opposite arm of the lever, N, overbalances the ball, T.

At a convenient point in the top, A′, is the

compressed air-outlet, C, which may be provided with a check-valve, D, as shown, said check-valve having a downwardly extending stem, *d*, and ball-float, *d'*, whereby, should the cylinder accidentally become filled with water, the check valve would be raised and held against its upper side to prevent the ingress of water to the air discharge pipe, *c*. Said pipe may be provided with a pressure gage, C'.

The operation of the device is as follows: Assuming that the cylinder, A, is free from water, the outlet-valve, *b*, is closed upon its seat. The valve, H, is also closed and the float, E, is in its lowest position, as indicated in Fig. 1. The cylinder is of course full of air and the compressed air pipe, *c*, is either closed, or in communication with the receptacle to which air is to be delivered. The water entering at the inlet pipe, B, gradually rises within the chamber, A, compressing the air before it until a level has been reached at which the float, G, tends to rise. The float, E, however, is not yet sufficiently submerged, to cause it to lift the outlet valve, *b*. As, however, the water continues to rise, the float, G, is raised, thus opening the air pipe, M, and permitting the compressed air to suddenly escape. The relief, thus afforded, causes the water to rise with great rapidity within the cylinder, A, and reach a level where the buoyancy of the float, E, is sufficient to lift the valve, *b*, this action being aided by the sudden jerk of the chain, *e*, due to the quick rise of the water. The float, E, in rising also throws the crank, K, to the left in Fig. 1, raising it to the position indicated in Fig. 3, whereupon the stop, *p*, by coming in contact with the rod, I', arrests the further movement of the shaft, J, and crank, K. This rotative movement of the shaft, J, has also shifted the lever, N, so that the ball, T, which is now in a depressed position, prevents the shaft from returning so long as the balance-float, R, remains submerged. In this raised position of the crank, K, the arm, L, engages with and supports the lever, F, so as to hold the valve, H, open, and permit the entrance of air during the fall of the water. The water escapes rapidly through the outlet-pipe, B', and the position of the parts just described continues until the water level has fallen below the float, R, whereupon its weight destroys the equilibrium which has hitherto maintained the float, E, and lever arm, F, in their raised position, and the rock-shaft, J, turns, allowing the valve, E, to descend and close the water outlet by means of the valve, *b*, and also permitting the valve, H, to colse the air inlet. This movement of the shaft continues until it is arrested by the stop, *p'*, which comes in contact with the rod, I', and the parts thus resume their original position. Thereupon the compressing action again commences, the water entering at the pipe, B, and repeating the operations which have just been described. Thus a series of compressing impulses can be automatically obtained from a continuous water current, without limit as to number. The compressed air from the apparatus may be made available for any ordinary uses, such as beer-pumps, &c.

Having thus described our invention, we claim—

The combination, substantially as set forth, with a closed cylinder having a water-inlet, a valve-controlled water outlet, a valve-controlled air-inlet, and a compressed air-outlet; of a float, operatively connected with the water-outlet valve; a rock-shaft and crank engaging with said float; a weight and a balance-float operatively connected with said rock-shaft; a lever and float controlling the air-inlet valve; and means substantially as set forth whereby said lever is maintained in position to keep the air-inlet open during the discharge of the water from the cylinder.

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