F. E. NORTON.

VALVE.

APPLICATION FILED DEC. 7, 1915.

1,277,463.

Patented Sept. 3, 1918.

2 SHEETS—SHEET 1.

Fig. 1.

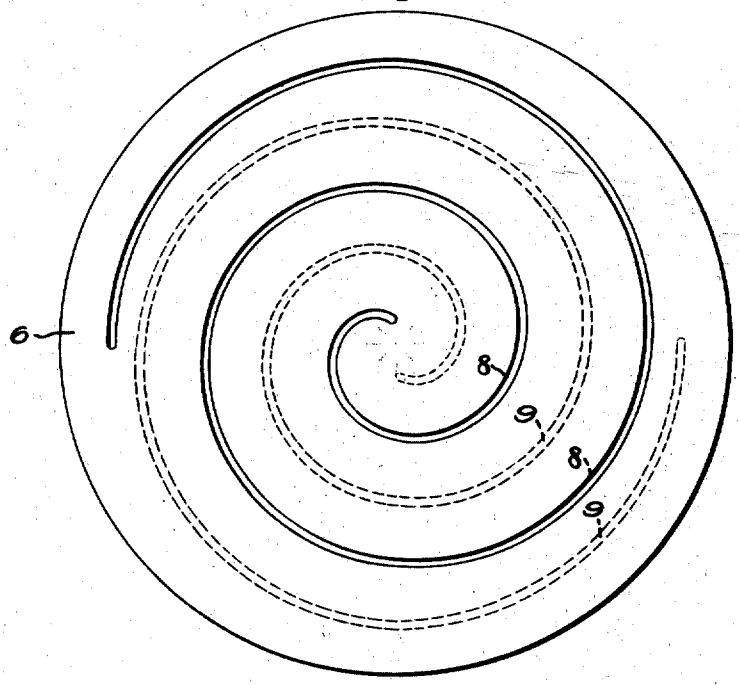
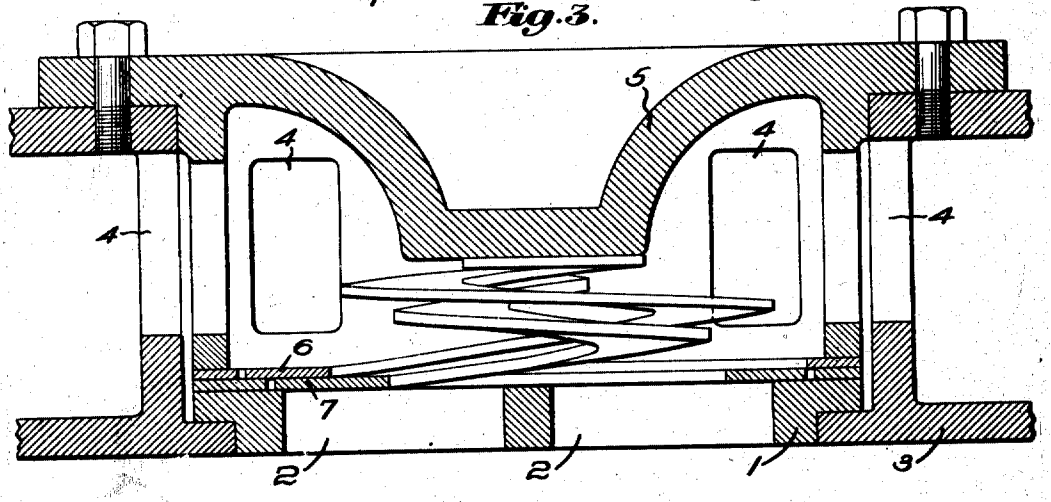


Fig. 2.



Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

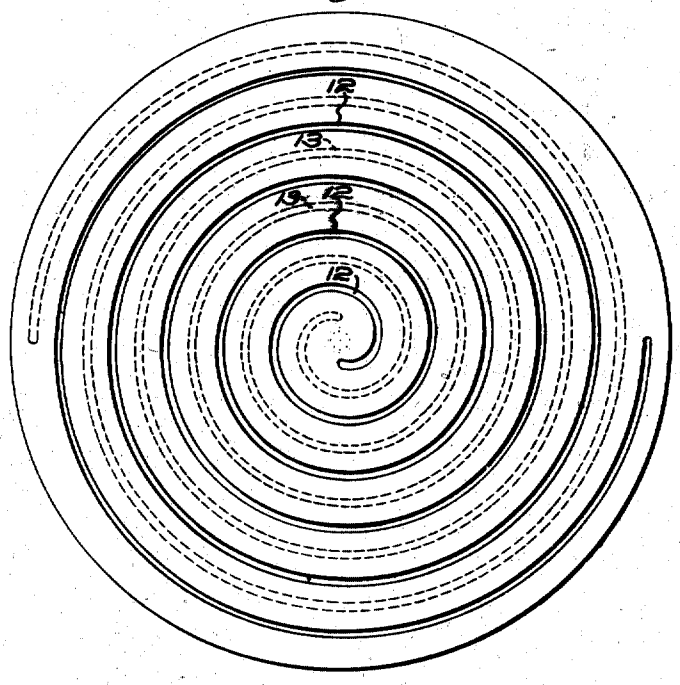


Fig. 5.

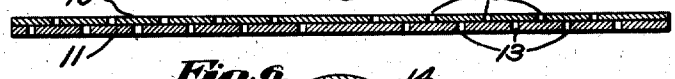
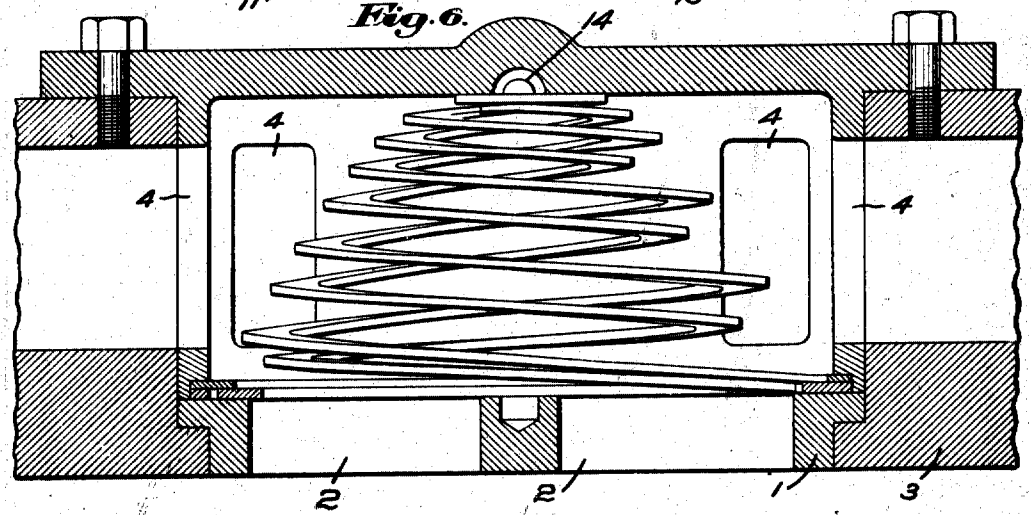


Fig. 6.



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UNITED STATES PATENT OFFICE.

FRED E. NORTON, OF WORCESTER, MASSACHUSETTS.

VALVE.

1,277,463. Specification of Letters Patent. Patented Sept. 3, 1918.

Application filed December 7, 1915. Serial No. 65,602.

To all whom it may concern:

Be it known that I, FRED E. NORTON, a citizen of the United States, and a resident of Worcester, in the county of Worcester and State of Massachusetts, have invented an Improvement in Valves, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to valves which may be of general application, but which are particularly intended for use as compressor valves.

