W. H. BIRGE.

SAND-PUMPS.

No. 193,915. Patented Aug. 7, 1877.

Fig. 1.

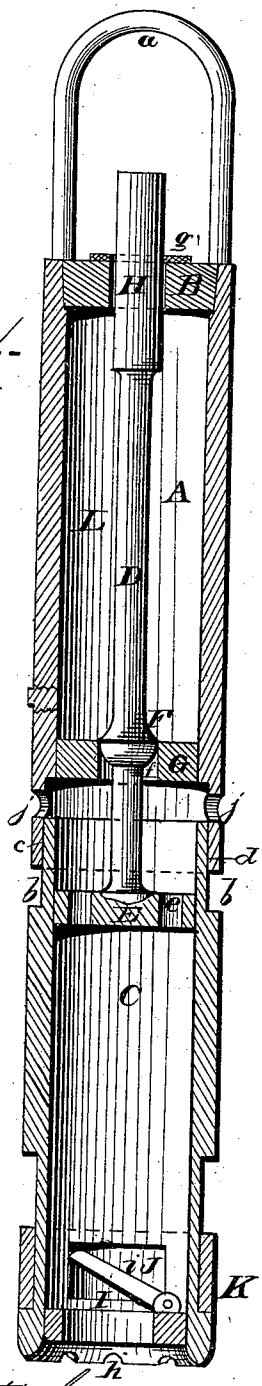
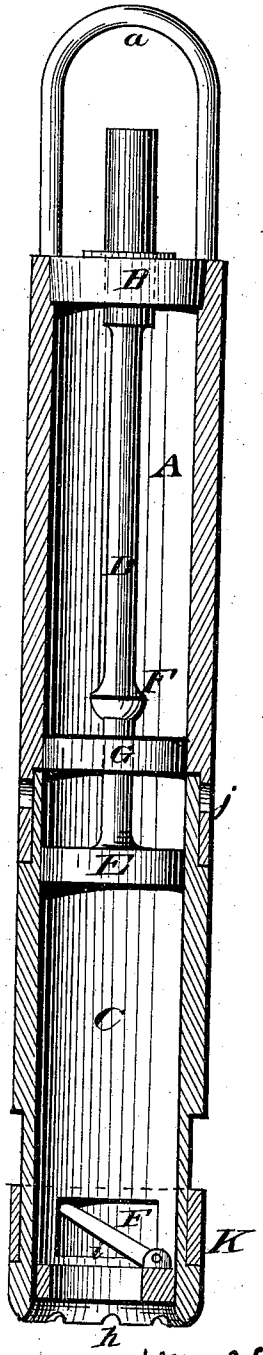


Fig. 2.



WITNESSES

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IMPROVEMENT IN SAND-PUMPS.

Specification forming part of Letters Patent No. **193,915**, dated August 7, 1877; application filed August 1, 1877.

To all whom it may concern:

Be it known that I, WM. H. BIRGE, of Franklin, in the county of Venango and State of Pennsylvania, have invented certain new and useful Improvements in Pumps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to certain improvements in sand-pumps.

The object of my invention is to produce a sand-pump of such a construction that the upper portion of the pump shall contain an inclosed air-chamber, while the lower portion thereof is made to allow the free passage of water through the same while the pump is being lowered in the well, and when the bottom is reached the port or passage connecting the upper and lower sections of the pump-chambers is automatically opened, whereby sand or other débris in the well bottom is drawn into the mud-chamber of the pump.

In the accompanying drawings, Figure 1 represents a vertical section of the sand-pump, showing the location of the several parts as the pump is being lowered in the well. Fig. 2 is a vertical section of the pump, represented as resting on the bottom of the well.

A represents the upper section of the pump, having a bail, *a*, secured to the pump-head B or to the cylinder or section A in any suitable manner for the attachment of the pump-line.

C is the lower section or cylinder of the pump, and is formed with a shoulder, *b*, which constitutes a stop or supporting-ledge for the lower end of cylinder A, the adjacent ends of said sections being cut away, as shown at *c d*, to constitute a combined air and sand chamber cylinder of equal diameter throughout its entire length.

D represents a stationary valve-rod, the lower end of which is attached to a disk, E, rigidly secured within the upper portion of the lower cylinder C. Disk E is provided with any desired number of openings *e* for the upward passage of fluid through the same.

It is evident that a cast or wrought iron grating might be used in lieu of a disk constructed in the manner shown, and the same result accomplished thereby.

A valve, F, preferably conical in form, is secured to the valve-rod D, and serves to govern a port or passage-way, *f*, in the disk or valve-seat G, which latter is secured to the lower portion of section A of the pump.

It is evident that instead of forming the valve-seat G with a flat upper surface there may be a raised annular ledge constructed around the port *f*, the inner surface of said ledge being conical in form to receive the valve, thereby constituting an annular chamber between the inner wall of the cylinder A and the valve-seat, within which chamber sand or other sediment might fall, and thus not affect the operation of the valve; also, the valve-seat G may be formed on a gradual inclination from the wall of the cylinder to the passage-way *f*, thus preventing the accumulation of sediment about or beneath the valve F.

