

(No Model.)

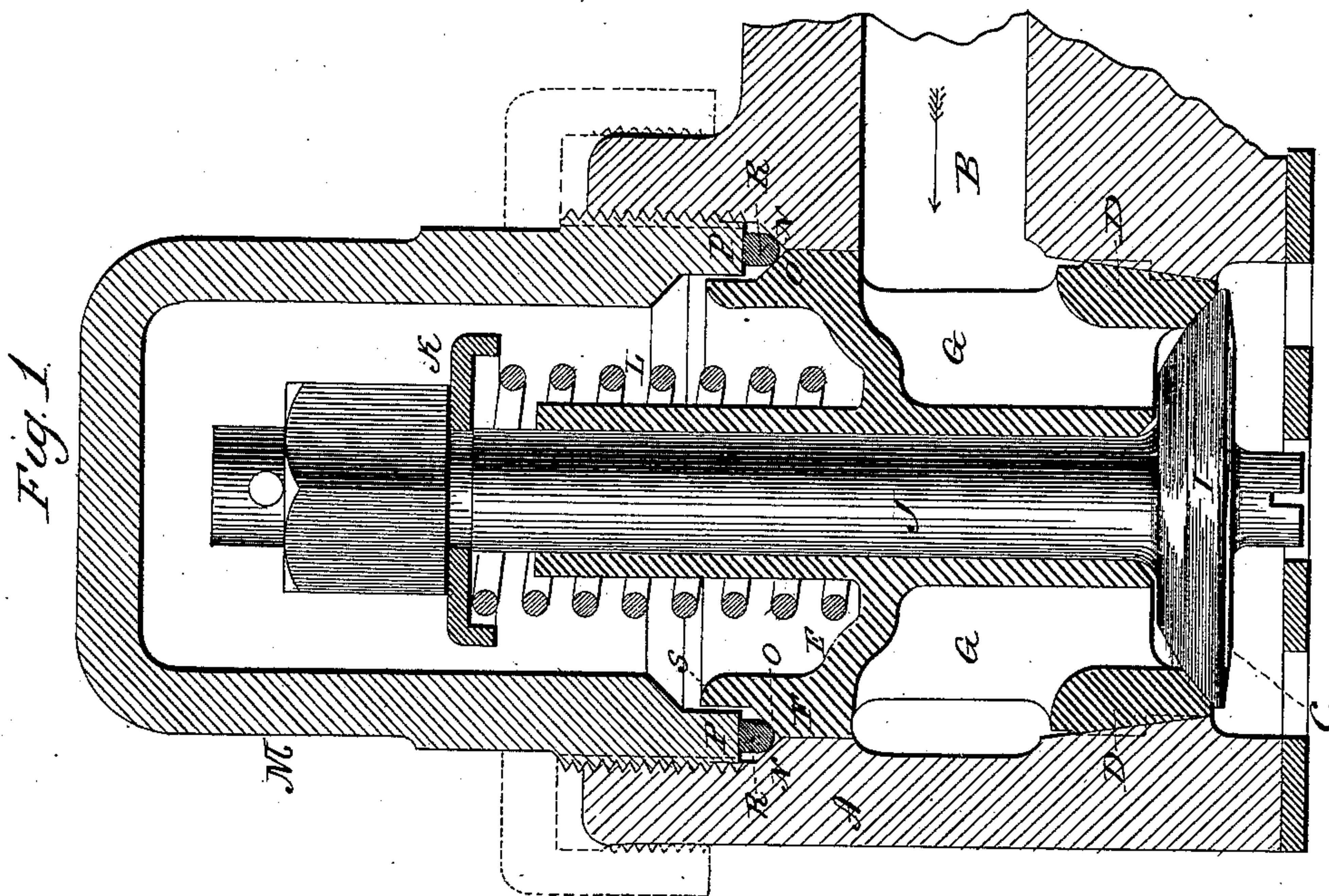
2 Sheets—Sheet 1.

E. HILL.

VALVE FOR AIR COMPRESSORS.

No. 393,980.

Patented Dec. 4, 1888.



