July 24, 1923. 1,462,519

P. R. ROTHE

HOLLOW STEM SUCTION VALVE

Filed Feb. 7, 1921

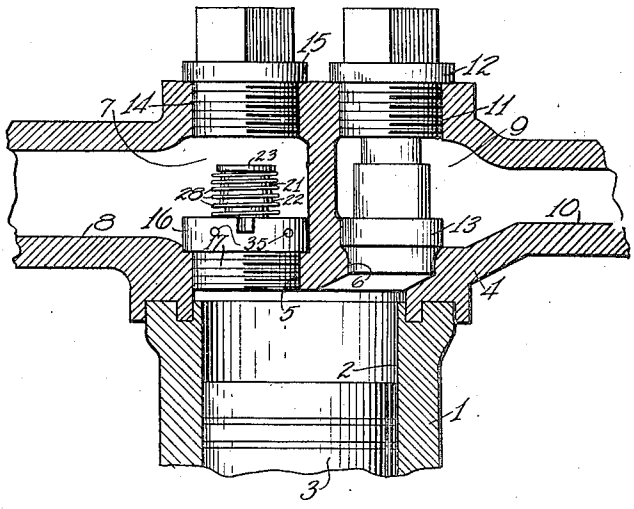


Fig. 1.

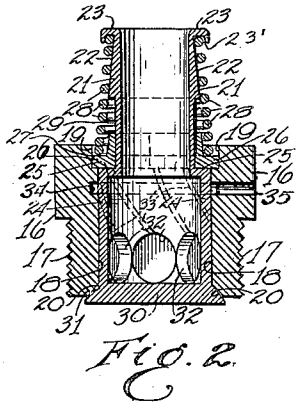


Fig. 2.

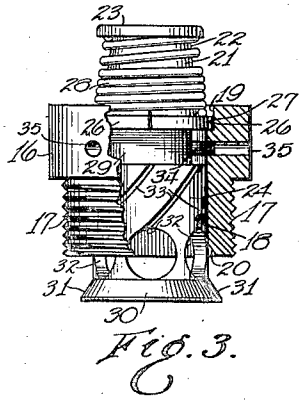


Fig. 3.

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PAUL R. ROTHE, OF CHICAGO, ILLINOIS.

HOLLOW-STEM SUCTION VALVE.

Application filed February 7, 1921. Serial No. 443,160.

To all whom it may concern:

Be it known that I, PAUL R. ROTHE, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Hollow-Stem Suction Valves, of which the following is a full, clear, and exact description.

My invention relates to improvements in hollow stem suction valves, and it consists in the combinations, constructions, and arrangements herein described and claimed:

An object of my invention is to provide a novel form of valve that is designed particularly for use in the inlet of apparatus for compressing elastic fluids, such as air, oxygen, nitrogen, ammonia, or other gases to a pressure up to 3000 lbs.

A further object of my invention is to provide a device of the type described having a hollow stem formed integral with a tubular valve provided with openings in its side walls, wherefore a comparatively great volume of the elastic fluid is permitted to pass through the valve casing when the valve is open.

A further object of my invention is to provide a device of the type described that is constructed to remain closed when the elastic fluid is being compressed and consequently permits no return of the gas through the inlet port.

A further object of my invention is to provide a device of the type described that is relatively simple in construction and operation, not likely to get out of order easily, and thoroughly practical commercially.

A further object of my invention is to provide a device of the type described that is self cleaning.

A further object of my invention is to provide a device of the type described provided with a valve having a relatively large surface contacting with a valve seat therein, wherefore the life of the device is prolonged beyond that of other valves used in like operations.

Other objects and advantages will appear in the following specification, and the novel features of the invention will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings, forming part of this application, in which

Figure 1 is a sectional view, partly in elevation, showing the use and application of the device,

Figure 2 is a vertical section through the device,

Figure 3 is a side elevation of the device, a portion of the casing being broken away and being shown in section.

In carrying out my invention, I make use of a cylinder 1 having a central bore 2 in which a piston 3 is arranged for reciprocation. The cylinder 1 in the drawings is positioned vertically. A head 4 is fitted on the upper end of the cylinder 1 and is formed with an inlet port 5 and an outlet port 6. The inlet port 5 is enlarged to provide a cavity 7 communicating with a passage 8 through which the elastic fluid passes to the cylinder. The outlet port 6 is enlarged to provide a cavity 9 communicating with the passage 10 through which the gases exhausted from the cylinder are forced. An outlet valve 13 that may be of any suitable construction is inserted through an opening 11 into the cavity 9 and is operatively positioned in the outlet port 6. A plug 12 is then placed in the threaded opening 11. A threaded opening 14 having a plug 15 provided therefor permits the installation of an inlet valve in the inlet port 5.

The parts described so far are ordinary in construction and form no part of my invention, except insofar as they cooperate with the parts about to be described. The inlet valve comprises a cylindrical casing 16 having a threaded reduced portion 17 adapted for engagement with the wall of the port 5 which is threaded for the reception thereof. The casing 16 is formed with a central bore 18 of relatively large diameter. The bore 18 is enlarged at 19 and beveled at 20, as shown. A tubular valve 24 is slidable in the bore 18 and is formed integrally with a hollow stem 21 that has a diameter slightly less than that of the tubular valve, thereby defining a shoulder 25. The stem 21 has its outer wall tapered adjacent the upper end thereof at 22, and is formed with an outwardly extending annular flange 23 at its upper edge.