In order that the principle of the invention may be readily understood, I have disclosed an embodiment thereof in the accompanying drawings, wherein—

Figure 1 is a plan view of a compressor or other valve constructed in accordance with one form of my invention;

Fig. 2 is a central cross section thereof;

Fig. 3 is a vertical section representing the valve position in the compressor or other part with which it coöperates, the valve being open; and

Figs. 4, 5 and 6 are views similar to Figs. 1, 2 and 3 respectively, the valve being represented as having a greater number of spires or convolutions.

Compressor and like valves have heretofore been provided. They have commonly consisted of a thin sheet steel, perforated disk, the peripheral or other portion of the valve being imperforate and attached to a solid center by variously shaped spring spirals or arms. This general type of valve is known as the Hoebriger-Rigler type. Other forms or compressor valves have been employed, one of which comprises a flat, thin, steel plate secured at one end and positioned with respect to a port in such manner that the discharge of air is permitted by the bending of the thin strip away from the valve seat. These several forms of valves have the essential defect that if the spring portion be made long enough to allow a full opening through the port, the area through the valve is very much reduced for a given diameter. Such valves also fail from excessive deflection of material, and it is impossible to secure a fully satisfactory free port area in restricted space.

By my invention, I overcome the defects of the types of valves above referred to and in its preferred embodiment I provide a valve whereof one part constitutes the valve proper and another part constitutes the seat, no guide other than the valve itself being necessary.

Referring more particularly to the drawings, and first to that form of my invention shown in Figs. 1, 2 and 3, I have therein represented a portion of an air or other fluid compressor, but it will be obvious that my invention is in no wise restricted to such use. Therein I have represented the valve support at 1, it having one or more openings 2 for the upward passage of the air or other fluid through the valve constituting my invention. Surrounding the support 1 is a member 3 having a suitable series of ports 4 through which the air or other fluid passes into the cylindrical or like portion of the compressor. The cap co-acting with the valve is represented at 5, it being of any suitable form and preferably acting also as a stop or limiting means to the opening of the valve. I have not illustrated the other co-acting portions of the compressor, but it will be understood that preferably I provide a cylinder having therein a piston reciprocated toward and from the valve. Such piston acts upon its upward stroke away from the valve to open the latter, and upon its downward stroke toward the valve to close it.

In this preferred and simplest form, the valve of my invention is composed of a plurality of inter-related flexible members, which preferably are of spring material such as steel or other metal, but which may be of rubber, leather or other suitable non-metallic material. Preferably I provide two spiral members indicated generally at 6 and 7. These members are of thin sheet material, are superposed, and each is composed of any suitable number of spires or convolutions, the two spirals being displaced in rotation with respect to each other to a suitable amount, which preferably is 180 degrees. In that form of my invention herein shown, the two spirals are displaced to the extent indicated, the spaces between the spires of each spiral being indicated at 8 and 9 respectively. The spires may, of course, be of any suitable width, and it is not necessary that the two or more spirals be alike. They may differ in the width of the spires or in other respects, not affecting the principle of the invention. In practice,

the part of the spiral 7 of the valve constitutes the valve seat and the part 6 constitutes the valve proper. It will be observed that in action no guide is required to secure the proper relative position of the parts of the valve other than the spirals themselves. Thus, all friction and wear incident to the movement of a valve along its guide is avoided.

It will be observed that when the valve is closed, the members 6 and 7 overlap and when open the port is formed between the convolutions or spires of the two spirals. Thus, the seat is formed by the valve itself, and the support 1 for the valve in its closed position in no way performs the usual function of a seat, the openings 2—2 therein having no necessary relation in form to the ports of the valve. The ports of the valve, it will be observed, consist of two spiral or helical openings in the members 6, 7. Thus, no bridges or other obstructions exist to interfere with the free passage of the air or other liquid. When open, the valve assumes a conical form, as indicated in Fig. 3, wherein for sake of clearness the valve is shown open to an exaggerated degree. The opening and closing of the valve are gradual and without shock.