Witnesses.  
J. H. Shumway,  
Fred C. Earle.

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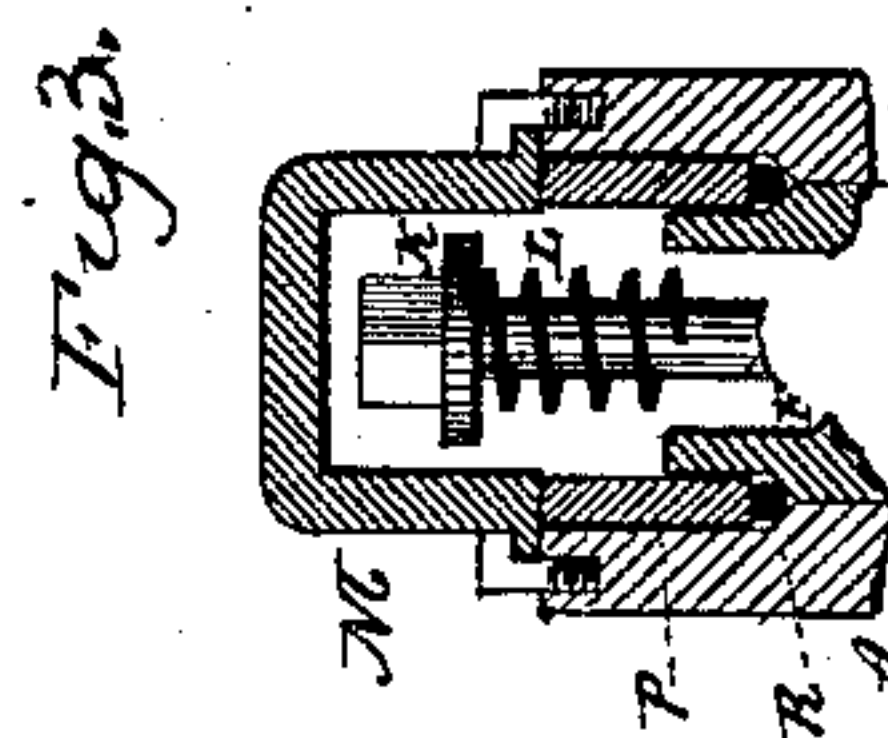
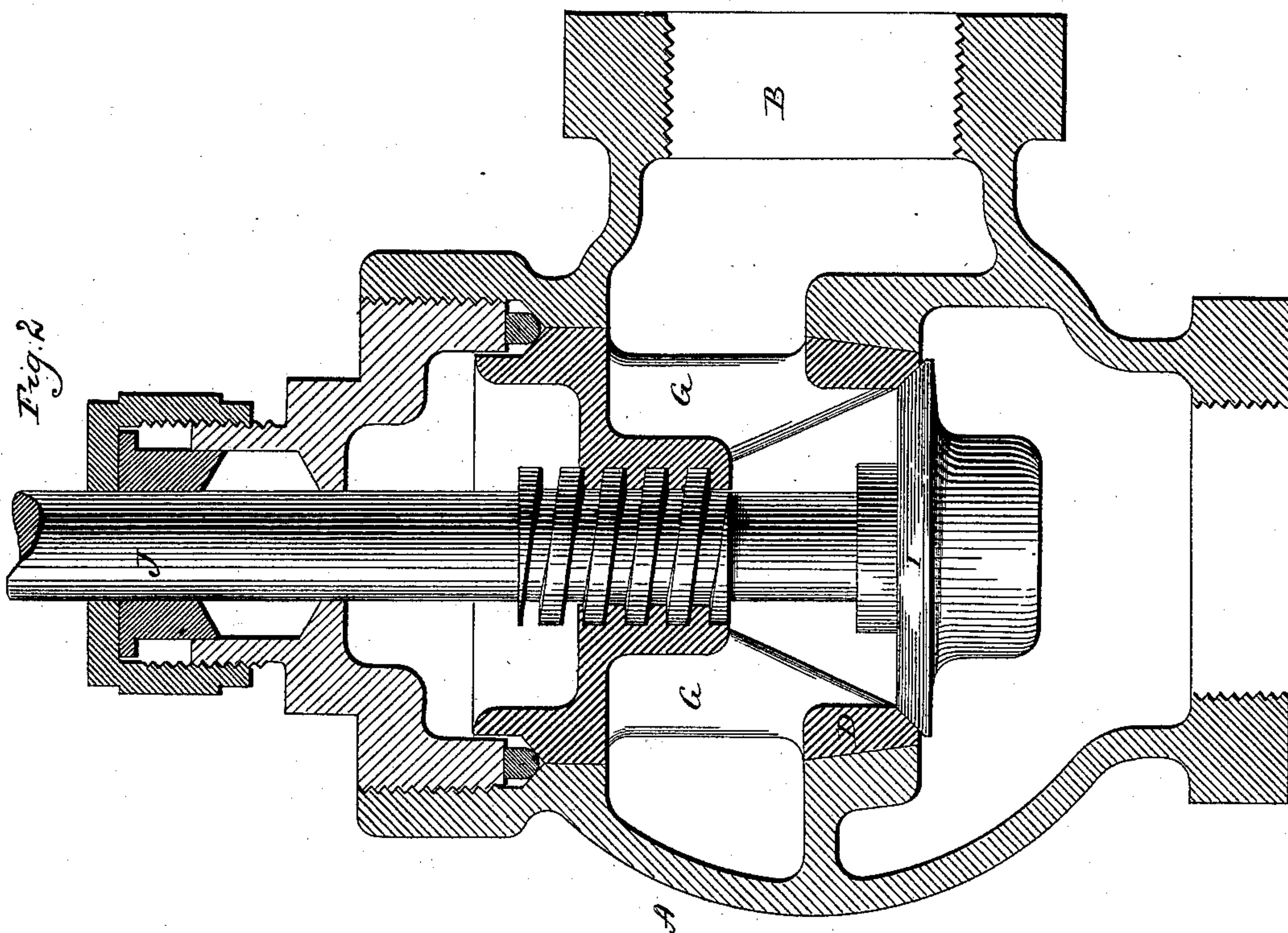
2 Sheets—Sheet 2.

