E. D. LEAVITT, Jr.

Pump.

No. 163,018. Patented May 11, 1875.

Fig. 1.

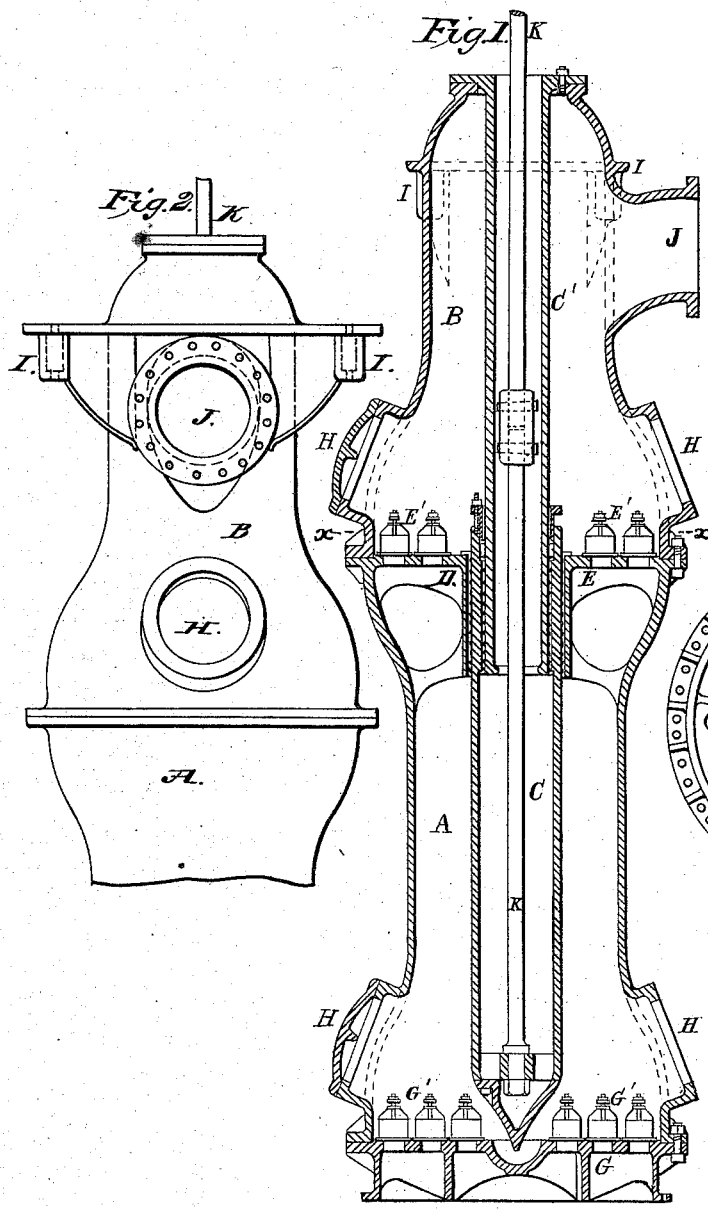
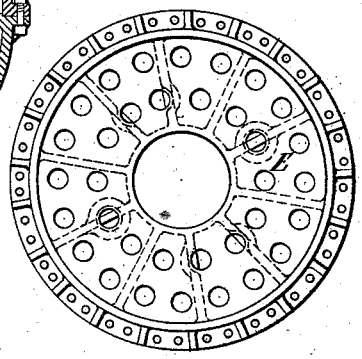


Fig. 2.

Fig. 3.



Witnesses,

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UNITED STATES PATENT OFFICE.

ERASMUS D. LEAVITT, JR., OF CAMBRIDGE, MASSACHUSETTS.

IMPROVEMENT IN PUMPS.

Specification forming part of Letters Patent No. **163,018**, dated May 11, 1875; application filed December 7, 1874.