The upper end of valve-rod D is provided with a piston-valve, H, the transverse area of which is equal to or formed slightly to exceed the area of port *f*, whereby the pressure on said piston-valve will be sufficient to overcome the upward pressure exerted on valve F and the additional resistance offered by the liquid as the pump is being lowered into the well.

The piston-valve may be packed by means of rubber or other flexible gaskets *g*, or by means of cup-packing inserted in the head B, whereby the pressure of water serves to force the packing in close contact with the piston, or a collapsible cylinder made of rubber or other suitable material may be secured at one end to the piston and the other to head B, thereby effectually excluding water from the interior of cylinder A.

The lower end of sand-chamber or lower cylinder C is serrated or formed with projections *h*, whereby sand or other débris in the bottom of the well may have free passage through the valve-seat I into the sand-chamber.

In order to allow of the passage of large pieces of rock into the sand-chamber, I employ a large flap or clapper valve, *i*, which latter may be secured to a raised valve-seat,

if desired, and thus prevent the accumulation of sand between the valve and its seat, in which case it would destroy the function of said valve.

J represents an opening formed in the sand-chamber, adjacent to the valve *i*, which serves to allow of the escape of the sand from the pump when the vertically-movable ring K is raised for such purpose.

Instead of constructing the ring to be raised in order to allow of the escape of sand through opening J the ring may be formed with an opening corresponding in size and shape with opening J. By turning said ring, the passage J may be opened or closed at will.

Openings or passage-ways *j* are made in the lower end of upper cylinder A, for the passage of water as the pump is being lowered into the well. It is evident that the same result might be effected by forming guides on the upper portion of lower cylinder through which the water would readily escape when the sand-pump is descending into the well.

The operation of the sand-pump is as follows: The sand-pump, when in position for lowering into the well, automatically forms and preserves an air-chamber, L, in the upper cylinder A. The pressure of water on the piston-valve being slightly in excess of the pressure on the valve F and the weight of the sand-chamber together serving to hold the valve F securely against its seat, and prevent the ingress of water to air-chamber L. As the sand-pump descends water continually flows past the lower valve *i* through the sand-chamber C, and out through openings *j* in the upper section of the pump. When the sand-chamber strikes the bottom of the well the upper cylinder A descends until it rests on the supporting-shoulder of the sand-chamber. This movement of the upper cylinder operates to carry the valve-seat away from the valve F, thus forming a passage-way between the sand and air chambers. As the pressure of the column of water in the well is much greater than the pressure of air within the air-chamber, a strong upward current is formed which operates to lift the sand and débris from the well bottom and carry it into the sand-chamber. The pump being raised the liquid and sand within the sand-chamber operates to close the lower valve, and thus the sand is securely retained within the pump while the latter is being raised from the well. When the pump has been removed from the well the movable ring is either raised or turned to open the lower escape-passage and allow the removal of the sand from its chamber.

When there is but little water in the well, and hence the pressure insufficient to cause a current sufficiently strong to lift the sand therein contained and deposit it in the sand-chamber, I provide the air-chamber of the pump with a steam plug or valve, M, and before inserting the pump into the well inject steam into the air-chamber. As the air-chamber filled with steam descends into the water, the cylinder forms a surface-condenser, and quickly condenses the steam contained therein, thereby forming a partial vacuum, and hence the lack of atmospheric pressure in the air-chamber allows the column of water in the well to exert its maximum pressure to force sand into the sand-chamber.

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

1. A sand-pump constructed of telescopic sections, the upper section serving as an air-chamber, and the lower one as a sand-chamber, the passage between said chambers being automatically opened and closed by a valve actuated by the movement of the lower section of the pump, substantially as and for the purpose set forth.

2. In a sand-pump, the combination, with a sand-chamber, having a valve-rod secured thereto, of an air-chamber, provided with a valve-seat, and a valve adapted to open and close a port in said valve-seat, substantially as and for the purpose set forth.

3. A sand-pump formed in movable sections, the lower section provided with a valve-rod having a conical and piston valve secured thereto, while the upper chamber is constructed with a valve-seat for the conical valve, and a perforated head for the passage of the piston-valve, substantially as and for the purpose set forth.

4. The combination, with the air-chamber of a sand-pump, of a valve-rod secured to the lower section of the pump, said valve-rod being provided with two valves of differential areas to insure the seating of the valve governing the passage between the air and sand chamber as the pump is lowered in the well, substantially as and for the purpose set forth.

5. The combination, with the sand-chamber provided with an opening adjacent to the inlet-valve, of a ring-valve, substantially as and for the purpose set forth.

6. The combination, with the air-chamber provided with openings *j*, of the vertically-movable sand-chamber, adapted to automatically close openings *j* as the pump strikes the bottom of the well, substantially as and for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 29th day of November, 1876.

WILLIAM H. BIRGE.

Witnesses:
GEO. ALLEN,
G. W. BRIGHAM.