July 3, 1945. F. VOLLMER 2,379,667

DEVICE FOR REGULATING THE DELIVERY OF RECIPROCATING COMPRESSORS

Filed Aug. 10, 1943

Fig. 1,

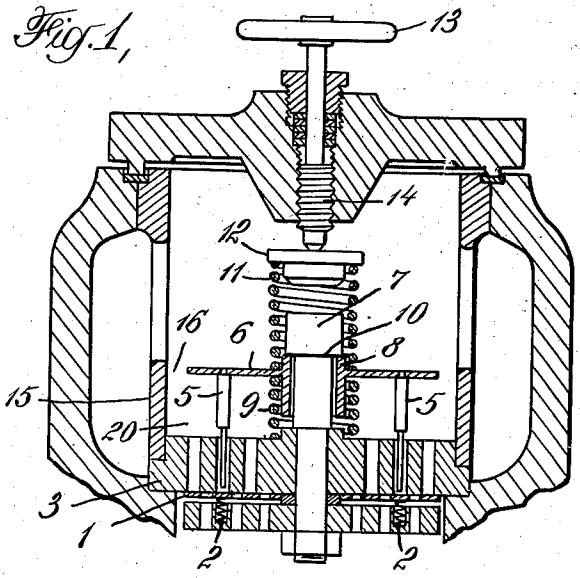



Fig. 2,

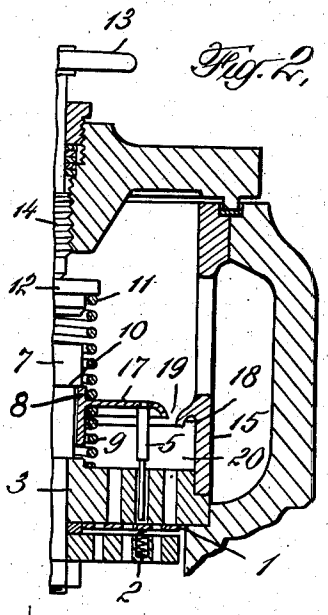



Fig. 4,

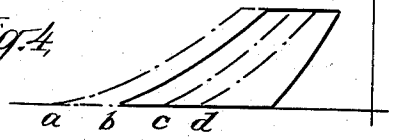



Fig. 3,

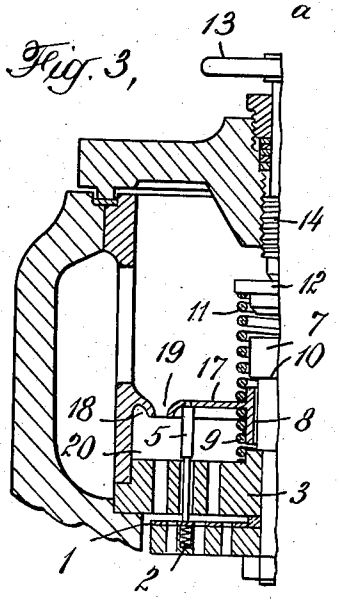
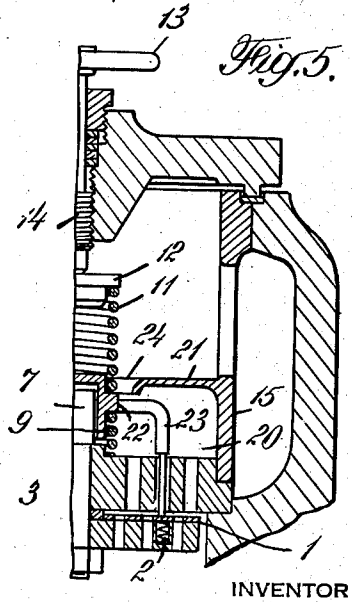



Fig. 5.




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Patented July 3, 1945 2,379,667

# UNITED STATES PATENT OFFICE

2,379,667

## DEVICE FOR REGULATING THE DELIVERY OF RECIPROCATING COMPRESSORS

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Application August 10, 1943, Serial No. 498,040

7 Claims. (Cl. 251—119)

The invention relates to a suction valve having a valve plate for regulating the delivery of reciprocating compressors.

The suction valve of the present invention comprises a casing with a valve-plate actuating member therein having means acting upon a valve plate so as to open it, and means providing a gap between the valve-plate actuating member and the casing by means of which the loading of the suction valve is relieved in accordance with the return flow.

The invention presents the advantage for suction valves that the return forces are not exerted on the valve plate, with the result that the suction valve can be designed so as to be best suited to stream-line requirements. Nor is the most sensitive member of the suction valve, the valve plate, any longer loaded by the controlling forces. In particular, when the gap has a nozzle-like design, considerable forces can be employed for the controlling process, in spite of the fact that flow losses during the suction stroke are extremely small, because the coefficient of contraction of the gap is considerably greater for the return than for the suction flow.

Examples of execution of the subject matter of the invention are represented diagrammatically in the drawing.

Fig. 1 shows a partial longitudinal section through a suction valve of the invention.

Fig. 2 shows another suction valve having a gap with a nozzle-shaped construction.

