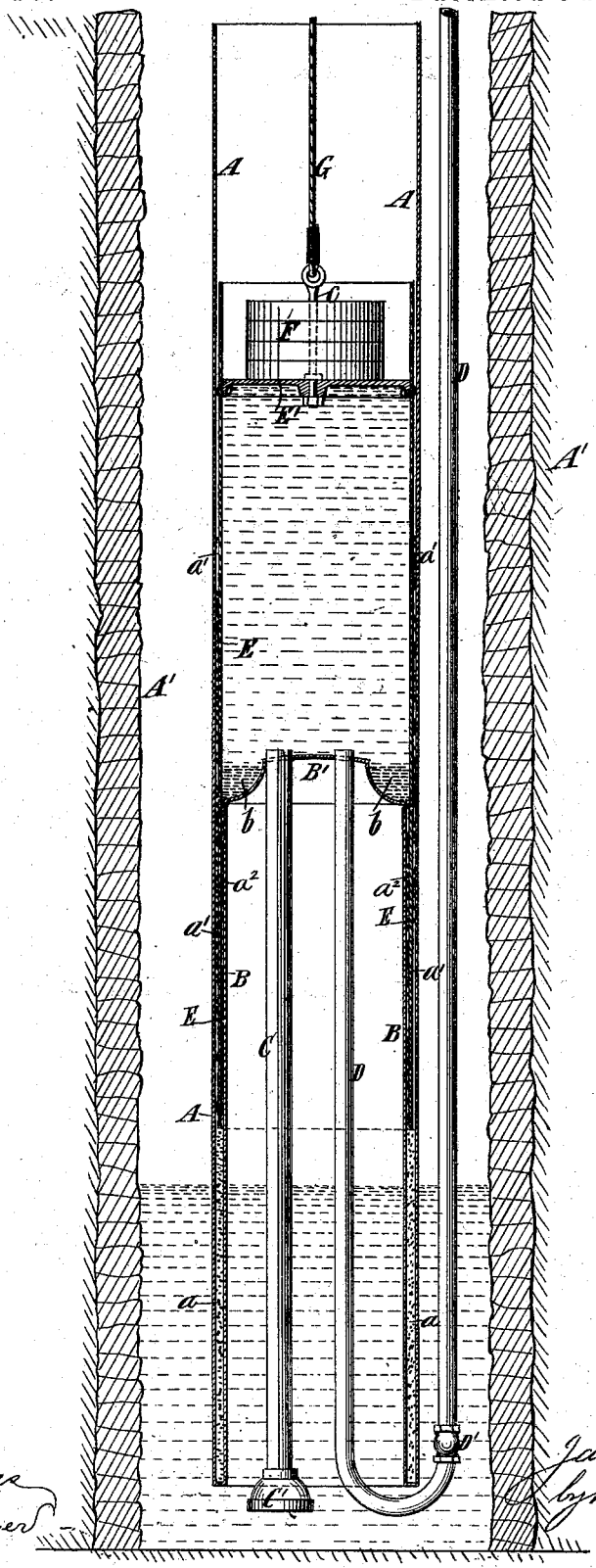
(No Model.)

J. C. HORTON.

LIQUID ELEVATING APPARATUS.

No. 261,716. Patented July 25, 1882.



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JACOB C. HORTON, OF NEW YORK, N. Y., ASSIGNOR TO JOSEPH M. DEUEL AND GEORGE W. OLNEY, OF SAME PLACE.

LIQUID-ELEVATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 261,716, dated July 25, 1882.

Application filed January 17, 1882. (No model.)

To all whom it may concern:

Be it known that I, JACOB C. HORTON, of the city and county of New York, in the State of New York, have invented certain new and useful Improvements in Liquid-Elevating Apparatus, of which the following is a specification.

My invention relates to that class of apparatus for elevating water or other liquid in which a weighted piston is raised in a cylinder by mechanical means, thereby producing a vacuum and drawing in a large volume of liquid below it, after which the piston can descend only as fast as the liquid is allowed to escape from the discharge-pipe, and by its weight upon the liquid forces it up to the desired height. The liquid contained in the cylinder is kept under a constant pressure by the weight of the piston, and forms a supply which will be available until the piston reaches the lower end of its movement, when it must be again raised.

