P. LANGER.

VALVE.

APPLICATION FILED MAR. 22, 1905.

919,036. **Patented Apr. 20, 1909.**

2 SHEETS—SHEET 1.

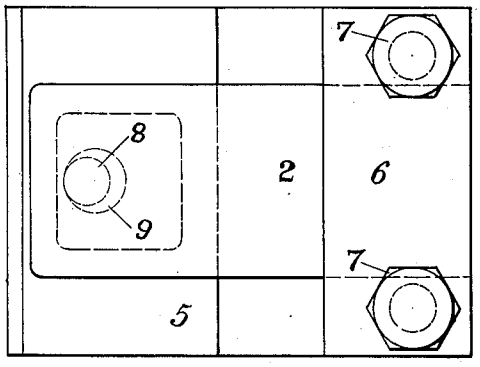

Fig. 1.

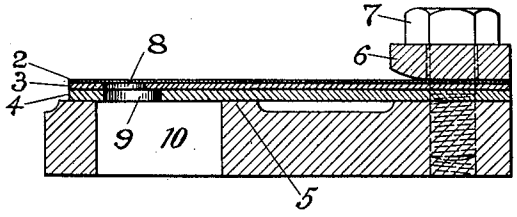

Fig. 2.

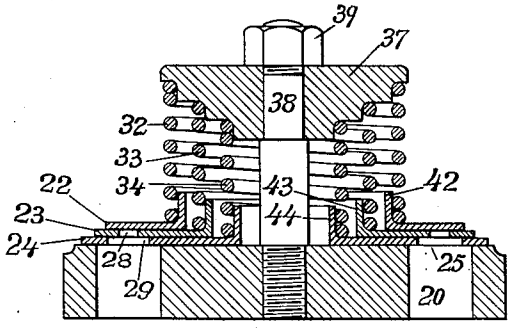

Fig. 4.

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2 SHEETS—SHEET 2.

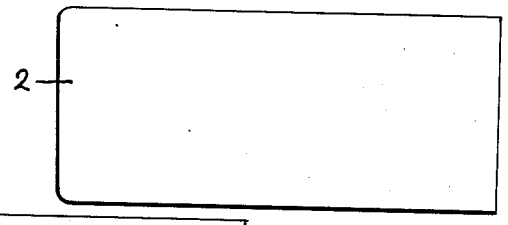

Fig. 6.

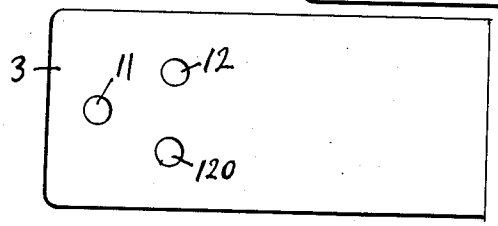

Fig. 7.

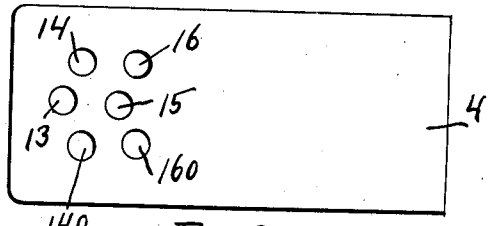

Fig. 8.

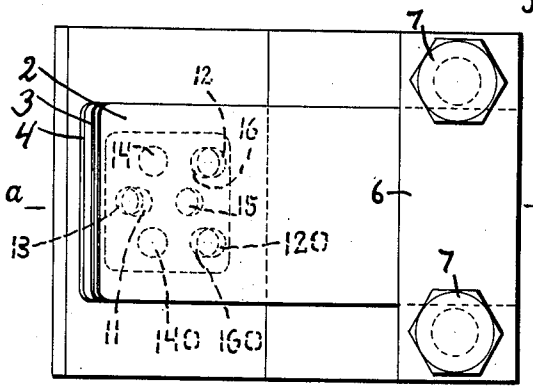

Fig. 5.

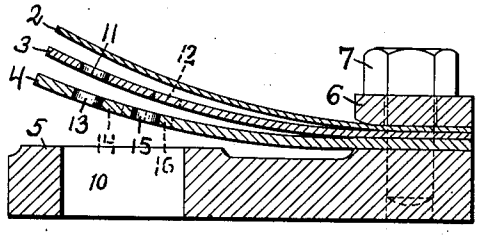

Fig. 3.

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UNITED STATES PATENT OFFICE.

PAUL LANGER, OF MILWAUKEE, WISCONSIN.

VALVE.

No. 919,036. Specification of Letters Patent. Patented April 20, 1909.

Application filed March 22, 1905. Serial No. 251,429.

To all whom it may concern:

Be it known that I, PAUL LANGER, a subject of the Emperor of Austria-Hungary, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Valves, of which the following is a specification.

This invention relates to a valve for compressors and the object of the invention is to secure an easy closing of the valve avoiding all shock and consequent wear.

On the drawing,—Figure 1 is a plan view of the valve and seat. Fig. 2 is a vertical section of the valve and seat in the closed position of the valve. Fig. 3, a similar view of a multiple ported valve and its seat in the open position of the valve. Fig. 4 is a vertical section of a modified valve and seat. Fig. 5 is a plan view of the valve shown by Fig. 3, Fig. 3 being a section taken on the line *a*—*a* of Fig. 5. Fig. 6 is a plan view of the outermost lamina. Fig. 7 is a plan view of the middle lamina; and Fig. 8 is a plan view of the innermost lamina.