To all whom it may concern:

Be it known that I, ERASMUS D. LEAVITT, Jr., of Cambridge, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Pumps, of which the following is a specification:

These improvements relate to the construction of what I term a "differential plunger-pump," which is intended to be used for water-works and other similar purposes, and by which a more rapid rate of working can be obtained than with pumps that are made with buckets, as is usual, and the discharge from the pump is made to take place when the plunger is moved in both directions. The plunger, for about one-half of its length, is made of twice the sectional area of the other part, and works in a barrel, which is divided midway of its length by a partition, through which the large part of the plunger works water-tight, and this partition is provided with valves, through which the water passes from the large end of the plunger to the other. By this construction one-half, more or less, of the volume of the larger part of the plunger of the pump is discharged by each single stroke of the plunger, thus dividing the labor.

My improvement consists in a modification of the plunger, by which the smaller part of the same can be made stationary, while embodying the same principle of action, to enable the pump to occupy a shorter space than is practicable with both parts of the plunger rigidly connected, which will be more fully explained.

In the drawings, Figure 1 is a vertical section through the center of the pump-barrel. Fig. 2 is an elevation of the upper part of the pump-barrel, showing the bracket for suspending the pump from the bed-plate of the engine. Fig. 3 is a plan on the line *x x* of Fig. 1, of the bottom of the upper part of the pump-barrel, showing the partition and valve-seats, and bushing for the plunger.

A and B are the two parts of the pump-barrel, made of the form shown to save weight, and at the same time to give space for the valves, which are made of greater capacity than is usual, to enable the pump to be worked with greater speed. C C′ is the plunger, the lower part C of which has about twice the sectional area that the upper part C′ has. It works through a bush, D, in the partition E, water-tight. The upper part C′ of the plunger is made hollow and provided with a flange, by which it is permanently attached to the upper part B of the chamber, as is shown, and the lower part C of the plunger is made to slide upon the outside of the smaller part, with a water-tight joint between them, formed by a stuffing-box, as is shown, or in any other efficient manner. Thus the larger part of the plunger slides upon the fixed part somewhat like a telescope. The piston-rod K is attached to the lower end of the large plunger at such a distance from the top as to leave room for the required length of stroke before the attachment comes in contact with the lower end of the fixed small piston, as is obvious.

The arrangement shown is adapted to be used where the pump would be driven from a prolongation of the piston-rod of the steam-engine, projecting through the bottom of the cylinder, in which case a vibrating connecting-joint of the piston-rod would not be necessary.

The partition E is constructed as is shown, and divides the pump-barrel into two chambers, and has a series of valves, E′, opening upward, through which the water from the lower chamber of the barrel passes into the upper one, and the seat of the valves is made of a much larger diameter than the barrel, to give sufficient space for the valves. This is shown in plan in Fig. 3, which is a horizontal section on the line *x x* of Fig. 1. G is the seat of the foot-valves G′, and forms the bottom of the pump-barrel and the upper part of the suction-pipe. The valves are all of the ordinary double-beat variety, and of the same size, but it is considered preferable to use a greater number of the inlet-valves than of the exit-valves in the partition E. H H are the manholes and covers, to give access to the valves. I I are brackets cast upon the upper part of the pump-barrel, as shown, by which the pump is suspended from the bed-plate or the engine, and J is the discharge-pipe, by which the water is delivered.

From this construction it will be seen that when the plunger is drawn up the water will be drawn into the lower chamber of the pump

barrel, and at the same time a quantity of water equal in volume to the difference in volume of the two parts of the plunger is delivered from the upper chamber, or about one-half the amount that is received by the lower chamber. When the plunger is forced down a quantity of water is displaced and forced upward through the valves E′ equal to the volume of the large part of the plunger, but the amount discharged from the upper chamber of the pump is only equal to this amount, less the volume of the small part of the plunger, which is also about equal to one-half the amount of water that is received in the lower chamber at the upward stroke of the plunger. By this means about one-half of the water is discharged from the pump at each movement of the plunger.

What I claim is—

The differential plunger having the two parts of different diameters made separate from each other, the smaller of which is fixed and the larger movable, as described, in combination with the two chambers communicating with other by valves, and operating substantially as described.

Executed 30th November, 1874.

E. D. LEAVITT, JR.

Witnesses:

WM. C. HIBBARD,

JAMES W. POTTER.