No. 620,936. Patented Mar. 14, 1899.

L. G. KUNZER.

VALVE MECHANISM FOR GAS COMPRESSING MACHINES.

(Application filed Sept. 29, 1898.)

(No Model.)

Fig. 1.

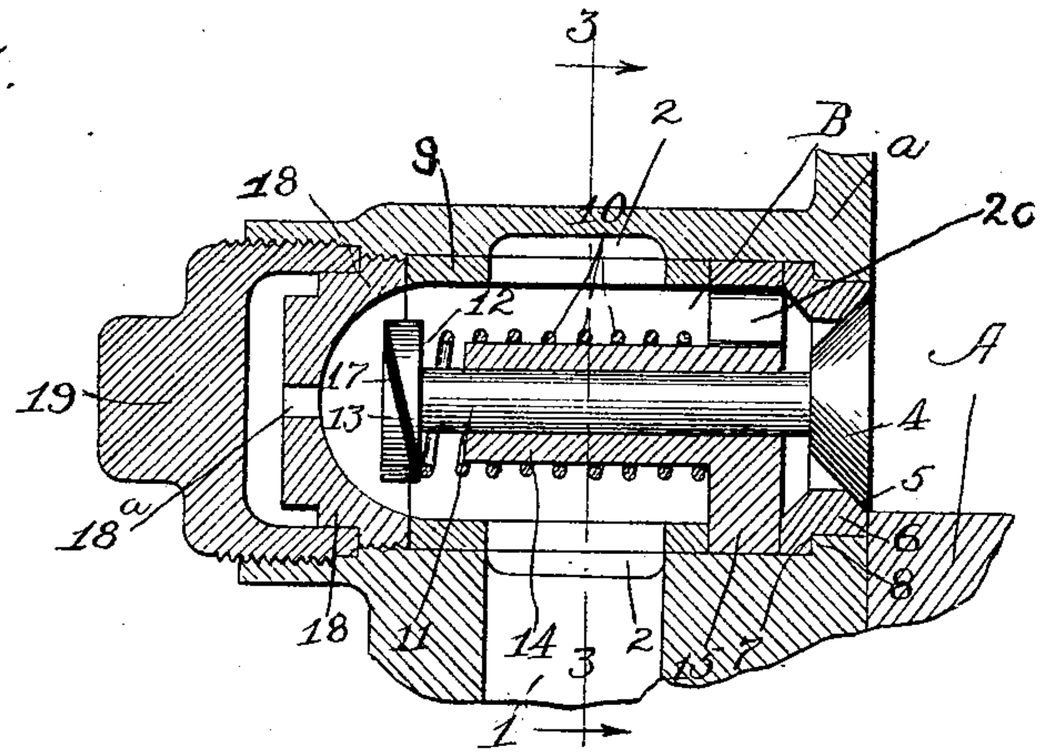


Fig. 2

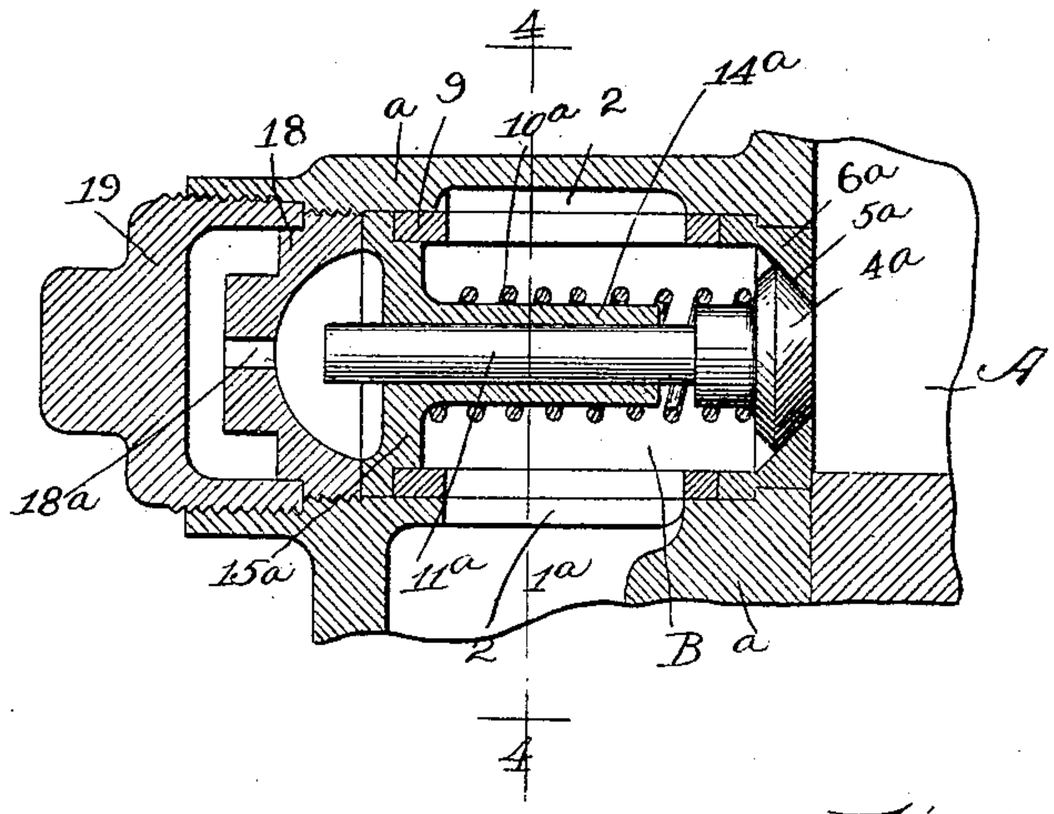


Fig. 4.

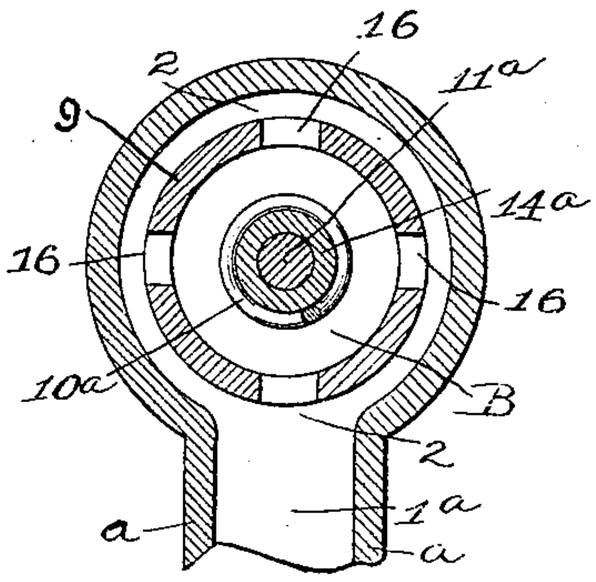
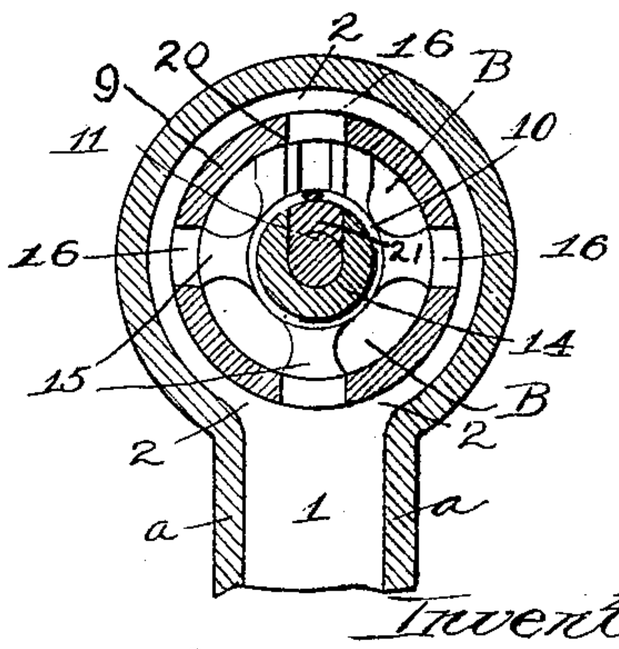


Fig. 3.



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VALVE MECHANISM FOR GAS-COMPRESSING MACHINES.

SPECIFICATION forming part of Letters Patent No. 620,936, dated March 14, 1899.

Application filed September 29, 1898. Serial No. 692,172. (No model.)

To all whom it may concern:

Be it known that I, LOUIS G. KUNZER, a citizen of the United States of America, and a resident of Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Valve Mechanism for Gas-Compressing Machines, of which the following is a specification.