The valve, Figs. 1, 2 and 3, is laminated and made up of plates 2, 3, 4, preferably of different thicknesses. The laminæ or plates of the valve are designed to have different seating tendencies. This result may be accomplished in various ways. When so designed, the plates comprising the valve will, when closed, be opened by various degrees of force. The plates are held in place on the seat 5 in any convenient way, that shown being by a plate 6 and bolts 7. The plates are ported, except the outer one, in such a way that inner plates have less effective surface than outer plates. That is the ports 8, 9, in the plates are directly in line with the port 10 in the seat 5 and the effective surface of plate 4, namely, the area of port 10 minus area of port 9,—is less than the effective surface of plate 3, namely, the area of port 9 minus area of port 8.

Figs. 1 and 2 show the valve with the plates 3, 4 having a single port each, but this is conventional only and merely so shown to indicate clearly that the inner plates have less effective surface than the outer plates.

Fig. 3 shows the preferred and practicable structure wherein the total area of porting for a single plate is distributed over a plurality of ports. The ports are all conveniently of the same size, though this is not necessary, it being essential that some of the ports of any one plate register with ports in the next inner plate. Thus in Fig. 3, the ports 11, 12 and 120 of plate 3 register with the ports 13, 16 and 160 of plate 4. Plate 4 is also provided with the ports 14, 15 and 140.

The modification shown in Fig. 4 is a laminated valve the plates of which are in the form of rings 22, 23, 24. These plates are of the same thickness and are urged to the seat 25 by different forces exerted by different lengths of the same strength of spiral spring. Thus, considering the plates to act independently of each other, the plate 22 is urged to seat by the spring 32; the plate 23 by a shorter and consequently stiffer spring 33; and the plate 24 by a still shorter and consequently stiffer spring 34. The springs bear at their lower ends conveniently against the plates just outside shoulders 42, 43, 44; and at their upper ends against a suitably stepped cap 37 held rigidly in place by a nut 39 upon a bolt 38 screwed into the seat 25.

The plates are ported 28, 29, as before to register with ports 20 in the seat 25.

The operation is as follows: The underlying principle which governs the action of this valve is that the different plates, members or laminæ are caused to move only when acted upon by different pressures, for example, taking specifically the construction shown by Figs. 3, 5, 6, 7 and 8, and assume the valve to be closed with the several laminæ in contact and the one indicated by the numeral 4 in contact with the seat 5. If, now, a fluid is exerting pressure through the port 10 against said valve, said fluid will be exerting pressure against each one of the laminæ 2, 3 and 4; but the valve is so proportioned that when the pressure reaches a certain point, it will be sufficient to raise the lamina 2 from lamina 3, allowing the fluid to flow through ports 10, 13, 11, 16, 12, 160 and 120, and out between lamina 2 and 3. If, now, the pressure exerted by the fluid increases, lamina 3 will be raised, the fluid acting upon it through ports 10, 15, 14 and 140, and the fluid will now flow out between laminæ 3 and 4, as well as between laminæ 2 and 3. If, now, the pressure exerted by the fluid increases sufficiently, lamina 4 will be raised from the seat 5 and the fluid will flow between laminæ 2 and 3, 3 and 4, and between lamina 4 and seat 5. It is probable that when the several laminæ have been successively unseated that the greater portion of the fluid will escape from port 10 be-

tween lamina 4 and the seat 5, being a more direct passage than through the ports 14, 15, 16, 140 and 160 of lamina 4, and ports 11, 12 and 120 of lamina 3, so that the laminæ or plates would probably be in proximity each to the other though slightly separated. If, now, the volume of fluid passing through the port 10 diminishes, the pressure exerted by it upon the lamina 4 will diminish, and at a certain pressure lamina 4 will close against the seat 5, the pressure exerted by the fluid passing through the ports 13, 14, 15, 16, 140 and 160 of plate 4 being sufficient to retain plates 3 and 2 away from plate 4. Upon a further drop in the pressure of the fluid, plate 3 will be permitted to seat against plate 4, plate 2 being still retained away from plate 3; while in a further reduction of the pressure exerted by the fluid, plate 2, which is imperforate, will seat against plate 3 and the valve will be closed.

The valve being open and presumably the plates together, on lessening of the flow of air, the inner plate being more strongly urged to its seat will separate slightly from the next plate and this for the same reason from the next and so on, the escaping air securing access between the plates through the porting thereof. The plates will therefore close in series and no excessive or harmful shock will be produced.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire it to be understood that the apparatus shown is merely illustrative and that the invention can be carried out by other means.

What I claim is,—

1. A valve including laminæ and provided with a face, a lamina of the valve nearer the face of the valve offering greater resistance to unseating than a lamina more remote from the face.

2. A member provided with a port, and superposed plates, one of which is imperforate and another of which is provided with a port, the imperforate plate offering less resistance to unseating than the plate provided with a port.

3. A valve seat and a laminated valve having independent laminæ, the seating tendency of a lamina near the seat being greater than that of a lamina more remote from the seat.

4. A laminated valve having superposed independent plates, the thickness of the plates progressively increasing to the lamina which is adapted to contact with a valve seat.

In testimony whereof I affix my signature in presence of two witnesses.

PAUL LANGER.

Witnesses:
MAX ROTTER,
JOHN DAY, Jr.