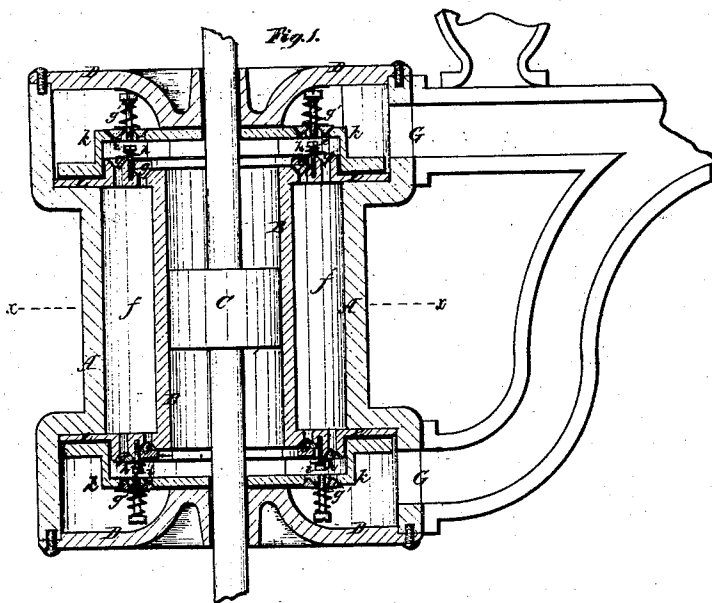


*W. H. Ivens,*

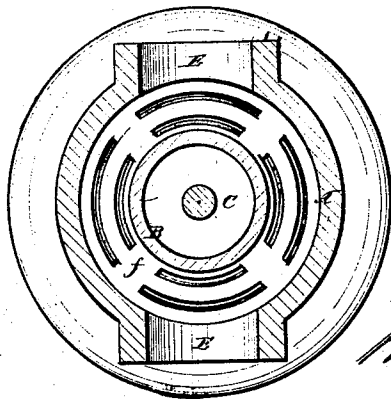
*Double Acting Pump.*

*No. 99680.*

*Patented Feb. 3, 1870.*



*Fig. 2.*



*Witnesses.*

*Spencer C. Smith.*

*J. C. Robbins*

*Inventor.*

*Wm. H. Ivens*

*by Attorneys  
Brown, Coombs & Co.*

# United States Patent Office.

WILLIAM H. IVENS, OF TRENTON, NEW JERSEY.

Letters Patent No. 99,680, dated February 8, 1870.

## IMPROVEMENT IN DOUBLE-ACTING PUMPS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern.

Be it known that I, WILLIAM H. IVENS, of Trenton, in the county of Mercer, and State of New Jersey, have invented certain Improvements in "Pumps;" and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing, through letters of reference marked thereon, forming part of this specification, and in which—

Figure 1 represents an axial section of a pump, constructed according to my improvement.

Figure 2, a transverse section, taken on the line  $x x$  of fig. 1.

The same letters, occurring on both figures, indicate like parts.

This invention consists in a novel construction and arrangement of the valves of a pump, whereby the discharge-area is materially increased, and the necessary lift of said valves proportionately decreased; also, in the arrangement of a series of annular V-shaped valves, in steps, one above another, so that the water passing one shall not impinge against the current from the adjacent one; and, furthermore, in a novel construction and arrangement of the pump-cylinder, and its supply-pipe or pipes.

Referring to the drawing—

A represents the outer cylinder or jacket.

B, the inner or working-cylinder, in which is fitted a piston, C, having a rod extending through each cover, D, in which suitable stuffing-boxes are to be provided.

An annular plate,  $e$ , connects the outer and inner cylinders A B at each end, thus forming an undivided annular space,  $f$ , between the two, in open communication with the supply-inlets E.

The annular plates  $e$  are formed on their outer surfaces in steps, which are channelled, of a V-form, the bottom of which is punctured or slotted, to give passage to the water from the outer to the inner cylinder.

In these V-formed channels are fitted annular valves,

$g$ , of corresponding shape, and, when two or more are used, they are connected by two or more spiral springs,  $h$ , retained by bolts,  $i$ , screwed into the plate  $e$ .

Around and enclosing these annular valve-seats are caps,  $k$ , also having annular valves,  $g'$ , of similar form, and may be arranged also in steps, but in the reverse direction, so that the inner one will deliver over the outer, toward the discharge-pipe G. The covers D are then screwed on, enclosing both ends of the outer cylinder, and with their central portion bearing upon and holding the valve-seats in place.

Water is supplied to this pump through the openings E, and encircles the working-cylinder, passing the valves  $g$ , at either end, into the cylinder B, to fill the vacuum caused by the receding piston, while that previously occupying the opposite end of said cylinder is being forced through the valves  $g'$ , into the discharge-pipe G, and thence to the hose.

By this construction, much greater area of valve is obtained, in proportion to the area of the piston, consequently much greater velocity of piston may be obtained, with less expenditure of power.

Having thus described my invention,

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

1. The arrangement of the cylinders A B, one within the other, forming an annular water-space, communicating with the ingress or foot-valves  $g$ , at each end thereof, and with the supply-apertures E, as and for the purpose described.

2. The arrangement of the annular valves in steps, one above another, as and for the purpose set forth.

3. The annular valves  $g g'$ , constructed and operating substantially as shown and described.

WM. H. IVENS.

Witnesses:

GEO. E. HALE,  
W. MORRIS SMITH.