My invention relates to valve mechanism for gas-compressing machines—that is to say, to valve devices by which the gas, such as ammonia or the like, is permitted to pass properly into and out of the compression-cylinder or like chamber of a gas-compressing machine.

Prominent objects of my invention are to provide a simple, efficient, and inexpensive valve mechanism; to reduce to a minimum its number of parts or elements; to avoid all possibility of any of its parts falling or dropping or being drawn into the compression-chamber and so interfering with the proper operation of the machine or even causing its breakage or injury; to permit the easy and quick withdrawal of the different parts of the mechanism for the purpose of inspection, repair, or replacement, and to render practically impossible the injury, breakage, or disarrangement of these parts by the handling or treatment of them by persons unskilled in the manner of properly treating machinery.

To the attainment of the foregoing and other desirable ends, my invention contemplates matters hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a longitudinal sectional view of an inlet or suction valve forming a part of a valve mechanism embodying my invention. Fig. 2 is a similar view of an outlet or exhaust valve; and Figs. 3 and 4 are cross-sections taken, respectively, on lines 3 3 in Fig. 1 and 4 4 in Fig. 2.

I have shown both the suction or inlet and the discharge or outlet valve devices comprising my improved valve mechanism arranged within valve-chambers B B formed in the head *a* of a cylinder A, which is assumed to form a part of any suitable or well-known form of gas-compressor. It will of course be understood, however, that the valve-chambers B B can be formed in any other part of the casing which provides the compression-chamber, if so desired.

The gas, such as ammonia or the like, is admitted to the cylinder A in the case of the inlet or suction valve, Figs. 1 and 3, and discharged therefrom in the case of the outlet or discharge valve, Figs. 2 and 4, by way of suitable inlet and outlet ports 1 and 1^a, respectively, which ports are likewise formed in the cylinder-head *a*. These ports 1 and 1^a desirably terminate, respectively, in annular chambers 2 2, which surround the valve-chambers B B, and so permit the gas to enter and leave the latter from all sides.

In the inlet or suction valve, Figs. 1 and 3, the admission of the gas from the valve-chamber B to the interior of the cylinder A is controlled by a reciprocating valve 4, which is arranged to lift forwardly—that is to say, inwardly into or toward the cylinder, so as to afford an opening into the latter. The form of valve shown is a conically-shaped disk valve, which tapers rearwardly—that is to say, in a direction away from the cylinder. Of course any other style of valve could be used, if desired.

The valve 4 seats upon an annular valve-seat 5, which is rearwardly beveled or inclined in correspondence with the inclination of the valve 4.

The valve-seat 5 is desirably provided by a collar 6, whose forward edge or end portion is beveled or tapered in the manner necessary to form the valve-seat. This collar 6 is made bodily removable from the valve-chamber B in a rearward direction—that is to say, in a direction away from the cylinder—so as to permit its easy and quick removal therefrom, and therefore the quick and easy complete removal or withdrawal of the valve 4 bodily from the valve-chamber, without inconvenience and without detaching the cylinder-head *a* or otherwise dismembering the machine.

The collar 6 is prevented from falling or working into the cylinder by a forwardly-facing shoulder 7, formed on its outer periphery and adapted to coöperate with a corresponding rearwardly-facing shoulder 8, formed on the cylinder-head *a*.

The valve 4 is automatically returned to its seat 5 by a compression coil-spring 10, which is arranged to act rearwardly against an abutment, such as the cylindrical head 13, on the valve stem or spindle 11. The cylindrical head 13 is undetachably secured to the valve

stem or spindle 11, in which way it is absolutely prevented from becoming loose relatively thereto or becoming detached therefrom, and thereby allowing the valve and spindle to work away from the influence of the spring 10. As a result the valve 4 is prevented from working or being drawn forwardly and into the cylinder, and thereby interfering with the correct operation of the machine or breaking or injuring the same.

The cylindrical head 13 can be secured undetachably to the rear end of the valve-spindle 11 in any desired way—as, for example, making it integral therewith, which is the preferred way. In this way the valve 4, spindle 11, and head 13 can be easily and inexpensively made by turning them out of a single piece of metal and by then properly tempering the structure so made.