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VALVE FOR AIR COMPRESSORS.

No. 393,980.

Patented Dec. 4, 1888.



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# UNITED STATES PATENT OFFICE.

EBENEZER HILL, OF SOUTH NORWALK, CONNECTICUT.

## VALVE FOR AIR-COMPRESSORS.

SPECIFICATION forming part of Letters Patent No. 393,980, dated December 4, 1888.

Application filed July 9, 1888. Serial No. 279,367. (No model.)

*To all whom it may concern:*

Be it known that I, EBENEZER HILL, a citizen of the United States, residing at South Norwalk, in the county of Fairfield and State of Connecticut, have invented a new Improvement in Valves for Air-Compressors; and I do hereby declare the following, when taken in connection with accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, the invention as applied to a suction or inlet valve; Fig. 2, the invention as applied to a globe-valve; Fig. 3, a modification in the flange within the case which bears upon the packing.

This invention relates to an improvement in valves for air-compressors, but applicable to other purposes where the valve is liable to “hammer.”

In valves of air-compressors and for other purposes, where a heavy pressure comes upon the back of the valve, the valve, after having been opened and the power which opened the valve released, necessarily flies to its seat under a great force, and striking hard thereon produces what is commonly called “hammer.” The instantaneous closing of the valve is essential to its proper working, and to insure such instantaneous closing a spring is applied, the tendency of which is to yieldingly hold the valve upon its seat. The result of such hammer is to injure or abrade the face of the valve or valve-seat, so that these faces require frequent grinding or repair. Again, this hammer produces a heavy jar upon the valve-case, such jar tending to loosen the screw connections of the case, such as the cap by which the valve-case is closed. The seats of these valves are usually made removable from the valve-case to facilitate such repairs. In suction-valves the hammer of the valve necessarily tends to throw the valve-seat out of place.

