No. 609,726. Patented Aug. 23, 1898.

P. DE C. BALL.

VALVE.

(Application filed Sept. 27, 1897.)

(No Model.)

Fig. 1.

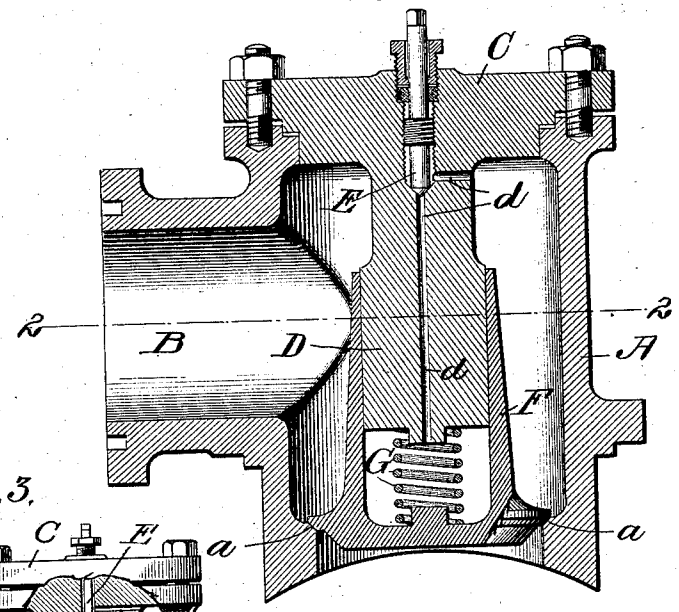


Fig. 3.

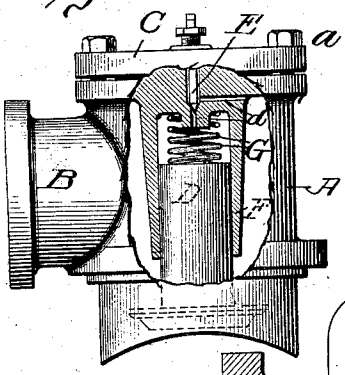
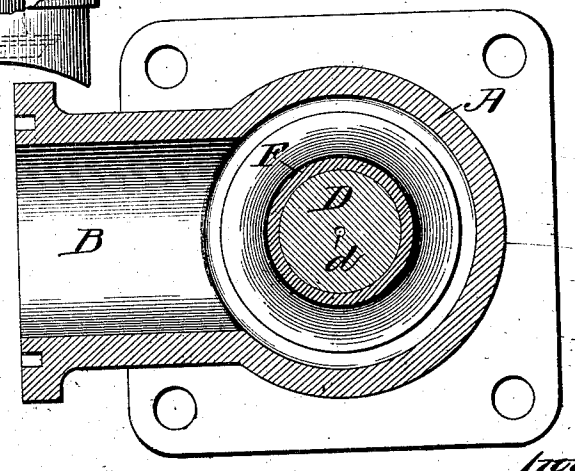


Fig. 2.



Witnesses:
G. A. Pennington
Ralph L. Kelsick

Inventor
P. DeC. Ball,
by
Bakewell & Cornwall
his attys.

UNITED STATES PATENT OFFICE.

PHILIP DE C. BALL, OF ST. LOUIS, MISSOURI.

VALVE.

SPECIFICATION forming part of Letters Patent No. 609,726, dated August 23, 1898.

Application filed September 27, 1897. Serial No. 653,155. (No model.)

To all whom it may concern:

Be it known that I, PHILIP DE C. BALL, a citizen of the United States, residing at the city of St. Louis, State of Missouri, have invented a certain new and useful Improvement in Valves, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical sectional view through my improved valve. Fig. 2 is a horizontal sectional view on line 2 2, Fig. 1; and Fig. 3 is a slightly-modified form.

This invention relates to a new and useful improvement in valves designed especially for use in the discharge-pipes of gas-pumps in refrigerating plants, the object being to make a quick-acting and noiseless self-closing valve which will accommodate itself to varying pressures in the pump-cylinder and in the discharge-pipe without requiring frequent adjustment or constant attention.

