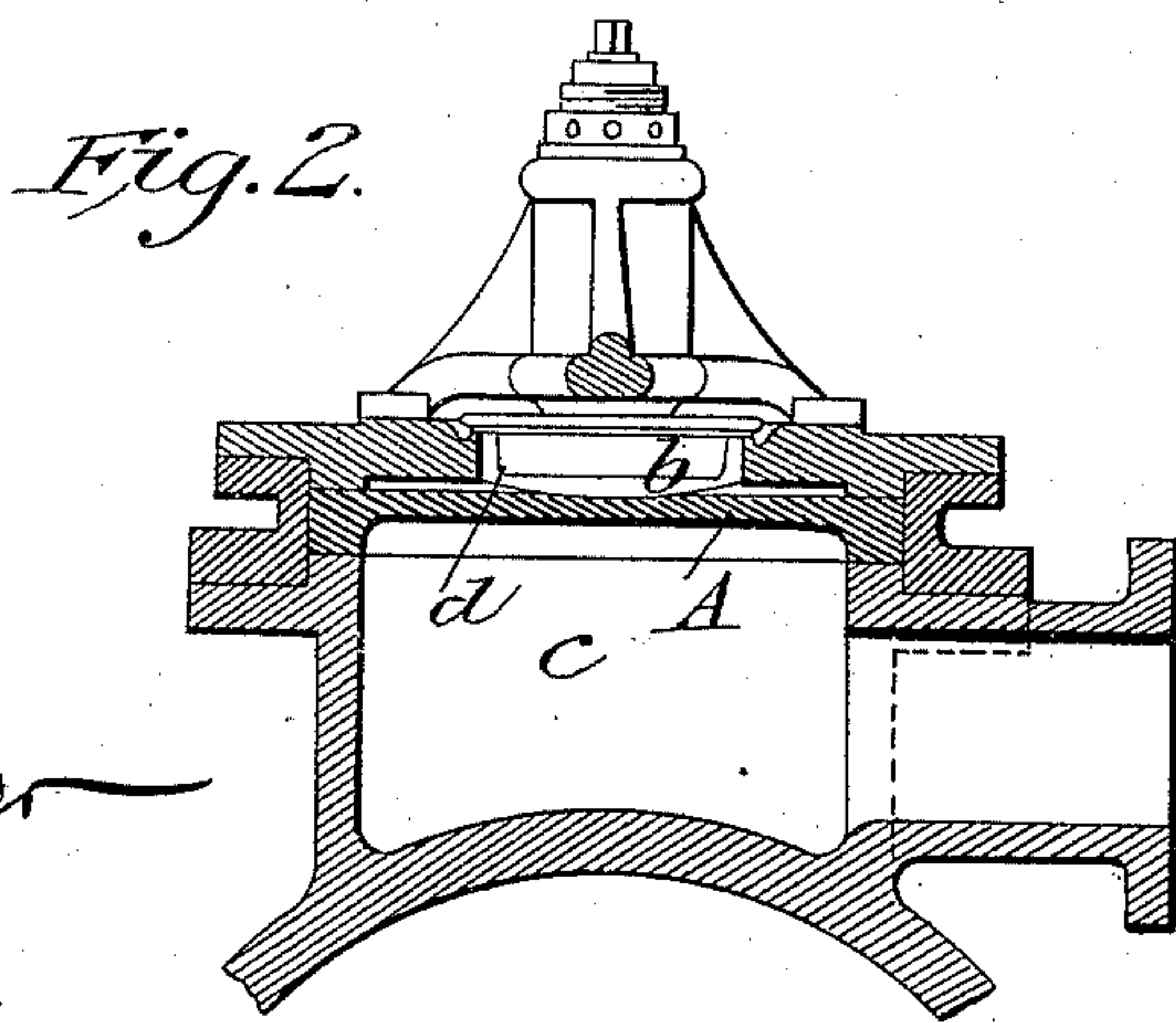
