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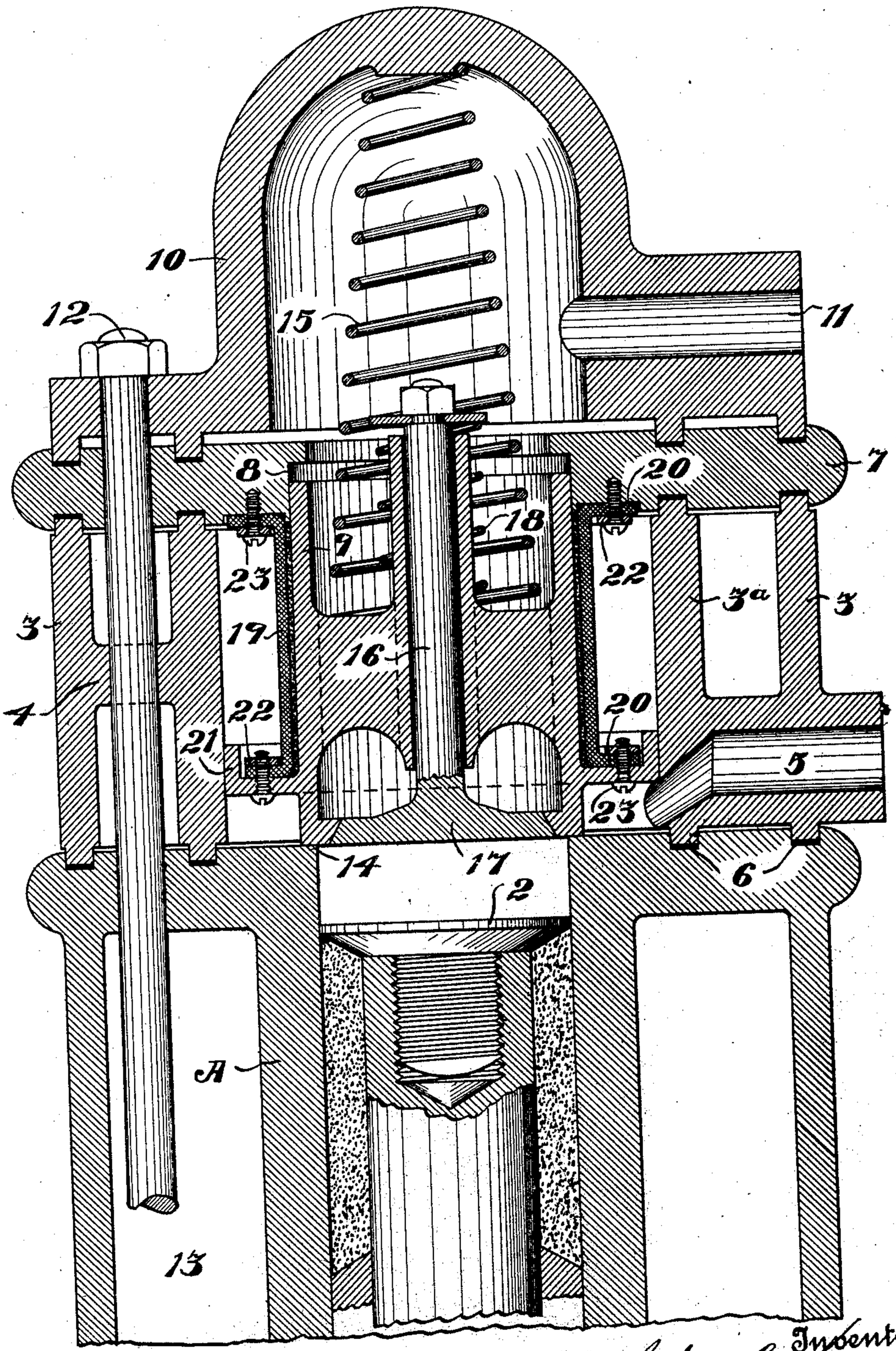
J. C. KITTON.

ELASTIC FLUID COMPRESSOR VALVE.

APPLICATION FILED SEPT. 30, 1903.

NO MODEL.



Witnesses,
L. Dorsee
Dudley Moss.

Inventor,
John C. Kitton
By Geo. H. Strong. Atty.

No. 765,363. Patented July 19, 1904.

UNITED STATES PATENT OFFICE.

