Sept. 1, 1925. 1,551,697

M. F. RICHARDSON

SPRING FOR CHECKS AND VALVES

Filed Aug. 31, 1922

FIG. I.

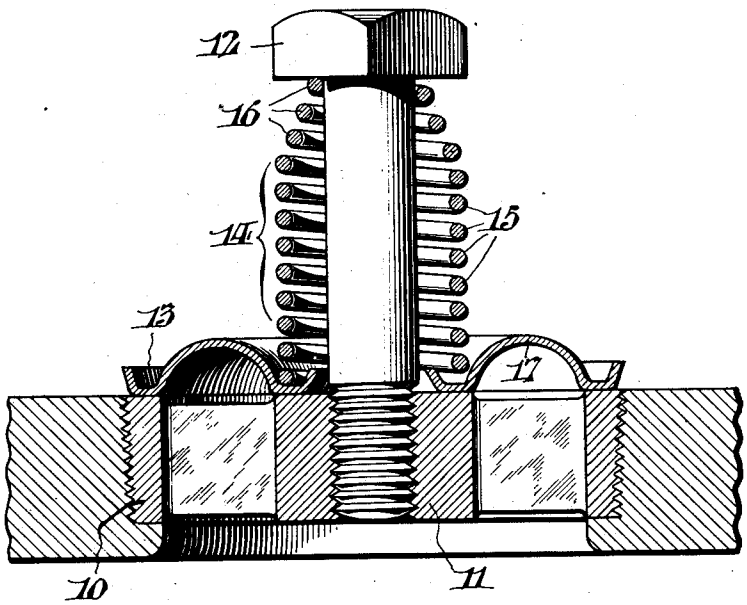
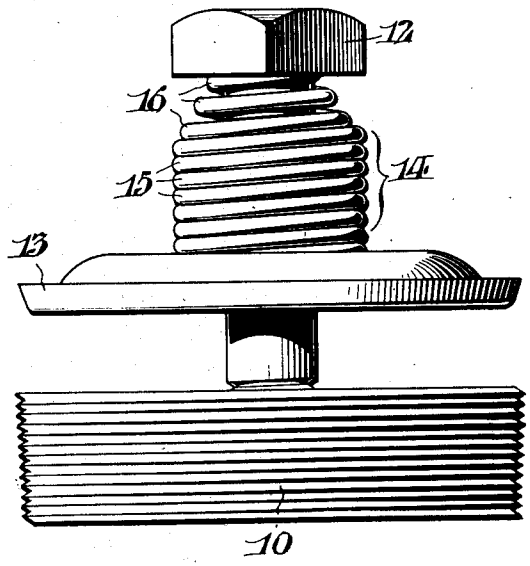


FIG. II.



WITNESSES:

John C. Bergner

Alfred E. Aschinger

INVENTOR:

Maurice F. Richardson,

BY Fraley & Faul

ATTORNEYS.

Patented Sept. 1, 1925. 1,551,697

UNITED STATES PATENT OFFICE.

MAURICE F. RICHARDSON, OF BERWYN, PENNSYLVANIA.

SPRING FOR CHECKS AND VALVES.

Application filed August 31, 1922. Serial No. 585,484.

To all whom it may concern:

Be it known that I, MAURICE F. RICHARDSON, a citizen of the United States, residing at Berwyn, county of Chester, and State of Pennsylvania, have invented certain new and useful Improvements in Springs for Checks and Valves, whereof the following is a specification, reference being had to the accompanying drawings.

This invention relates to automatic checks and valves, particularly those used in pumping machinery, and an object of the invention is to provide improvements in springs utilized to retain the valves on their seats, with a view to generally improving the performance of such springs and to accomplish certain new functions among which are the production of a cushioning effect manifested when the valve has been opened beyond its working limit so that any excess movement may be cushioned and retarded; to promote rapid and easy opening of the valve; to afford a positive stop to limit degree of opening of the valve, and to insure the greater durability of the spring against usage.

These and other objects are accomplished by what I now regard as the preferred embodiment of my invention from among other possible forms embraced within the spirit of the invention and the scope of the appended claims.

In the accompanying drawings, Fig. I, is a view in vertical section of a valve seat and valve illustrating the embodiment therein of my improved valve spring; and

Fig. II, is a view of the device shown in the preceding figure and illustrating the spring under partial compression.

With reference to the drawings 10 indicates a valve spider of the kind adapted to be inserted in the port of a water chest forming part of a power pump. The spider is formed with a central boss 11 from which a headed stud 12 extends, forming a guide for a disk valve 13 which may be of any desired or approved type or construction having a central aperture for the reception of the stud whereby the valve may be guided to its seat subsequent to each period of dislodgment in a manner which will be apparent to those familiar with the art to which this invention appertains. I have illustrated a pump valve as affording one adaption of the use of my improved spring, although the spring is capable of almost endless application, as will be presently apparent.

