

UNITED STATES PATENT OFFICE.

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AMMONIA COMPRESSOR.

Application filed March 16, 1925. Serial No. 15,877.

This invention relates to ammonia compressors, and particularly to the valve construction therefor, in which all intake valves are eliminated and the exhaust valves simplified as to the number of elements, accessibility for repair replacement or regrinding.

In addition to these features, is the provision of a construction in which the clearance between the piston and the cylinder head, when the piston is at its extreme limit of upward movement, is reduced to a minimum. While the machine as shown by the present drawings is of the single cylinder type, it is understood that any number of cylinders may be employed and made of any suitable size.

Referring to the drawings forming a part of this specification,

Figure 1 is a vertical cross-section through the compressor,

Figure 2 is a top plan view of the valve retaining and guiding, and spring housing block,

Figure 3 is a section taken on the line 3-3 of Figure 2,

Figure 4 is a top plan view of the spring retaining plate,

Figure 5 is a section taken on the line 5-5 of Figure 4,

Figure 6 is a top plan view of the valve plate,

Figure 7 is a section taken on the line 7-7 of Figure 6.

Figure 8 is a top plan view of the assembled valve removed from the compressor, and

Figure 9 is a section taken on the line 9-9 of Fig. 8.

Referring now more particularly to the accompanying drawings by numerals of reference, and especially to Figure 1, wherein is shown the upper portion of the compressor, 1 designating the cylinder having a water jacket 2.

The piston 3 has the usual upper and lower series of packing rings 4 and 5. The cylinder is also provided with a removable head 5', secured by a suitable number of bolts 6, and further provided with a gas exhaust port 7. The wall of the cylinder 1 is also provided with a gas inlet port 8, which is so arranged that it will be uncovered by the piston 3, when the latter is in its lowermost position, as shown in Figure 1, for the

purpose of admitting the ammonia or other compressible fluid.

The construction as above described is more or less conventional in design, except for those differences which are necessary to adapt the machine to my particular valve arrangement.

The feature upon which the present invention is based, is the particular construction and arrangement of the valve or valves which control the exhaust gases compressed in the compression space of the cylinder, the details of which are more clearly illustrated in the several Figures 2 to 9 inclusive, while the general assembly is shown in Figure 1.

Specifically, the valve structure includes primary or main valves and a secondary or relief valve, the principle of operation being that the primary valves are brought into operation under normal operating conditions, while the secondary or relief valve comes into operation under abnormal conditions or pressures within the compressor. The upper portion of the inner wall of the cylinder 1 is formed with an annular flange 10, having a plane ground upper face providing a seat for a disk-like valve plate 11, shown in detail in Figures 7 and 9, said valve plate being provided with an annular series of lugs 12, for the purpose of properly centering it with relation to the removable head 5, and at the same time providing alternate recessed portions 14 to permit of the passage of the compressed fluids when said plate is caused to rise from its seat formed by the upper face of the annular flange 10.

Under normal operating conditions, this valve plate is held to its seat by a heavy coil spring 15, confined between the upper face of the valve plate 11 and the lower inner face of the head 5. This plate, which has a plane ground upper face, is provided with an annular series of groups of exhaust openings 16, arranged around a central bolt-receiving opening 17, in which is mounted, and through which passes a bolt 18, on the upper threaded end of which is secured a valve spring confining disk plate 19, shown in detail in Figures 4 and 5, the lower face of which is provided with a central hub receiving recess 20, and an annular series of spring centering bosses 21, the purpose of which will be later set forth.

Mounted upon the valve plate 11, and con-

centric therewith, is a valve spring and valve disk guide block 22, the hub 23 of which is bored to receive the retaining bolt 18, while the upper portion is formed as a circular boss or extension 24, adapted to seat within the hub receiving recess 20 of the disk plate 19. A nut 25 on the upper end of the bolt 12, binds the plates 19 and 11, and guide block 22 in assembled relation.