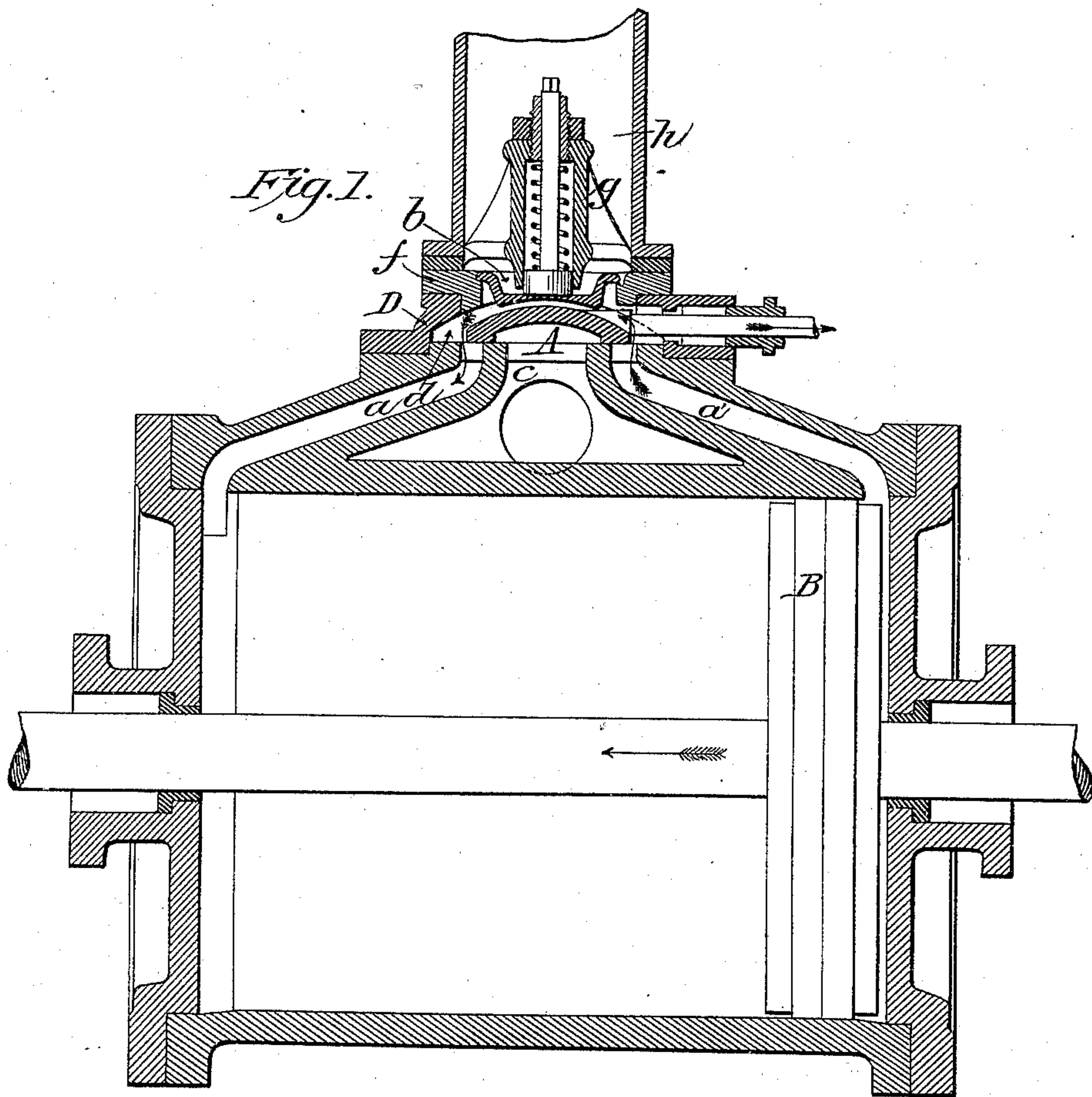