JOHN C. KITTON, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO EDWARD B. BLOOD, OF SAN FRANCISCO, CALIFORNIA.

ELASTIC-FLUID-COMPRESSOR VALVE.

SPECIFICATION forming part of Letters Patent No. 765,363, dated July 19, 1904.

Application filed September 30, 1903. Serial No. 175,167. (No model.)

To all whom it may concern:

Be it known that I, JOHN C. KITTON, a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Elastic-Fluid-Compressor Valves, of which the following is a specification.

My invention relates to improvements in valves, especially of that class designed for the compression of elastic fluids, such as air, ammonia, or other gases.

It consists in the construction of the suction-valve, having its seat on the inner end of the discharge-valve, both valves being of very large diameter, so that very small lift of either is necessary.

It also comprises a means for preventing leakage on the return of the fluid from the pressure to the inlet side by the use of an elastic foldable cylindrical sleeve surrounding the valve and so constructed that while the receiver-pressure acts against the exterior of the sleeve it is prevented from passing through or beyond it.

My invention also comprises details of construction which will be more fully explained by reference to the accompanying drawings, in which the figure is a vertical central section of my invention.

In the construction of compressing devices for elastic fluids in which a piston or plunger reciprocates within the cylinder and in which inlet and outlet valves are provided considerable difficulty is experienced in so arranging these valves as to provide a large inlet and discharge, and thus reduce the necessary lift of the valves. It is also difficult to prevent what is known as the "slip" of the gas—that is, the rushing of the compressed gas or fluid back into the cylinder on the suction-stroke and before the discharge-valve closes.

It is the object of my invention to so construct my valves that there will be little or no back discharge and to provide a device by which there can be no passage of the compressed gas to the inlet side of the apparatus.

As shown in the drawing, A is the cylinder, within which a plunger or piston 2 is arranged to reciprocate. The cylinder as here shown is in a vertical position, and on the top of this cylinder is fitted an annular head 3, this head having also an internally concentric portion 3^a connected with it by radial arms or lugs, as at 4, so that a considerable open space is provided between the outer and inner members of this head. Through one side of the head is a discharge-passage 5, extending from the interior of the inner portion through the outer portion, and this is adapted to be connected with any suitable receiver or conductor. (Not here shown.) The lower edges of the sleeves 3 and 3^a are turned and fitted into grooved channels in the upper end of the cylinder, as shown at 6, and the upper edges are correspondingly fitted into the lower surface of the plate of the disk 7, which carries an internal central cylinder 8, within which the discharge-valve 9 is fitted to reciprocate. Upon the top of the disk 7 is fitted the cap 10, through which is formed the inlet-opening 11, and this cap has flanges fitting in grooves in the top of the disk 7 in a manner similar to that shown at 6 and previously described. Bolts 12 are passed through the space between the sleeves 3 and 3^a and down into the cylinder water-jacket 13, and by means of these bolts and nuts upon the upper end the parts are all removably secured together, it being easy to dismount the whole upper portion of the apparatus by simply removing the nuts on the upper ends of the bolts.

The valve 9 seats upon a shoulder 14 at the top of the cylinder and is slidable within the barrel 8, previously described, so that it has a diameter equal to the full diameter of the cylinder A. This valve is normally closed upon its seat by a spring 15 of any required tension. Through a central sleeve of the valve 9 extends the valve-stem 16 of the inlet-valve 17. This valve is seated against the bottom of the valve 9 and is normally retained closed by a spiral spring 18. The operation of this portion of the apparatus will then be as follows: When the piston or plunger 2 is drawn downward, a vacuum is formed in the upper part of the cylinder, and the pressure of the

gas or fluid entering through the passage 11 and passing down through the open spaces within the valve 9 will force the inlet-valve 17 open. This valve having approximately a diameter equal to the interior diameter of the cylinder will allow the latter to be rapidly filled with but small opening or clearance of the valve. As soon as the suction-stroke is ended this valve immediately closes, and the upward movement of the piston 2 compresses the elastic fluid between itself and the bottom of the two valves 9 and 17. It will be seen that the lower faces of these valves are in the same plane, forming a practically level surface, and the upper end of the piston corresponds therewith. When the compression in the cylinder is sufficient to overcome the back pressure in the receiver or conductors connected with the passage 5, both valves 9 and 17 will be forced upwardly, the valve 9 lifting from its seat 14, so as to leave the whole diameter of the cylinder for the discharge of the gas into the annular surrounding space, from which it escapes into the passage 5. The flat surface of the piston 2 will then fit closely against the bottom of the two valves, and no gas will remain to be expanded upon the return movement of the piston. As the valve 9 is lifted from its seat and the piston 2 is in contact with it, when the piston 2 again moves down the valve will follow it until it is seated before the piston begins to move out of contact with the valve. Thus all back movement of the compressed gas will be prevented.