In the drawings, A indicates the valve-casing, formed or provided with a valve-seat *a* near its lower end and just above the point where it enters the pump-cylinder.

B is a coupling extending into the valve-casing, to which the discharge-pipe is secured.

C indicates a head, secured by suitable means to the upper end of the valve-casing A, said head being formed or provided with a plunger D, extending into the valve-casing, as shown. This plunger D is provided with a duct *d*, which is controlled by a needle-valve E. This needle-valve may be threaded or otherwise arranged in the head C, so as to render its adjustment easy.

F indicates the valve, seated on the valve-seat *a*. The stem of this valve is made hollow and receives plunger D, which is close-fitting therein, so as to form a chamber under said plunger D.

G indicates a spring interposed between the plunger D and the valve F. This spring, however, is not necessary and is only used to normally keep the valve to its seat when the pump is starting to run.

The operation of the valve is as follows: Gas-pumps for forcing vapors through systems in refrigerating plants usually make from sixty to one hundred and sixty strokes a minute, the pressure of the vapors compressed by the plunger of the pump-cylinder being about two hundred pounds per square inch. Ordinarily valves are arranged in the discharge-pipes of said pumps and have a spring surrounding their stem, said spring acting to keep the valve to its seat to prevent the pressure from the discharge-pipe from coming back into the cylinder. It is well known that when the pump-piston is approaching the end of its stroke the pressure of the gases in front of it exceeds that of the discharge-pipe, and under such conditions the valve will be raised to permit said gases to pass into the discharge-pipe. When the pump-piston passes the end of its stroke and returns, the pressure is taken from beneath the under side of the valve, and when a spring such as described is used the valve will return to its seat with a quick movement, making considerable sound and tending to wear the valve and its seat irregularly, and thus prevent the proper seating of the valve.

By the construction of my valve the pressure in the discharge-pipe is constantly flowing through the duct *d* to the chamber beneath the plunger D, and this pressure is depended upon to keep the valve to its seat. The needle-valve is so adjusted that this pressure can escape back through the duct *d* to the discharge-pipe whenever the valve is to be raised to permit the passage of gas from the pump-cylinder. Under such conditions the valve will be raised, and when the piston starts on its return stroke instead of the valve hammering or striking the valve-seat with a sudden blow it will descend to a point where the pressures on each side are practically equalized, when the spring G will commence to act until such time as the pressure in the pump-cylinder is less than that in the discharge-pipe, when the valve will be seated by the pressure in the discharge-pipe, making a tight seat.

When the pump is working rapidly—say about one hundred and sixty strokes a minute—the needle-valve is adjusted so as to open the duct *d* to a considerable extent to permit free passage of the pressure into and

out of the chamber beneath the plunger D. When the pump is running slowly—say about sixty strokes a minute—the needle-valve is adjusted so as to almost close the duct *d*.

In Fig. 3 I have shown a slight modification in which the plunger is arranged on the valve and the open-ended cylinder on the head of the valve-casing. The operation is the same as that of the construction shown in Fig. 1.

I am aware that many minor changes in the construction, arrangement, and combination of the several parts of my valve can be made and substituted for those herein shown and described without in the least departing from the nature and principle of my invention.

Having thus described my invention, what I claim is—

1. In a valve for controlling discharge-pipes in pumps, the combination of a casing provided with a valve-seat, a valve provided with a stem, a guide for said stem and forming therewith a chamber, a valve for controlling a passage placing said chamber and casing in communication, and a spring arranged in said chamber acting to hold the valve to its seat.

2. In a valve for controlling discharge-pipes in pumps, the combination of an open-ended casing with a valve-seat opposite the open end, a cap for said open end provided with a plunger extending toward but terminating a distance from said valve-seat and provided with an open passage leading to the end of the plunger, a valve controlling said passage, a valve having a hollow stem slidingly engaging said plunger and forming therewith a chamber between the end of the plunger and the valve, and a spring in said chamber seated against the plunger and valve.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 9th day of September, 1897.

PHILIP DE C. BALL.

Witnesses:
HUGH K. WAGNER,
F. R. CORNWALL.