E. G. SHORTT.

PUMPING ENGINE.

No. 182,387. Patented Sept. 19, 1876.

Fig. 1.

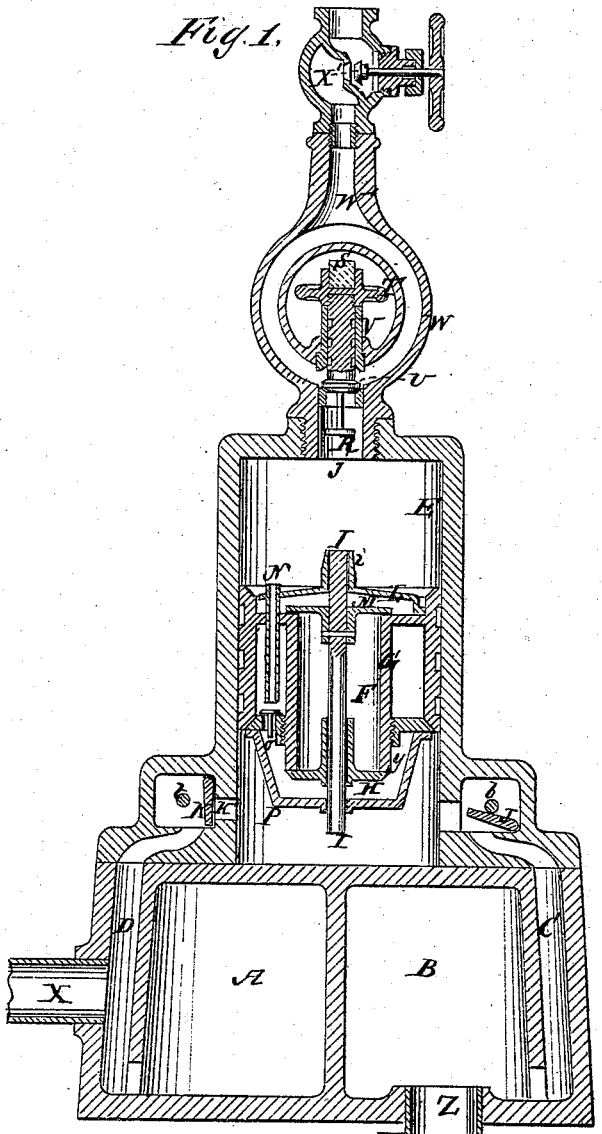
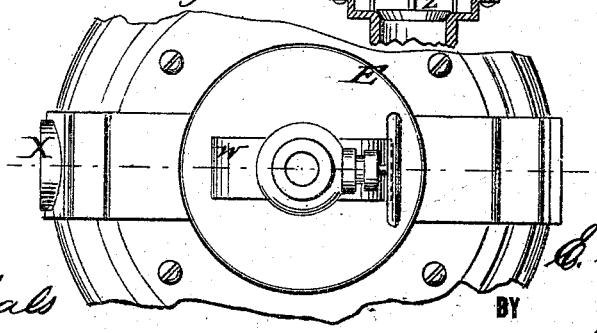


Fig. 2.



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EDWARD G. SHORTT, OF CARTHAGE, NEW YORK.

IMPROVEMENT IN PUMPING-ENGINES.

Specification forming part of Letters Patent No. **182,387**, dated September 19, 1876; application filed February 28, 1876.

To all whom it may concern:

Be it known that I, EDWARD G. SHORTT, of Carthage, in the county of Jefferson and State of New York, have invented a new and Improved Pumping-Engine, of which the following is a specification:

My invention is a contrivance of a moving head and valves, with a water and steam piston, having an inlet and cut-off valves for steam at one end and inlet and exhaust for water at the other end, together with air and vacuum chambers, contrived as hereinafter described.

Figure 1 is a sectional elevation of my improved pumping-engine, and Fig. 2 is a top view.

Similar letters of reference indicate corresponding parts.

E, in the drawing, represents a vertical cylinder. G is an accurately-fitted head, its length being equal to the stroke. This head is provided with valves M H O. The valve M prevents the mingling of steam with the water or other liquid under the head, on its stroke. The valve H prevents the water from passing the head on its downward stroke. The valve O allows the liquid to compress the air in the chamber F of said head, and prevents its return. When a vacuum is formed above the head, the expansion of the air below the same instantly injects cold water from the lower part of the cylinder E through the tube N into the upper portion of the cylinder occupied by the steam, the object being to arrest the molecular atoms of water which adhere to the surface of the hot cylinder from flashing into steam, which otherwise would expand and fill the cylinder and prevent a vacuum. A and B represent air and vacuum chambers, the upper wall of which forms a bed for the cylinder E to rest on. X is the discharge-pipe, and Z the suction-pipe. D and C are passages to and from the pump. J and K are suction and discharge valves. P is a bracket forming the bottom of head and guide for the valve-stem I. Y is a tubular extension of head G, which projects so as to extend below the discharge-port K′ when the head is down, for the purpose of causing the steam to pass through the water before reaching the said port, thus making condensation certain within the cylinder, and preventing the unnecessary slamming of the valves, which would otherwise be caused by the escape of steam past the said valves, and the forming of a vacuum in the valve-case. *t* and *b* are bolts which secure the valve-case covers. L is a disk to prevent the steam-jet from agitating the water of condensation, which takes its position under said disk. From this disk projects a hub, *i*, forming a guide for the valve-stem I, also forming a plug to check the sudden inflow of steam by nearly closing the opening *j*, leading from the steam-valve U, and gradually opening it as the head G recedes. The sudden admission of a large volume of steam to the cylinder E would force the piston down instantly, and slam the valves J and K violently. W is a cut-off case, which contains the steam-valve U and valve-seat and guide V. R is a counter-balance connected with the balance-valve U, to equalize the wedging-action of the steam between the seat and valve when open. T is a milled nut, whereby the steam-valve U may be operated by hand at will. S is a rubber cushion for steam-valve. W′ is a steam-passage, and X′ is an ordinary steam-valve.