The object of my invention is to overcome these and other difficulties, which will be apparent.

In describing the invention I will first do so with reference to an inlet-valve, as seen in Fig. 1.

A represents the case or body of the valve, B the inlet-passage, and C the outlet.

D represents the valve-seat, which is made in the form of a ring and set into the case, it being preferably of frustum-of-cone shape, the bearing-surface in the case for the ring being of corresponding shape. The case above the ring D is of larger diameter than the ring, open at the top, so that the ring may be introduced from the top downward. This ring D stands below the inlet-opening B. Above that opening is a disk, E, having a flange, F, around its edge, which fits substantially close upon the inside of the case. The disk E is connected to the valve-seat ring by wings G, so that the valve-seat ring D becomes practically a part of the disk E, the disk E forming a partition across the case above the passage B, the space in the case below the disk forming the inlet-chamber to the valve.

Concentrically through the disk E is a tube, H, made substantially a part of the disk E, so that the said disk E, the tube H, the valve-ring D, and the wing connections G are best formed as a single casting. The face of the valve-seat is upon the under side of the ring.

I represents the valve resting against said seat, and is constructed with a spindle, J, which extends up through and above the tube H, and at its upper end is provided with a collar, K, made fast to the spindle, and between the said collar K and the disk E a spring, L, is arranged around the tube, bearing forcibly against the collar K, and tending to yieldingly hold the valve upon its seat.

The upper end of the case is internally screw-threaded, and over the upper end of the spindle a cap, M, is applied, screw-threaded upon its outside, so as to be screwed into the upper end of the case over the spindle. The screw-threaded portion of the case is of larger diameter than the external diameter of the flange F, so as to form an annular shoulder, N, upon the inside of the case, and the flange F is constructed with a like shoulder, O, so that the lower edge, P, of the cap stands over the said two shoulders, as clearly seen in Fig. 1. Upon the said two shoulders a packing-ring, R, is arranged, preferably of soft metal, such as copper. The width of the ring is less than the combined width of the



two shoulders, but so as to rest over and cover the joint between the two shoulders without coming into contact with either side.

After the valve has been properly set in place the packing-ring R is introduced, and then the cap screwed in onto the packing-ring to force it hard upon the shoulders of the flange F and the case. This operation brings the valve-seat ring D firmly into its seat. This done, the packing-ring R not only securely closes the joint from the valve-chamber upward, but owing to the nature of the material of which it is composed it forms a non-conductor of the hammer to the cap and case. The whole resistance of the hammer comes upon the packing, and that being a non-conductor, as I have described, the shock of such hammer upon the cap and case is very materially reduced over what it would be with a hard metal connection between the valve-seat and case, as in the usual construction.

The shoulders N O are best made inclined to each other, so as to form a V-shaped recess between the case and the disk, in which the packing will rest. This V-shaped recess insures the proper concentric location of the packing, and also insures a firm contact between the packing and the two shoulders. The flange F is also best made with an annular lip, S, extending up from its shoulder O inside the cap, so as to extend the recess between the disk and case to a point above the lower edge of the cap. This is particularly desirable, as in many cases a soft packing is used, temporarily or otherwise—such, say, as wicking. Then the groove formed by the lip S affords a convenient receptacle for the introduction of the wicking, the lip serving to retain the packing in place. While such soft packing—such as wicking—may be used, it is intended that it shall only be temporarily used, and as a substitute for the soft metal packing, as occasion may require, during repairs or otherwise.

In case of repairs required upon the valve-seat it is only necessary to remove the cap, when the valve-seat ring D, with its disk E and tube H, and which form substantially a cage for the valve, may be readily withdrawn from the case, the repairs made, and the cage with the valve returned. This construction permits the screwing of the cap directly into the case, so that the cap itself serves as the means for packing and supporting the valve-cage, thereby simplifying the construction to a very great extent.

The principal object of making the packing-ring narrower than the width of the recess in which it stands is to prevent the sides of the ring from being forced into contact with the adjacent sides of the case and cage, which, if permitted, would make it difficult to remove the cage from the case.