Fig. 3 is a view of the suction valve of Fig. 2 with the parts in a different position.

Fig. 4 illustrates characteristics of the compressor for various settings of the valve-plate actuating member.

Fig. 5 shows another form of suction valve of the invention.

In Fig. 1, the suction valve of a reciprocating compressor not otherwise shown has a valve plate 1 which is pressed against the valve seat 3 by light springs 2 (Fig. 2), which take the weight of plate 1.

The means for holding open the valve plate 1 consists of rods 5 which are attached to plate 6. The plate 6 is guided by a hub 8 surrounding a bolt 7 and is pressed upwards against a shoulder 10 of bolt 7 by a spring 9. A spring 11 is further provided, the spring plate 12 of which can be pressed down with the aid of a handwheel 13 by a screw 14 to load the spring 11. The valve-plate actuating member comprises rods 5, plate 6 and hub 8. Between the plate 6 and the valve casing 15 is a gap 16.

In Fig. 2 the suction valve has a plate 17 which is firmly connected to the hub 8 and the rods 5, and a gap 19 formed between the plates 17 and the ring 18 provided on the valve casing 15. By bending down the edges of the plate and ring, the gap is designed in the form of a nozzle pointing towards the valve plate.

As a result of this nozzle-shaped gap 19 the medium flowing therethrough during the suction stroke of the compressor meets with no resistance to its flow worthy of mention and its pressure is thus not decreased. Medium flowing back from the valve plate, on the other hand, is effectively throttled by the eddies arising at the edges of parts 17 and 18.

In Fig. 2 the suction valve is shown with its movable parts in a position of rest. The valve plate 1 closes at the beginning of the pressure stroke and compression begins in the compressor at *a* in Fig. 4.

In Fig. 3 the spring plate 12 has been lowered so far by screwing down handwheel 13 that the force of spring 11 exceeds that of spring 9 and the rods 5 press down valve plate 1. During the compression stroke the medium to be compressed is forced back out of the compressor cylinder through the open suction valve and flows through the nozzle gap 19. As a result of the throttling of the return flow in gap 19, the pressure in the space 20 increases continually until the plate 17 subjected to this pressure overcomes the excess force of spring 11 over spring 9 and presses the hub 8 of the valve-plate actuating member against shoulder 10.

The rods 5 then free the valve plate 1, which thereupon presses against the seat 3 and closes the cylinder during the compression stroke at one of the points *b*, *c* or *d* (Fig. 4) after which compression begins in the compressor. As a result of the increase in pressure during compression, the valve plate 1 remains closed, as the excess force of spring 11 is no longer sufficient to keep the valve open.

In Fig. 5 the suction valve has a plate 21 attached to the wall 15 of the valve casing, independently of the control device. The valve-plate actuating member has a lower spring plate 22 which surrounds bolt 7 in the form of a kind of cap and carries the rods 23. The flared shape of the inner edge of member 21 results in a throttling of the return flow in gap 24 and causes in space 20 an increase of pressure which loads the spring plate 22 and overcomes the force of spring 11, so that valve plate 1 is released and can press against the seat 3.

The gaps 16, 19 or 24 may be chosen as desired, which provides a means of producing considerable return-motion forces and nevertheless allows the output losses during the suction stroke to be reduced to a minimum by suitable shaping.

I claim:

1. Suction valve for regulating the delivery of reciprocating compressors which comprises an exterior housing, a valve casing mounted in the housing with a space between the housing and the casing for the flow of gas, a valve seat arranged transversely across the valve casing, passages in the valve seat, a valve plate with resilient closing means pressing the valve plate against the valve seat, a valve-plate actuating member slidably supported within the casing, spring means opposing the movement of the valve-plate actuating member in both directions from a certain position, means on the valve-plate actuating member for moving the valve plate away from its seat to open the passages in the valve seat for the flow of gases therethrough in one direction, means for adjusting the springs opposing the movement of the valve-plate actuating member to cause it to respond to different gas pressures, and means providing a restricted gap between the valve-plate actuating member and the valve casing for the flow of gas therethrough in the opposite direction.

2. A suction valve according to claim 1 wherein the gap is of nozzle-shaped construction between the valve-plate actuating member and the casing, whereby the gas flowing therethrough in said opposite direction meets little resistance whereas the gas flowing in the first mentioned direction creates eddies and is throttled.

3. A suction valve according to claim 1 wherein the valve-plate actuating member includes a plate with the peripheral edge turned down to form with the casing a gap of a nozzle-shaped construction.

4. A suction valve according to claim 1 which comprises rigid guide means connected to the valve seat on which the valve-plate actuating member is slidably supported.

5. A suction valve according to claim 1 in which the valve-plate actuating member includes a laterally projecting plate slightly spaced from the casing whereby said gap is in the form of an annular passage.

6. A suction valve according to claim 1 in which the valve seat has a plurality of holes therethrough and the valve-plate actuating member has a plurality of rods slidable in the holes for engaging the valve plate to open the valve.

7. A suction valve according to claim 1 in which the casing has a plate attached thereto which has an inner edge slightly spaced from the valve-plate actuating member whereby said gap is in the form of an annular passage.

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