To start the pump when first set up, it is only necessary to pour a small quantity of water into the cylinder, then open the globe-valve X′ and raise the steam-valve U by means of the milled nut T, which allows the steam to flow into the cylinder E, forcing the air therefrom through port K′, the head G being at the bottom of the cylinder, and resting on the bracket P, so that the valve-stem I, projecting below the bracket P, holds the valve M open, and allows the steam to come in contact with the water. Then, by closing the steam-valve U, a partial vacuum is formed. The steam is then again admitted, and the same operation continued until the air is exhausted from the pump and pipes. This being accomplished, the pressure of the atmosphere forces the water up the suction-pipe Z, nearly filling the vacuum-chamber B, then up the passage C, forcing the head G upward until the hub on the disk L comes in contact with the counter-balance R, and, lifting the steam-valve U, admits steam into the cylinder E.

As the valve M (the only means of escape

for the steam) is closed, the head G is forced downward, forcing the water with it until the valve-stem I is brought to bear on the bottom of the cylinder, when head G leaves the valve M, which is thereby opened and allows the steam to pass through the piston, past valve H, and exhaust into the water below the piston, which condenses it instantly, thus forming nearly a perfect vacuum in the cylinder E, the valve U being at that instant closed by the pressure of the atmosphere. There is always a quantity of air in the chamber B, sufficient to fill about one-third of the same at the ordinary pressure of fifteen pounds to the square inch, and when the vacuum is formed in cylinder E, beneath the piston, the air instantly expands and forces the water out of chamber B into the cylinder. At such time the foot-valve Z′ is held closed by reason of the pressure in the chamber B being superior to the atmospheric pressure without. But the instant the piston begins to descend again, so that the valve J closes, the water at once rushes past the foot-valve and into the chamber B with great force, thus compressing the air as before. In this respect the action is similar to what takes place in a hydraulic ram. When water enters the cylinder E a jet is forced through tube, N, above the piston. The steam-valve U is held open while steam is to be admitted by the pressure of steam under it, but is closed by atmospheric pressure as soon as it is allowed to descend by the forming of the vacuum under i, the action being gentle, so as to prevent hammering the seat by the valve. It will be seen that the steam cut-off valve is practically closed by atmospheric pressure; also that the plug *i* secures a gentle flow of steam as it enters the cylinder at the commencement of each stroke, while it has instant pressure against the stem of valve U, for the purpose of forcing the said valve open. The arrangement of the cylinder E, and head G, with its valves or equivalent, effects separation of the steam and water until the time of exhaust, and secures at all times a hot steam-cylinder into which the water to be pumped has no access either to space or surface. By the location of the air-chamber A, and vacuum-chamber B under the cylinder E, and below the exhaust-port K′, the position of the steam above the air contained in the said chambers is such that it cannot take the place of the air, as would be the case if the chambers were above the discharge-openings. The vacuum-chamber is of sufficient capacity to fill the cylinder E without starting the suction-column until the pump is filled.

This machine may be used as a condensing steam-engine, it being only necessary to connect a piston-rod with the head and allowing it to take in only sufficient water for condensation purposes.

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

1. The steam-cut-off valve V open to the atmosphere on its upper side, in combination with the steam and vacuum chamber E, and the reciprocating piston, as shown and described, whereby the valve is seated by atmospheric pressure just previous to the upward stroke of the piston, as set forth.

2. The combination of the plug *i*, the passage *j*, the cut-off valve, the piston, the valve J, and chamber B, as shown and described, to operate as specified.

3. The air-chamber B, and supply-pipe Z, provided with valve Z′, in combination with the passage C, valve J, cylinder E, and piston having the valve M, substantially as shown and described, whereby the expansion of air in said chamber forces the water into the cylinder when a vacuum is formed therein, as set forth.

4. The combination, with cylinder E, of the head G, and its valves H M O, arranged and operating substantially in the manner described.

EDWARD G. SHORTT.

Witnesses:
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