The full opening through the valve support may be had through the valve ports existing in the valve itself, and such opening is limited only by the mechanical strength of the valve. The overlapping feature of the members 6 and 7 does not in any way restrict the port area. The rise of the valve is determined entirely by the amount of air passing therethrough, and sufficient flexibility may be secured to make the resistance to the passage of air very slight. The flexible members 6, 7 may be of any desired length and the life of the valve correspondingly is increased. The manufacture of the valve is also extremely simple, inasmuch as if desired the two or more spirals may be exactly alike. In the forms of my invention herein shown, the two spirals are exact duplicates of each other.

At their outer edges the spirals 6, 7 are secured to the support 1 by the cap 5. The valve may, however, be secured in position in any suitable manner, and the stop or cap 5 may be of the form shown or of any other suitable form. The support 1, surrounding member 3 and cap 5 may be of any suitable form, since they are provided merely to afford a housing for the valve. Their form and structure may depend on the function of the valve.

The form of valve shown in Figs. 4, 5 and 6 differs from that shown in Figs. 1, 2 and 3 only in that I have provided spirals 10, 11, each having a greater number of spires or convolutions. It is evident from a comparison of Fig. 6 with Fig. 3 that by providing a greater number of spires or convolutions, the deformation of the material of the valve is reduced by increasing the length of the spiral.

In Figs. 4 and 5, the spaces between the spires of the two spirals are respectively indicated at 12 and 13. If desired, the spirals may be fastened to each other at their inner ends in any suitable manner, as, for example, by a rivet 14 indicated in Fig. 6.

It is preferred to fasten the inner ends of the spirals in order that when open they may assume their proper position, as previously stated. With respect to the form of the invention shown in Figs. 1, 2 and 3, it is not necessary that the spirals be identical and the spaces between the spires of one spiral may be greater than those between the spires of the other. As in the form of my invention shown in Figs. 1, 2 and 3, the spiral 10 constitutes the valve proper and the spiral 11 the seat, but the space of the spaces between the spires of each member does not determine the form of the port when the valve is open.

The spirals shown in the several figures may be formed in any suitable manner, as, for example, by perforation of the material, by bending a narrow strip edgewise or by a combination of both methods. Obviously, the two or more spirals may be formed from separate pieces, such, for example, as 6, 7, or 10, 11, or they may be formed from one piece, the coils being made to overlap. In the latter case, the valve would not close flat, but would be of cylindrical or conical form, depending upon the winding of the spiral. Each spiral 6, 7, 10, 11, if distinct from the co-acting spiral, may be formed from a single piece or may be constructed of two or more pieces.

Having thus described one illustrative embodiment of my invention, I desire it to be understood that although specific terms are employed, they are used in a generic and descriptive sense and not for purposes of limitation, the scope of the invention being set forth in the following claims.

Claims:

1. A valve comprising a plurality of inter-related, spiral, flexible members, the spaces between the spires of the respective members being mutually covered by the other member.

2. A valve comprising a plurality of inter-related spiral members, one acting as a valve seat and the other as the valve proper.

3. A compressor or other valve comprising a plurality of spiral spring members constituting in themselves a valve proper, the seat therefor and the guiding means for the valve.

4. A compressor or other valve comprising a plurality of flexible, spiral members adapted to seat one on the other, thereby to

form a valve and seat, whereby the port is determined in shape and area solely by the said members.

5. A valve comprising, in combination, two superimposed sheets, each presenting a unitary outside portion and a helix cut within said outside portion, one of said sheets serving as the valve proper, and the other as a seat.

6. A valve comprising two spiral flexible resilient members, one above the other, one serving as the valve proper and the other as the seat therefor.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

FRED E. NORTON.

Witnesses:
C. F. STEVENS,
MARY G. MCCARTHY.