

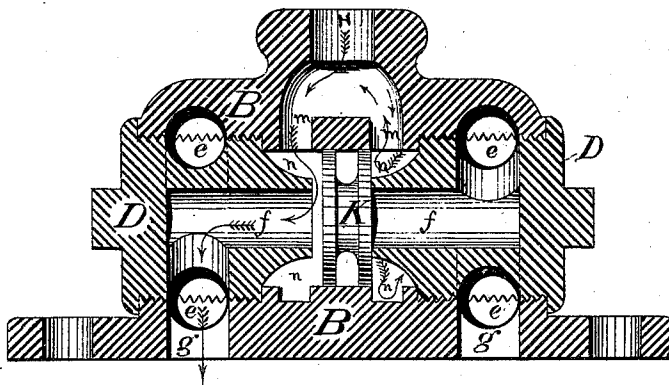
W. E. PRALL & D. A. BURR.

STEAM VACUUM PUMP.

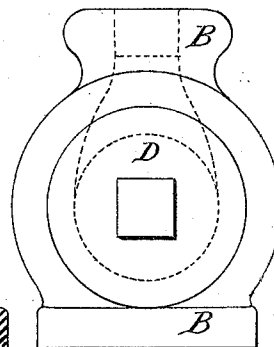
No. 172,655.

Patented Jan. 25, 1876.

*Fig. 1*



*Fig. 2*



*Witnesses:*

*Jno. Eversding*  
*J. Chordens Bell*

*Inventor:*

*W. E. Prall*  
*David A. Burr*

# UNITED STATES PATENT OFFICE.

WILLIAM E. PRALL AND DAVID A. BURR, OF WASHINGTON CITY, DISTRICT OF COLUMBIA.

## IMPROVEMENT IN STEAM VACUUM-PUMPS.

Specification forming part of Letters Patent No. 172,655, dated January 25, 1876; application filed November 21, 1873.

### CASE C.

*To all whom it may concern:*

Be it known that we, WILLIAM E. PRALL and DAVID A. BURR, of Washington City, in the District of Columbia, have invented certain Improvements in Steam Vacuum-Pumps, of which the following is a specification:

Our invention involves an improvement upon the original invention of William E. Prall, described in his Letters Patent dated December 19, 1871, and reissued November 5, 1872, No. 5,138, in which the admission of steam to a double-acting steam vacuum-pump is automatically controlled by means of a diaphragm, movable piece or piston, so placed in a channel of communication between the working chambers or cylinders of the pump as to be moved by the reduction of pressure produced within either of them by reason of the sudden vent of the steam through, and its partial condensation within, the discharge-port of the cylinders; and it consists in so combining a steam-supply pipe with the aforesaid channel of communication, and with a piston therein, arranged to cover and uncover the steam-ports of the respective chambers of the pump, as that the pressure of the steam in said supply-pipe shall bear directly upon the face of the piston, closing either steam-port, and shall consequently operate to force it toward the opposite open port and close it so soon as a reduction of pressure takes place in the chamber with which it communicates.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of our improved diaphragm or piston-valve, Fig. 2 being an end view thereof.

B is a metallic casing inclosing a cylindrical chamber, extending from end to end thereof. K is a piston, fitted to play freely, yet closely, in the center of said cylindrical chamber, and which is confined therein by plugs D D screwing into its two ends. *e* is an annular groove formed about the circumference of each plug, of a transverse area equal to that of the steam-supply pipe of the pump, and which communicates, by means of one or more radial perforations, with a central aperture, *f*, extending inwardly, to be closed by the face

of the central piston when it bears against the end of the plug. These grooves *e e* communicate also with steam ways or ports *g g*, formed through the base or other portion of the outer wall of the casing B, so as to open, respectively, into the one and the other chamber of the pump. By means of these steamways *g g* and channels *e* and *f*, a channel of communication is established through the casing B between the working-chambers of the pump, which said channel of communication is, however, intercepted and closed by the piston K, as illustrated in Fig. 1. From its position the piston is thus subjected to the influence of any variations of pressure in the said working-chambers, so as to be drawn invariably inward toward that of least pressure. *m m* are steam ways or ports, opening, respectively, into annular grooves *n*, cut in the outer edge of the ends of the two plugs, so as that the steam may bear against the piston playing between them, even when the piston is in contact with the one or the other of said plugs. These ports connect with one common port, H, fitted to receive the steam-supply pipe from the boiler, but are each made of a transverse area somewhat smaller than that of said supply-pipe, so that there shall be a partial confinement of the steam passing through either of them.

In the operation of this improved piston-valve, so soon as a reduction of pressure takes place in either chamber of the pump, the piston is forced toward that chamber, so that its face, coming into contact with the end of the plug on that side, will close the central opening in said plug communicating with the chamber of least pressure. This movement of the piston will uncover the central passage in the opposite plug, so that the steam entering on that side will find free vent into said passage, and through it into the corresponding pump-chamber. Under these conditions the steam exerts a pressure against the entire open face of the piston in passing into the discharging-chamber of the pump equal to the pressure within that chamber, while at the same time a pressure equal to that in the sup-

ply-pipe is exerted by the steam upon so much of the opposite face of said piston as covers the annular recess *n*. So long as the steam entering the chamber of the pump meets with the resistance of the water therein, to be discharged therefrom, the pressure within the cylinder, reacting upon the entire face of the piston, is nearly as great as that of the steam in the supply-pipe communicated to the annular surface of the opposite face of the piston; but the moment the pressure in the discharging-chamber is suddenly reduced by a vent of the steam into the discharge-pipe, the pressure is as quickly withdrawn to a corresponding degree from the entire face of the piston, so that the pressure from the supply-pipe upon its opposite face will drive it over before an equilibrium can be established, and will, by such movement, close the steamway into the exhausted cylinder and open the opposite one.

We contemplate connecting to and combining with the piston *K* vanes or disks placed in a chamber or enlarged space formed in the steam-passages *f f*, so that the steam issuing

through and from said passages shall strike against said vanes or disks, and increase the tendency of the valve to move and close in the direction of the steam-current.

We claim as our invention—

In combination with a piston or valve, *K*, intercepting a channel of communication between the working-chambers of a steam and vacuum pump, and with a pipe admitting steam thereto, steam-ways *m m* and recesses *n n*, formed opposite to the valve, in communication with said steam-pipe, to admit pressure therefrom against a portion of that end or face of the valve which may be operating to cut off communication between the steam-pipe and either chamber of the pump, substantially as and for the purpose herein set forth.

W. E. PRALL.  
DAVID A. BURR.

Witnesses:

ROBT. G. LOUGHERY,  
S. M. POOL.