In Fig. 2 I show the invention as applied to a globe-valve, the same letters indicating the same parts. In this case the valve-seat is

formed as a part of the cage, there is the same packing, and the same direct action of the cap upon the packing to secure the joint and hold the valve-seat cage in its place. These illustrations of the construction of the valve-seat cage, the shoulders between the cage and case, the packing, and the cap operating directly thereon will be sufficient to enable those skilled in the art to apply this invention to other constructions of valves.

I have represented the bearing between the valve-seat ring and the case as of conical shape, and this I prefer; but the bearing may be in the form of a square shoulder, as indicated in broken lines, Fig. 1. I have also represented the cap as screwed into the inside of the case, and this is the preferable construction, yet the cap may be screwed onto the outside of the case, as indicated in broken lines, Fig. 1. In this case the same flange, F, on the cap is retained so as to bring the cap to bear directly upon the packing. The non-conducting soft-metal ring R upon its shoulders may be employed in connection with an indirect support from the cap instead of a direct connection, as I have shown—say as seen in Fig. 3, where a ring like the flange P is introduced into the case and the cap bolted to the case with adjusting-screws through the cap upon the ring. This modification simply illustrates that the invention is not to be understood as limited to the bearing of the cap directly upon the packing-ring, except as hereinafter specified.

From the foregoing it will be understood that while the invention is particularly adapted for air-compressors it may be used entire or in parts for other purposes.

I claim—

1. In a valve substantially such as described, the combination of the case A, the cage within the case, composed of the valve-seat ring D and the flange F, the said cage constructed with a central support and guide for the valve as a part of the cage, the said cage supported on a bearing in the case, the said flange and adjacent side of the case constructed with annular shoulders, respectively, N O, the case extended above its shoulder N, and screw-threaded, with a cap, M, screw-threaded, corresponding to the case, and constructed with a flange, P, extending within the case and over the said two shoulders, N O, of the case and cage, with a metal packing, R, between the flange of the cap and the said two shoulders, and with a valve supported within the cage, the said cage being without substantial contact with the cap except through the said packing, substantially as described.

2. The combination of the case A, the valve-seat ring D, and the flange F, connected to form a valve-cage, the valve-seat constructed to take a bearing in the case, the said flange and case constructed, respectively, with annular shoulders N O, the said shoulders being inclined to each other, so as to form a V-shaped groove, a cap, M, screw-threaded onto



the case and constructed with a flange, P, extending within the case over the said V-shaped groove formed by the shoulders N O, and a packing-ring, R, concentrically over the joint between the said two shoulders and between said shoulders and the flange of the cap, with a valve supported in said cage, substantially as described.

3. The combination of the case A, the valve-seat ring D, and a flange, F, connected to form a valve-cage, the said valve-seat ring supported upon a bearing in the case, said flange and case constructed with shoulders N O, and the flange with a lip, S, above its shoulder, the case, lip, and shoulders forming a concentric groove around the upper end of the cage, and a cap adapted to be screwed onto the case and constructed with a flange, P, within the case and adapted to enter said groove, with a packing-ring, R, of soft metal, concentrically within said groove, but less in width than the width of the groove, substantially as and for the purpose described.

4. The combination of a valve-case, A, a valve-seat cage composed of the seat-ring D, and the flange F, connected thereto and constructed to form a guide for the valve-spindle, the said cage also constructed to take a

bearing within the case, the said flange and case constructed with the shoulders N O, respectively, a concentric packing arranged to take a bearing on both of said shoulders, and a flange within the case constructed to take a forcible bearing upon said packing above said shoulders, but without bearing-contact with the said cage other than through said packing, and with a valve arranged in said cage, substantially as and for the purpose described.

5. The combination of the case A, the cage within the case composed of the valve-seat ring D, and the flange F, connected thereto and constructed to form a guide for the valve-spindle, the said cage supported on a bearing in the case with a cap, the cap and case being constructed with corresponding screw-threads, and a packing directly between the cap and the said cage, and without contact between the said cap and the said cage except through said packing, substantially as described.

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Witnesses:

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