(No Model.)

E. HÜBNER.
APPARATUS FOR COMPENSATING THE PRESSURE IN SLIDE PUMPS
FOR AIR AND GASES.

No. 445,966.

Patented Feb. 3, 1891.



Witnesses:
Robt. L. Miller
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UNITED STATES PATENT OFFICE.

ERNST HÜBNER, OF HALLE-ON-THE-SAALE, GERMANY.

APPARATUS FOR COMPENSATING THE PRESSURE IN SLIDE-PUMPS FOR AIR AND GASES.

SPECIFICATION forming part of Letters Patent No. 445,966, dated February 3, 1891.

Application filed June 27, 1887. Serial No. 242,684. (No model.)

To all whom it may concern:

Be it known that I, ERNST HÜBNER, of Halle-on-the-Saale, in the Kingdom of Prussia and German Empire, have invented a new and useful Apparatus for Compensating the Pressure in Slide-Pumps for Air and Gases, of which the following is a specification, reference being had therein to the accompanying drawings, no patents being obtained by me anywhere for this invention.

My invention relates to apparatus for compensating the pressure in slide-pumps for air and gases.

Figure I is a longitudinal section of a slide-pump for air and gases with the improved apparatus for compensating the pressure. Fig. II is a cross-section through the same.

For the purpose of avoiding special compensation slides, valves, or channels and the like for compensating the pressure in the spaces of pumps for air and gases, the regulating-slide is made in this invention as a simple three-port slide-valve, too short to cover both cylinder-ports, and the space in the slide-box is used for the overflowing of the air or gases in the dead-point positions of the plunger. In order to render this possible, the back-pressure valve, which is fitted with a spring, (and which is used frequently in the delivery-pipes of such pumps for the purpose of raising the dynamical action, but not for regulating purposes,) is applied to the cover of the slide-box. The latter is kept as small as possible and made to suit the outside shape of the three-port slide-valve. The back-pressure valve therefore regulates the escape of air or gases out of the cylinder into the atmospheric air in vacuum-pumps or into the delivery-pipes of compressing-pumps, but remains shut during the compensating, so that the slide-box can serve as a passage for the overflowing air or gases, and thus cause a compensation of the pressure. Regulation and compensation are therefore effected by the co-operation of the three-port slide-valve, of the slide-box made to suit it, and of the back-pressure valve. They are effected in the simplest and most exact way, as follows: Air or gas can enter the cylinder through the three-port slide-valve only. Air or gas escapes into the atmospheric air or into the delivery-pipes solely through the back-pressure

valve; and finally the compensation of the pressures is effected through the slide-box, the entrance of air or gas being shut off by the three-port slide-valve, while the escape is closed by the back-pressure valve.

Figs. I and II show the three-port slide-valve A of such dimensions that when in its middle position—that is to say, when the piston B is in dead-point positions—the forcing-space is connected with the suction-space of the cylinder for a short time by means of the channels $a a'$ and the space d of the slide-box D. The slide-valve A is fitted for this purpose, in that it does not completely cover the two channels $a a'$ when in its middle position, as may be seen in Fig. I. The back-pressure valve b , which is provided with a spring g and applied direct to the cover f of the slide-box, opens outward.

If the pump is used for compressing air or gas, the delivery-pipe h is attached to the cover f of the slide-box, as is indicated in Fig. I. In the indicated position the plunger B has just completed its course or run, the slide-valve A has shut off the suction-channel c from the port a , and has established a connection of the forcing-space before and behind the plunger by means of the port a' , space d , and port a . The compressed air or gas rushes from the right side to the left side of the plunger, and in this way the compensation is effected. During the compensation the slide-box space d is shut off by means of the valve b from the outside or from the delivery-pipe h . When the compensation is finished, the slide A, while running to the right, shuts off port a' first, and then opens it toward c , whereas the plunger, while running to the left, sucks up fresh air or gas behind it, compresses the air or gas in front of it, and forces it through the channel a , space d , and valve b . It keeps on doing this till the slide A, which has in the meantime altered the direction in which it moved, shuts off the suction-channel a' from c , and opens it toward the slide-box space d when the plunger has reached the dead-point position on the left. In the same moment, and when the back-pressure valve b is shut, the compressed air or gas rushes from the left side to the right side of the cylinder. As may be seen from the proceedings just described, the slide A

regulates only the entrance of air or gas into the cylinder. The valve *b* opens as soon as one of the two ports *a a'* is opened toward the space *d*, and closes before the said port is shut off again by the slide *A*. The valve *b* therefore regulates the escape of air or gas into the open air or into the delivery-pipe, and consequently forms a material part of the regulating and compensating contrivance. It must be placed direct on the cover of the slide-box to keep the space *d* as small as possible, and to permit the compensation of the pressures to take place fully. During the compensation the slide *A* shuts off the entrance of air or gas into the cylinder. Valve *b* prevents the escape of air or gas into the open air or into the delivery-pipe, so that the air or gas can rush out of the forcing-space of the cylinder, through the space *d* of the slide-box, into the suction-space of the cylinder.

What I claim, and desire to secure by Letters Patent of the United States, is—

The combination of the pump-cylinder and the valve-box having the ports leading to the ends of the cylinder, said valve-box having the outlet-opening in its cover and having the delivery-pipe *h*, with the spring-pressed outwardly-opening valve *g* seated in the opening of the valve-box cover, the piston in the cylinder, and the slide-valve working in the valve-box, substantially as described, and provided with a passage through which fluid may pass from either of its ends to the other, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

ERNST HÜBNER.

Witnesses:

CARL BORNGRAEBER,
ALFORD A. WHITMAN.