- 10 The guide block 22 is provided with an annular series (in the present arrangement, four being shown) of vertically disposed, transverse circular spring housing and guiding recesses 26, which preferably open at the periphery of said block as at 27, said block confining and housing the group of coil compression springs 28 of the proper strength to hold to their seats, a series of exhaust valve disks 29, each of which cooperates with one group of exhaust openings in the plate 11, and being of an area sufficient to entirely cover the group with which it cooperates, and each disk valve being guided in its reciprocatory movements by the wall of the circular recess in which it is disposed. Each of the disk valves 29 is provided with a central circular boss 30 upon its upper face, which, with the cooperating upper boss 21 on the lower face of the upper disk plate 19, properly centers the respective valve seating spring 28.

Operation.

- Assuming, with reference to Figure 1, that the piston 3 has descended, having produced a vacuum or sub-atmospheric pressure in the compression space above the piston, gas inlet port 8 is uncovered, permitting an inflow of gas into said space 9. The piston on its return or upward stroke, will initially seal the port 8, and the gases trapped within the space 9 will be compressed until the pressure overcomes that of the springs 28 of the exhaust valves 29, which latter will rise from their seats on the valve plate 11, permitting the gases to escape through the openings 16, and through the exhaust port 7. When the piston has reached its limit of upward travel, the valves 29 will close under the influence of their respective springs, the piston returning on its downward stroke to its position shown in Figure 1, uncovering the gas inlet port 8 for another charge of gas, and the cycle of operation is repeated. In the event that the compression chamber 9 should receive a full charge of liquid ammonia, at the beginning of the compression stroke, the pressure against the valve assembly shown as a unit in Figure 9, would compress the large heavy spring 15, causing the said valve assembly as a unit to rise from its seat 10, permitting the liquid to pass through the exhaust port 7, in addition to the liquid which would pass through the grouped valve openings 16.

Having described my invention, what I claim as new and desire to protect by Letter Patent is:

1. A compound compressor valve of the class set forth, comprising a valve plate having a ground upper valve seating face, and provided with a series of groups of openings concentric with the axis thereof, a block mounted on said valve plate, and provided with an annular series of openings, a spring retaining disk secured upon the upper portion of said block and provided with an annular series of spring centering bosses, compression springs within the openings in said block, and a series of valve disks within said openings in said block, each of said valve disks cooperating with a group of the annular series of openings in the valve plate, and yieldingly held to its seat by its respective compression spring.

2. A compressor valve assembly comprising a valve plate having an annular series of groups of exhaust openings, a block mounted upon said plate and provided with a series of vertically transverse spring receiving openings, a spring compression plate secured upon the upper portion of the said block and provided on its lower face with a plurality of spring centering bosses, valve disks arranged within the openings in the block, and respectively cooperating with a group of the series of exhaust openings, and each provided with a plane ground seating lower face, and with a central boss upon its upper face, coiled compression springs within said openings in said block and confined respectively between one of said bosses on said spring compression plate and a valve disk, and yieldingly maintaining the latter upon its seat.

3. A compressor valve assembly comprising a valve plate having a plane upper face and provided with a concentric series of groups of exhaust openings, a spring carrying block secured on said plate, the hub of said block having an upper central extension, a spring retaining plate carried by said block, and having upon its under face a centering recess within which is seated the hub extension, and an annular series of spring centering bosses arranged around the axis thereof, a series of valve disks, each cooperating with one of the series groups of exhaust openings in the valve plate and of an area sufficient to completely cover its respective group, and a series of compression coiled springs arranged respectively in the recesses in said block, confined between the spring retaining plate and the said valve disks, and centered at their upper ends by the respective centering bosses.

4. A compressor valve assembly comprising a valve plate having a plane upper face and provided with a series of exhaust valve openings, a combined valve guide and spring

retaining block mounted on said plate and provided with an annular series of recesses, a spring retaining plate on said block, a plurality of valve disks arranged respectively within and guided by said recesses, 5 alined spring centering bosses on said plate and valve disks respectively, and coiled compression springs within said recesses of said spring block and confined between the spring retaining plate and the said valve disks, and 10 normally urging the latter toward their seats on the valve plate.

In testimony whereof I affix my signature.

EARL B. TERRILL.