The valve spindle or stem 11 is made relatively long, so as to afford ample accommodation for the coil-spring 10 between the integrally-formed valve 4 and head 13 at its opposite ends. It is confined within a sleeve 14, which is positioned centrally in the valve-chamber in the rear of the collar 6 and within the coil-spring 10. This sleeve 14 desirably incloses substantially the entire length of the valve-spindle 11, except so much as is necessary to allow the proper reciprocation of the valve. In this way it affords a guide or bearing for the spindle sufficiently long to assure the proper reciprocation and seating of the valve, while at the same time its rear end serves as an abutment or stop for engaging the valve-stem head 13 to limit the extent of forward movement on the part of the valve and also to absolutely prevent the same from falling or being drawn into the compression-cylinder to the great damage of the machine should the spring 10 become broken or otherwise inoperative.

The forward end of the sleeve 14 is constructed with a plurality of lateral projections 15 15, which serve as an abutment for the forward end of the compression-spring 10, as shown in Fig. 1. One of these projections 15 is provided with a slot or aperture 20 to engage the end of wire forming the spring. These projections 15 15 are extended outwardly to walls of the valve-chamber and have their outer edges rounded, as shown in Fig. 3, so as to fit closely therein. In this way they serve as well to hold the body portion of the sleeve centrally positioned in the valve-chamber and also to hold the collar 6 against rearward displacement.

It will be readily seen that the spindle-inclosing sleeve 14 could have its forward end provided with a solid flange or like device instead and for the purpose of the projections 15 15; but the latter are preferred, principally for the reason that they are lighter and provide passages in which the gas can pass forwardly to the valve. This sleeve 14 is split longitudinally, so as to permit of its being placed over and taken off the valve-stem between the undetachably secured valve and head thereof. As a preferred way a longitudinal portion 21 of it having a width at least equal to the diameter of the spindle is made separate and removable from the main body portion, as best shown in Fig. 3. By splitting the sleeve in this way its efficiency as a guide for the spindle is not impaired.

It will be observed that in order to have the head 13 on the valve-stem 11 available as an abutment for the spring 10 the latter, and therefore the sleeve 14, about which the spring is coiled, must be smaller in diameter than the head 13. So in order to permit the spring to be readily placed over the sleeve 14 the head 13 is provided with a groove 17, through which the wire forming the spring can be threaded.

The valve and the other aforesaid associated parts could be held in position in the valve-chamber by any suitable or desired means. I prefer, however, to so hold them by the means illustrated in the drawings, which devices I consider matters of further and specific improvement. The means illustrated involves a sleeve or cage 9, which is arranged in the valve-chamber B, outside of the sleeve 14, and has its forward end positioned against the rear faces of the projections 15 15 on the latter. In order to permit the passage of gas from the port 1 into the valve-chamber B, the cage 9 is provided with suitable perforations, such as the longitudinal slots 16 16, Fig. 3. Such means also involves an exteriorly-threaded nut 18, which is arranged to screw into and out of the valve-chamber B, and which when so screwed thereinto fits against the rear end of the cage 9. It is provided with a central aperture 18^a for the insertion of a wrench. The means illustrated further involves an exteriorly-threaded plug 19, which is likewise arranged to screw into and out of the rear end of the valve-chamber, and when so screwed thereinto to in turn hold the threaded nut 18 in position and also seal or close the valve-chamber against leakage of gas.

When it is desired to remove the suction-valve device, the plug 19 and the nut 18 are unscrewed from the valve-chamber. Then the remainder of the parts are withdrawn by simply taking hold of the spindle-head 13 and withdrawing the spindle 11, it being seen that the spring 10, by inclosing the split sleeve 14, holds the split portion thereof in position upon the spindle 11, and also that the valve 4, when drawn rearwardly by the withdrawal of the spindle 11, forces before it the collar 6 and the split sleeve 14, which collar 6 and the projections 15 15 of the sleeve are held firmly in position against it by the spring 10, while at the same time the projections 15 15 on the sleeve 14 in their withdrawal force before them the cage 9.

In the outlet or discharge valve device, Figs. 2 and 4, the valve 4^a is also conical, but it is beveled or tapered forwardly, in which

way it can open or lift rearwardly and so allow the passage of the gas outwardly from the cylinder. The valve-seat 5^a for the valve 4^a is provided by a correspondingly forwardly tapered or inclined annular surface on a collar 6^a, which is constructed and arranged similarly to the collar 6 of the inlet-valve device and is held in place by a slotted sleeve or cage 9.