The flange 23 is provided with an annular groove 23′ in its under surface for a purpose which will be hereinafter set forth. A collar 26 that, for convenience in adjusting the same, is split transversely into half portions is formed with a laterally

extending flange 27 at its lower end, and this laterally extending flange rests upon the shoulder 25, wherefore the inner wall of the collar 26 slidably engages the wall of a relatively wide annular channel 29 in the outer wall of the hollow stem 21. The extent of movement of the latter is determined by the distance between the upper wall of the channel 29 and the upper end wall of the collar 26, since further movement downwardly by the valve stem is prevented when the upper end wall of the channel 29 contacts with the upper end wall of the collar.

The tubular valve 24 has an integral valve disk 30 that forms a closure for the lower end thereof, and has its outer wall beveled at 31 to snugly fit the beveled portion 20 of the bore of the casing. The tubular valve 24 is also provided with a plurality of openings 32 through its side walls adjacent the lower end thereof.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. When the piston 3 is moved downwardly in the cylinder 1, a suction is created in the upper portion thereof, and the pressure of the elastic fluid against the valve disk 30 moves the tubular valve 24 downwardly until the portion thereof provided with the openings 32 projects beyond the casing 16 within the bore of the cylinder. Since the tubular valve 24 has a relatively large diameter, considering the diameter of the inlet port 5, a relatively great volume of the elastic fluid is permitted to pass very rapidly into the cylinder 1 when the valve is open. When the piston 3 is moved upwardly to compress the elastic fluid in the cylinder, the pressure of the latter in the passage 8 is overcome, and the tubular valve 24 is moved instantly into closing position, both on account of the thrust of a spring 28 that is disposed on the hollow stem between the flange 23 and the washer 26, and on account of the pressure of the compressed fluid within the cylinder against the surface of the valve disk 30. When the tubular valve 24 is moved upwardly against its seat, the surface of the valve disk 30 will be substantially flush with the inner wall of the header 4, wherefore the piston 3 may be moved to the full length of its upward stroke.

It will thus be observed that the movable tubular valve 24 has a relatively large surface bearing against its casing, and therefore no appreciable wear results from the continued operation of the device. The device provides effective means for the purpose intended and can be produced in large quantities with but few manufacturing operations being required, and therefore at a relatively low cost.

It is to be noted that the spring 28 is slightly tapered toward the upper end thereof, and that the same is mounted on the valve stem between the flange 23 and the flange 27. The upper end of the spring is seated within the groove 23′, and the lower portion of the spring loosely fits the collar 26, being thus spaced from the wall of the annular channel 29. On account of the tapered form of the spring and on account of the engagement of the same at its upper end with the groove 23′, it is positively maintained in operative position, without interfering with the slidable movement of the valve stem as hereinbefore described.

The device is self-cleaning, since the outer wall of the tubular valve 24 is provided with a plurality of spirally directed parallel grooves 33 in its outer wall between the openings 32 and the upper end thereof. These openings are in constant registration with an annular groove 34 in the inner wall of the casing 16, and a plurality of passages 35 extend radially from the annular groove 34 through the casing 16. The elastic fluid from the passage 8 passes into the annular groove 34 and into the parallel spiral grooves 33, and consequently any foreign matter lodging between the valve and its casing will be blown therefrom by the rush of the pressure fluid through such grooves when the valve is opened.

I claim:

1. A device of the character described comprising a valve casing having a plurality of radially extending openings through the side wall thereof, a tubular valve slidably disposed in said casing, a spring for normally elevating said valve in said casing to close the radial openings in said casing and to close the mouth of said casing, said valve being formed with a plurality of openings in its side wall and adapted to permit the passage of a fluid therethrough when said valve is forced downwardly against the action of said spring and the mouth of said casing opened.

2. A device of the character described comprising a valve casing, said casing being formed with a bore extending longitudinally therethrough and having its inner wall beveled at the inner edge thereof, a tubular valve slidably mounted in said bore and arranged for movement beyond the inner end of said casing, the inner end of the valve being closed and adapted to seat against the inner end of said casing, and means for yieldably maintaining said valve in an elevated position in said casing, said casing having a plurality of openings through the side walls thereof arranged to be closed by said valve when in an elevated position and to be opened when said valve is forced downwardly, said valve having passages for conducting a fluid from said openings in said casing out of the inner

end of said casing when said valve is forced downwardly.

3. A device of the character described comprising a valve casing, said casing being formed with a bore extending longitudinally therethrough and having its inner wall beveled at the inner edge thereof, a tubular valve slidably mounted in said bore and arranged for movement beyond the inner end of said casing, the inner end of the valve being closed and adapted to seat against the inner end of said casing, and means for yieldably maintaining said valve in an elevated position in said casing, said casing having a plurality of openings through the side walls thereof arranged to be closed by said valve when in an elevated position and to be opened when said valve is forced downwardly, said valve having grooves on the outer surface thereof adapted to convey a fluid from the said openings in said casing downwardly and out of the inner end of said casing when said valve is forced downwardly.

PAUL R. ROTHE.