An important object of my invention is to dispense with any packing for the piston, which, if used, lessens the effectiveness of the apparatus by the friction which it produces, and is also liable to leak; and to this end my invention consists in the combination of outer and inner cylinders connected at their lower ends, so as to form between them an annular space adapted to contain mercury or quicksilver, and the latter cylinder having an open bottom and a closed top or head; a hollow piston working in said annular space, and closed at the upper end, and suction and discharge-pipes extending upward within the inner cylinder and through the closed top thereof, substantially as hereinafter described, whereby I provide for the mercury flowing over the closed top of the inner cylinder when displaced by the downward movement of the piston.

The accompanying drawing represents a central vertical section of water-elevating apparatus embodying my invention and a well wherein it is situated; and I may here remark that in order to render the drawing more easily understood I have shown the diameter of the apparatus as greater in proportion to its length than it will preferably be.

A designates an outer cylinder, which is open at the top, and B designates an inner cylinder of about half the length of the outer cylinder and somewhat smaller in diameter. The inner cylinder, B, is inserted into the lower end of the outer cylinder, A, and their lower ends are connected, so as to form between them an annular space, *a*, closed at the bottom and open at the top. The inner cylinder, B, is about half the height of the outer cylinder, A, and is open at the bottom or lower end and closed at the upper end by a head, B′. At the juncture of the cylinder B and head B′ is an annular recess, depression, or cavity, *b*, the purpose of which will be hereinafter described. The inner cylinder, B, is open at the lower end, and C and D designate the suction and discharge pipes, which extend upward within the inner cylinder and through the head B′, where they communicate with the interior of the cylinder E. The suction-pipe C is provided with a foot-valve, C′, of any suitable construction, and in the discharge-pipe D is a discharge or check valve, D′, which may be of any suitable form.

The whole apparatus is designed to be located within a well, A′, or in any other locality from whence water is to be raised, and the discharge-pipe D extends to the place where the water is required.

E designates a cylinder adapted to fit within the cylinder A, left open at the lower end and closed by a head, E′, at the upper end. The cylinder E forms a follow-piston, and is adapted to move vertically in the annular space *a* between the outer and inner cylinders, A B, and as the piston rises and falls therein of course the space between the head B′ of the inner cylinder, B, and the head E′ of the piston increases and diminishes. The piston E is prolonged above the head E′, so as to form a weight-box, wherein are placed weights F; and G designates a rope, cable, or chain, which is attached to the head E′ by an eyebolt, *c*. The cable or chain G is wound upon a windlass located at the mouth of the well A′, and not here shown, or it may be connected with any other suitable apparatus whereby it may be raised when required.

The weight F may be made in sections and graduated to suit the height to which water is to be raised.

When the apparatus is to be used the annular space *a* between the cylinders A and B is filled with metallic mercury up to or about the top of the inner cylinder, B, and as the

piston E is immersed in the mercury the latter forms a seal thereto and prevents water from passing the piston. As the piston descends the mercury rises over or upon the head B′ of the inner cylinder, B, and the annular groove, recess, or cavity *b* forms a reservoir for the mercury and serves to maintain a sufficient supply in the annular space *a*, and also sufficient to supply the annular space *a′* between the moving piston or cylinder E and the outside cylinder, A, above the mercury-line in annular space a^2 between the cylinders E and B. This is rendered necessary, as the upward movement of piston E shortens the resisting-column of mercury in proportion as it reaches the top of the annular space *a′*; and when the weight is applied the reserve of mercury contained in this annular recess *b* mounts upward in the annular space *a′* between piston E and cylinder A until an equilibrium of pressure is attained. The upper portion of this annular recess or groove *b*, and the projection of the suction-pipe C and discharge-pipe D above the head B′ of the cylinder B, is also intended to hold sufficient water to keep the mercury at all times submerged, and thereby prevent its coming in contact with air, and consequent oxidation.

The mechanism for raising the piston E should be so constructed that a single person can readily raise the piston in a very short time; and when once raised the piston rests with all its weight on the water between its head E and the head B′ of the inner cylinder, and as soon as the water is allowed to flow from the discharge-pipe the piston will fall. To raise the piston only requires a few minutes, and when once raised a supply of water under pressure is obtained for a day, more or less, in accordance with the frequency with which the water is used.

The apparatus may be supported by rods extending downward from the top of the well, or in any other suitable manner.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of the outer cylinder, A, the inner cylinder, B, open at the bottom, and its head B′, closing the upper end, the suction and discharge pipes C and D, extending upward through the inner cylinder and through the head B′, and the hollow cylindric piston E, substantially as specified.

2. The combination of the outer cylinder, A, the inner cylinder, B, provided with the head B′ and the annular reservoir *b* for mercury, the suction and discharge pipes C D, projecting through the head B′, and the hollow cylindric piston E, substantially as specified.

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