The valve 4^a is automatically returned to its seat by a compression coil-spring 10^a, whose forward end acts in a forwardly direction upon the rear face of the valve.

The spring 10^a incloses the main body portion of a sleeve 14^a, which is disposed within the cage 9 in position similar to that of the inner sleeve 14 of the inlet-valve device and which in turn incloses and forms a long bearing or guide for the valve spindle or stem 11^a. The rear end of the spring 10^a acts against an abutment 12^a, provided by an outwardly-extending flange 15^a, formed at the rear end of the inner sleeve 14^a. The outermost portion of this flange 15^a is formed so as to provide an abutment for holding the cage 9 in position.

The aforesaid parts are shown held in position in the valve-chamber by a nut 18 and plug 19, similar to those employed in the suction or inlet valve device. When it is desired to remove this outlet or discharge valve from its chamber, the plug 19 and nut 18 are first withdrawn, after which the remaining parts can be easily and quickly extracted.

It will be seen that the two valve devices herein shown as comprising my valve mechanism involve in common a long sleeve which provides a long guide or bearing for the valve-spindle and which has one of its ends provided with a lateral flange or the like which extends outward to the walls of the valve-chamber and serves to hold the sleeve centrally positioned therein, a compression-spring having its ends acting against abutments provided, respectively, on the valve-stem and by the flange-like projection of the sleeve, and an independently-removable perforated cage which fits within the valve-chamber and against the flange-like projection of the sleeve.

In view of the foregoing it will be readily seen that the aforesaid valve devices are simple, effective, and practical; that they involve the minimum number of parts consistent with efficient operation; that these parts can be easily and inexpensively constructed and quickly and expeditiously repaired and replaced, and that they can be bodily removed from the valve-chamber without inconvenience or loss of time and without dismembering the machine.

What I claim as my invention is—

1. In an inlet-valve device adapted for use within a valve-chamber having its inlet-port situated between its ends, the combination of a valve having its spindle provided with an undetachably-secured head; a removable collar providing a seat for the valve; a separately-removable perforated cage adapted for arrangement within the valve-chamber in such position that its perforations can provide a passage-way from the inlet-port into its interior; a longitudinally-split sleeve inclosing the valve-spindle and having its forward end provided with an outwardly-extending flange-like portion which fits between the collar providing the valve-seat and the perforated cage, and is constructed with passages affording an outlet for the gas from the latter.

2. In an inlet-valve device, the combination of the inlet-valve, a split bearing supporting and confining the valve-spindle, a coil-spring surrounding the bearing, and a head secured undetachably to the spindle, said head being larger than the coil-spring so as to act as an abutment for the same, and being provided with a circumferential groove adapted to allow the spring to be threaded over the head.

3. An inlet-valve device comprising a valve having its spindle provided with an undetachably-secured head, which is in turn provided with a thread-like circumferential groove; a removable collar providing a seat for the valve; a separately-removable perforated cage having its middle portion provided with longitudinal slots; a bearing-sleeve inclosing the valve-spindle and constructed with a removable longitudinal section having as its width substantially the diameter of the valve-spindle; radially-extending projections formed at the forward end of the bearing-sleeve, and adapted to fit between the collar providing the valve-seat and the slotted cage; a coil-spring surrounding the longitudinally-split bearing-sleeve and having a diameter less than that of the valve-spindle head so as to permit of its acting against the latter; a screw-threaded nut adapted to fit against the rear end of the slotted cage; and a screw-threaded plug adapted to fit against the threaded nut; substantially as described.

4. An outlet-valve device comprising a valve; a removable collar providing a seat therefor; a separately-removable perforated cage adapted to fit against the removable collar; a bearing-sleeve arranged within the perforated cage and confining the valve-spindle; a flange formed on the rear end of the bearing-sleeve and adapted to fit in the rear of the perforated cage; a coil-spring surrounding the bearing-sleeve and having its forward end acting on the valve and its rear end against the flange on the sleeve; a threaded nut adapted to fit against the flange on the bearing-sleeve; and a threaded plug adapted to fit against the threaded nut; substantially as described.

Signed by me, at Chicago, Illinois, this 22d day of September, 1898.

LOUIS G. KUNZER.

Witnesses:
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A. MILLER BELFIELD.