In order to prevent any leakage or passage of the compressed fluid into the inlet-chamber around the valve 9, I have shown a sleeve 19, formed of elastic and foldable material, this sleeve having flanges, as shown at 20, at both top and bottom. These flanges fit against the lower side of the disk 7 and around the chamber 8, in which the valve 9 moves, and also against the annular piston portion 21 at the bottom of the valve, which moves and fits within the sleeve 3^a. These flanges are secured in place by annular rings or washers 22 and screws or bolts 23. Interior to this elastic sleeve 19 is a filling of finely-pulverized graphite which prevents any sticking of the parts and allows a considerable freedom of motion of this sleeve 19 by reason of its length and comparative thinness. Thus when the discharge-valve is opened this sleeve 19 will fold or compress in the direction of its length sufficiently to allow the valve to open and the discharge to take place; but the discharge-pressure which will leak in around the moving joints of the valve will be arrested by this flanged sleeve and prevented from passing through into the inlet. I am thus enabled to maintain a perfectly-tight joint and at the same to provide the largest possible valve-openings for the inlet and discharge of the gas or elastic fluid.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination in an elastic-fluid compressor of a vertically-disposed cylinder, a piston reciprocable therein, a head fitting the cylinder and provided with concentric sleeves spaced from each other, a disk fitting the end of the head and provided with a central chamber, a discharge-valve having one end adapted to reciprocate in the chamber of the disk and having an annular piston portion at its opposite end fitted to reciprocate in contact with the inner wall of the inner sleeve of the head, a cap surmounting the disk, bolts passing through the cap-disk and head and uniting them to the cylinder, an inlet-valve having a stem passing centrally through the discharge-valve and disposed axially in line with the piston, and closing against the end of the discharge-valve, independent springs for closing the valves in opposite directions, and a flexible and folding sleeve circumscribing the discharge-valve and forming an air-tight joint around said valve, said head having a discharge for the compressed fluid.

2. In a discharge-valve for elastic-fluid compressors, the combination with a compression-cylinder and a piston reciprocable therein, of an annular head seated upon the end of the cylinder and provided with an inner spaced sleeve; a disk fitting upon the head; a cap fitting upon the disk, said disk and the outer end of the cylinder provided with annular grooves adapted to receive correspondingly-formed portions on the head and cap; bolts passing through the cap and disk and the space between head and the inner sleeve thereof, said bolts extending into the water-space of the compression-cylinder; a discharge-valve mounted within the head and disk and having a diameter equal to the inner diameter of the cylinder, and having a valve-seat in its inner face, an inlet-valve slidable in the discharge-valve and seating against the seat thereof, and having a diameter substantially equal to the inner diameter of the cylinder, the faces of the valves being flush and the face of the piston being flat and parallel with the faces of the valves, said valves movable together during the opening and closing of the discharge-valve and the inlet-valve remaining closed until the discharge-valve has fully seated and the piston begins to move away from the valves; a sleeve of elastic foldable material closely surrouding the discharge-valve, having one end secured thereto and the opposite end fixed to a stationary part; and springs for seating the valves, said cap having an inlet-passage and said head having a passage for the compressed fluid.

3. The combination in an elastic-fluid compressor of a vertically-disposed cylinder and piston movable therein, a removable head hav-

ing an inner concentric sleeve, a discharge-valve fitted and slidable in said head, a seat upon the upper end of the cylinder against which said valve is closable, an inlet-valve concentric with the discharge-valve, a seat in the bottom of the discharge-valve against which the inlet-valve closes, an elastic sleeve inclosing the discharge-valve having flanges at top and bottom and bolts whereby said flanges are secured, and a filling of graphite or the like between the periphery of the discharge-valve and the interior of said sleeve.

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

JOHN C. KITTON.

Witnesses:
HENRY C. DROGER,
JAMES L. KING.