

UNITED STATES PATENT OFFICE.

LYMAN B. CRITTENDEN, OF CINCINNATI, OHIO.

IMPROVEMENT IN PUMPS.

Specification forming part of Letters Patent No. 40,328, dated October 20, 1863.

To all whom it may concern:

Be it known that I, LYMAN B. CRITTENDEN, of Cincinnati, in the county of Hamilton and State of Ohio, have invented a certain new and useful Improvement in Pumps; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the accompanying drawings, making a part of this specification, and to the letters of reference thereon.

My improvement relates mainly to that class of pumps in which the piston-rod is hollow and forms the eduction-pipe, as distinguished from those in which the piston is solid and works within a separate eduction-pipe or surrounding cylinder.

It consists in connecting two of such pumps with a walking-beam, so that the columns of water are nearly balanced, and much less power is required to lift them, and also in the improvement of several of the parts of the pumps themselves.

In the annexed drawings, Figure 1 is a perspective view of the balanced pumps. Fig. 2 is a longitudinal sectional view of a single pump, showing the arrangement of the several parts. Fig. 3 is a covered ball for the valves. Fig. 4 is an improved adjustable spring collar or guide for the eduction-pipe. Fig. 5 is a spring foot-piece for securing the pump in artesian wells or shafts of small diameter.

Like letters represent like parts in the different figures.

To enable others skilled in the art to make and use my improvement, I will proceed to describe its construction and operation.

A, Fig. 2, is a stationary cylinder, provided with a flange at the foot and a valve-seat, *b b*, at the top.

B is a movable cylinder or reciprocating piston, also constructed with a valve-seat, *c c*, on the top.

C is a hollow piston-rod and eduction-pipe.

D is an air-chamber connected with the reciprocating cylinder or piston B, and surrounding the eduction-pipe C.

E, Figs. 2 and 3, is a ball-valve, formed of heavy or loaded wood or metal, covered with vulcanized india-rubber, thus combining the weight of hard wood and metal with the elastic surface of the rubber, making an accurate

fit, and obviating much of the necessity of accurately turning the metallic balls, and tending to preserve their shape unimpaired.

In Fig. 3 a portion of the rubber is laid over, exposing the wood or metal beneath.

d d d d, Fig. 2, are bridles for the ball-valves, made in parts and screwed into that portion of the cylinder-heads forming the valve-seats.

e e are rods connecting a flange upon the stationary cylinder with the collar *f*, and forming guides for the reciprocating cylinder.

f is a collar forming a guide for the hollow piston-rod, and limiting the length of its stroke.

g, Fig. 4, is a collar, furnished with springs *t t t*, to be inserted in artesian wells or narrow shafts, to form an additional guide for the eduction-pipe.

h, Fig. 2, is a foot piece for the stationary cylinder. This may be anchored to the bottom of the well by means of the ball-and-socket joint *k o*, or it may be furnished with a screw, *l*, Fig. 5, for the purpose of expanding the springs *m m*, Fig. 5, so as to compel them to grasp firmly the sides of the aperture of narrow wells, and thus hold the pump in place. These springs are fastened to the nut *n* at their lower ends, and the action of the screw forces them to curve or bulge outward and press against the walls of the well.

o, Fig. 2, is the stem of the ball *k*, and is made to fit into a suitable socket.

In Fig. 1, X^1 and X^2 are two pumps, each constructed as shown in Fig. 2, which are suspended on opposite sides of the fulcrum of a lever or walking-beam, F, thus balancing the pumps and the column of fluid in each, and requiring for their operation only an additional power sufficient to overcome the vis inertia and to lift the excess of fluid which is discharged at each stroke.

X^3 and X^4 are two similar pumps, connected with X^1 and X^2 by rods *p' p'* and *p² p²*, so that they are worked by the same movement of the lever F. By this arrangement a vertical series of any desired number of pumps may be used, all nearly balanced, by which water or other liquids may be raised from any depth with much less power than has usually been employed, while the pumps themselves are less cumbrous and more economical.

In operating my pumps the cylinders B and

D are connected with each other, and the joints between them, as well as the joints between the air-chamber and hollow piston-rod at *s s*, are made air-tight. The bridles *d d d* are screwed into their places in the cylinder-heads. Reciprocating cylinder B is fitted over stationary cylinder A, and the guide-rods *e e* (one or more of which may be employed) and collar *f* are adjusted so as to limit the stroke. The foot-piece is attached to the stationary cylinder, and the pump is lowered into the well, to the bottom of which it is secured by the screw and springs or universal joint. The balanced pumps *X' X²* are operated by the lever F, with which they are connected by pitmen *G' and G²*. They rise and fall alternately, the weight of material being balanced, and the weight of fluid also, except the excess of the column which is for the time uppermost, and which is discharged at each stroke.

The vertical series of pumps *X'* and *X³* or *X²* and *X⁴* may be prolonged by the addition of pumps to any desired extent, the lower pump discharging into a tank or reservoir from which the pump next above is supplied, and so on to the top. By this arrangement, and the balancing of the pumps as described above, it is believed that the hollow-piston pump can be used in deep and narrow shafts and wells with great efficiency, while power is saved or applied with greater effect, and the entire apparatus is rendered more simple and economical.

Having thus fully described my improvements, I do not claim, broadly, to have invented the hollow piston-rod pump, nor the ball-valve, nor the counterpoising of pumps, other than those in which the piston-rod is hollow and serves the eduction-pipe; but

I do claim as my invention, and desire to secure by Letters Patent, the following particulars—to wit:

1. The combination of hollow piston-rod C, reciprocating cylinder B, and air-chamber D, substantially as described.

2. In combination with the walking-beam F, the cylinders *B', B², B³, and B⁴*, and hollow piston-rods *C', C², C³, and C⁴*, with their curves and basin, substantially as described.

3. The combination of the hollow piston-rod C, reciprocating cylinder B, and stationary cylinder A, substantially as described.

4. In combination with the third claim, the guide-rods *e* and collar *f*, substantially as described.

5. In combination with reciprocating cylinders *B'* and *B³*, the rods *p' p'*, arranged and operating substantially as shown.

6. The combination, in a ball-valve, of a wood or metal core and elastic cover, substantially as described.

L. B. CRITTENDEN.

Witnesses:

SAML. S. FISHER,
ANDREW WHITELEY.