My improved spring indicated comprehensively by the numeral 14 comprises a single strand of wire wound to spiral formation defining a plurality of normally spaced convolutions 15 of uniform diameter extending from a point in engagement with the valve to a point falling short of the head of the stud, the strand being then wound spirally to form a series of convolutions 16 which progressively decrease in diameter to a point where the last convolution engaging the head closely embraces the stud.

The general appearance of a spring constructed in this manner corresponds to that of a straight sided cylinder having its upper portion helico-volute or terminating in a taper the sides of which are directed inwardly in an unbroken uniform curve. It is a preferred though not an essential feature of the design that the difference in diameter of one convolution relative to that of an adjoining convolution 16 should not exceed the cross-sectional diameter of the wire from which the spring is formed. Were this difference less one of the convolutions 16 would be enclosed wholly within that of an adjoining convolution when the spring was compressed axially to its fullest extent, and interference between the convolutions might result thereby adversely affecting the efficient operation of the spring.

Owing to the fact that the convolutions of varying diameter yield only under greater pressure than those of uniform diameter it will be seen that during opening movement of the valve the uniform convolutions 15 will be compressed without effecting the spacing of the convolutions 16 until the valve reaches its normal working limit of opening movement under ordinary conditions. The extent of movement or working limit of the valve is illustrated as an example in Fig. II. However should the valve, by reason of excess pressure be forced open to an extent greater than its normal working limit, an increased resistance is encountered by flexing of the varying convolutions 16, which then begins, and owing to their greater stiffness the continued movement of the valve is increasingly resisted and the valve ultimately brought to rest in an effective but gradual manner, thus acting as a cushion to avoid straining or distorting the valve which might occur if the resting mo-

ment were introduced suddenly. When the spring is fully compressed and all of its convolutions brought into mutual contact the result is a rigid resistant tube which acts as a stop to positively limit any further opening movement of the valve.

From the foregoing it will be seen that I have devised a form of spring which, in its use as a retainer for valves is susceptible of many advantages, and which is capable of functioning in such a manner as to insure a more efficient operation of the valve than would be possible in the use of ordinary springs.

Owing to the relatively large lower or valve engaging coils which are subject to initial flexure a quick and easy opening of the valve is insured. As a result of the specific form imparted to the spring it is possible to use wire in its construction of greater cross sectional diameter than would be ordinarily employed without increasing the stiffness of the spring, and by virtue of the thicker wire the durability of the spring is greatly enhanced. It is to be noted that when under full compression and the convolutions are in contact the spring is self sustaining and forms in effect a tube that acts to prevent any lateral distortion of the spring or convolutions such as might result in the fracture of the spring.

It has been developed in practice that valve springs of the type disclosed are prone to fracture at a point adjacent the stud head remote from the valve. In my improved construction the possibility of fracture at the location named is reduced by reason of its tapering form and the possibility of fracture at any place is reduced by reason of the cushioning properties inherent in the spring. In cases where heavy spring pressure is required without increasing the cross-sectional diameter of the wire I may use wire which is square or rectangular in cross section thus providing greater resistance to tortional strain.

It will be apparent that the type of spring described above is applicable to disk valves of any conventional form although it has been illustrated in the drawings in connection with a specific form of sheet metal valve having a central recess defined by the angular expanded portion 17, so that the lowermost convolution of the spring may seat at a point adjacent the juncture of the expanding portion and the center portion of the valve. This combination results in increased efficiency in the general operation of the valve supplying several advantages which would not be present in the case of an ordinary flat disk valve.

Having thus described my invention, I claim:

1. As an article of manufacture, a spring for seating valves and checks including certain convolutions of a predetermined resistency to effect reseating of the valve or check within normal working limits, and helico-volute convolutions located at the outer end of said spring for exercising a gradually increasing retardation as the valve or check moves beyond its normal working limit.

2. As an article of manufacture, a spring for valves and checks including a cylindrical portion for exercising a normal closing influence upon the valve or check, and a helico-volute extension of greater resistance to flexure affording a progressively increasing retarding influence as the valve or check advances beyond its maximum working limit, said cylindrical and helico-volute portions when fully compressed functioning as a rigid resistant to further movement.

3. In combination, a valve seat, a stud, a valve centrally apertured to receive the stud, and a part cylindrical spring embracing the stud and engaging the valve to retain the latter seated, said spring including certain convolutions having a normal influence to retain the valve seated and certain helico-volute convolutions of greater resistance to flexure for retarding movement of the valve when advanced beyond its ordinary working limit said spring when fully compressed functioning as a rigid resistant to further movement.

4. In combination, a valve seat, a stud, a centrally apertured valve guided by the stud, and a spring in part cylindrical embracing said studs and interposed between the stud head and valve, said spring having convolutions of equal diameter adjacent the valve for exercising a normal closing influence thereon, and helico-volute convolutions remote from the valve of greater resistance to flexure exercising a progressive retardation when the valve is moved beyond its normal working limit, said helico-volute convolutions gradually diminishing in diameter in a ratio not exceeding the gage of the material from which the spring is formed.

In testimony whereof, I have hereunto signed my name at Philadelphia, Pennsylvania, this 28th day of August 1922.

MAURICE F. RICHARDSON.