No. 840,793. PATENTED JAN. 8, 1907.

J. J. McGEE.

PISTON PACKING.

APPLICATION FILED JUNE 29, 1906.

2 SHEETS—SHEET 1.

Fig. 1.

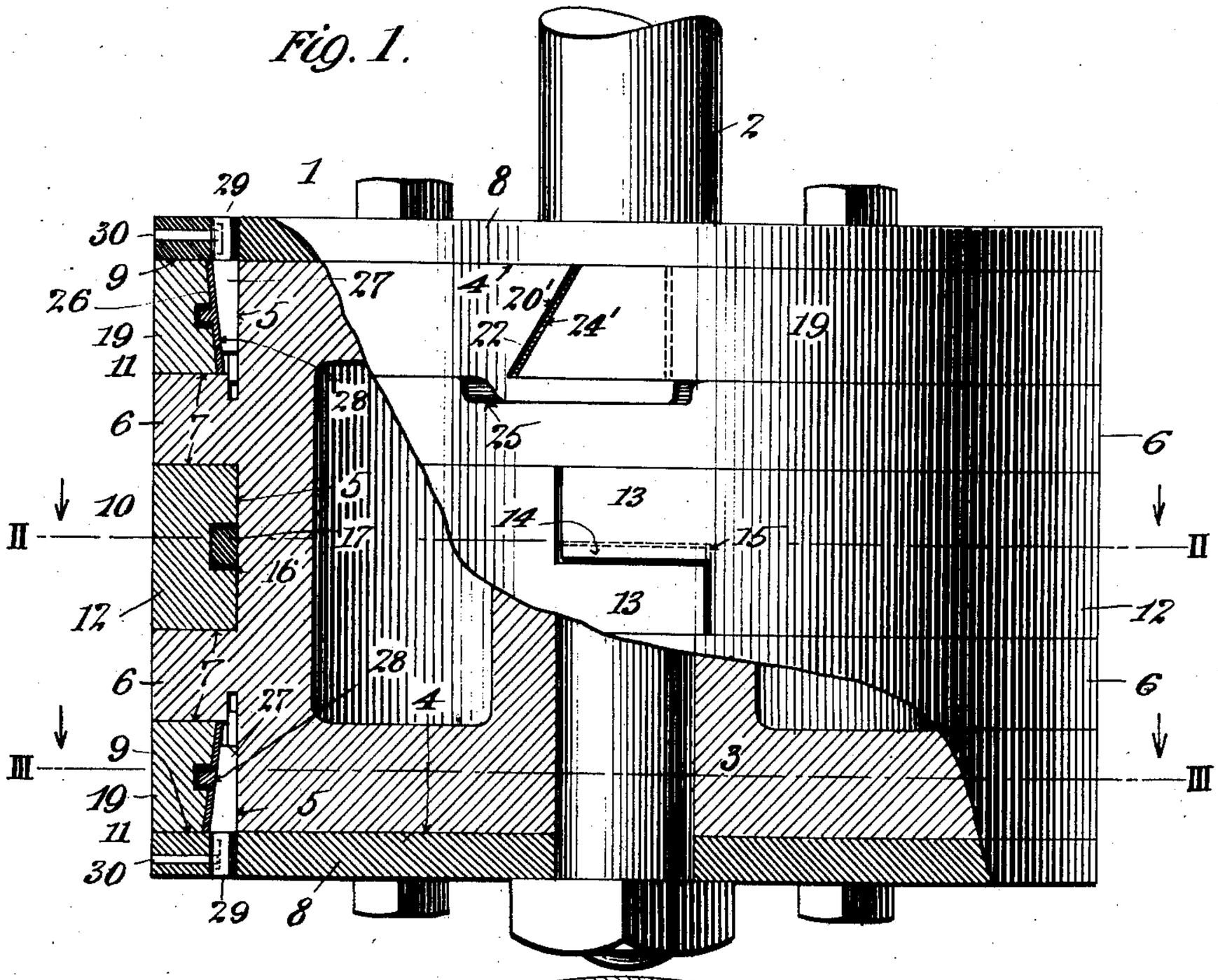
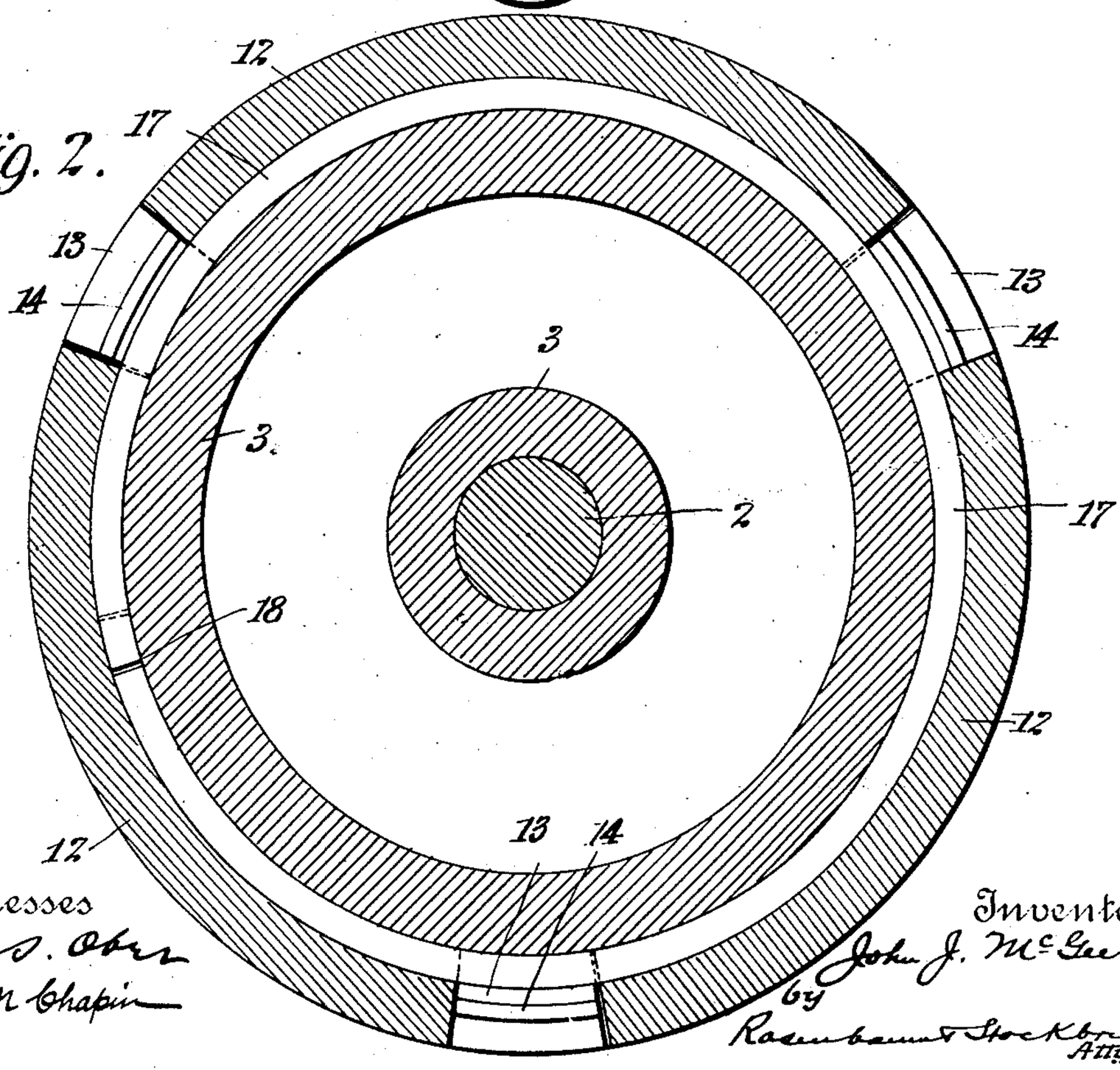


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

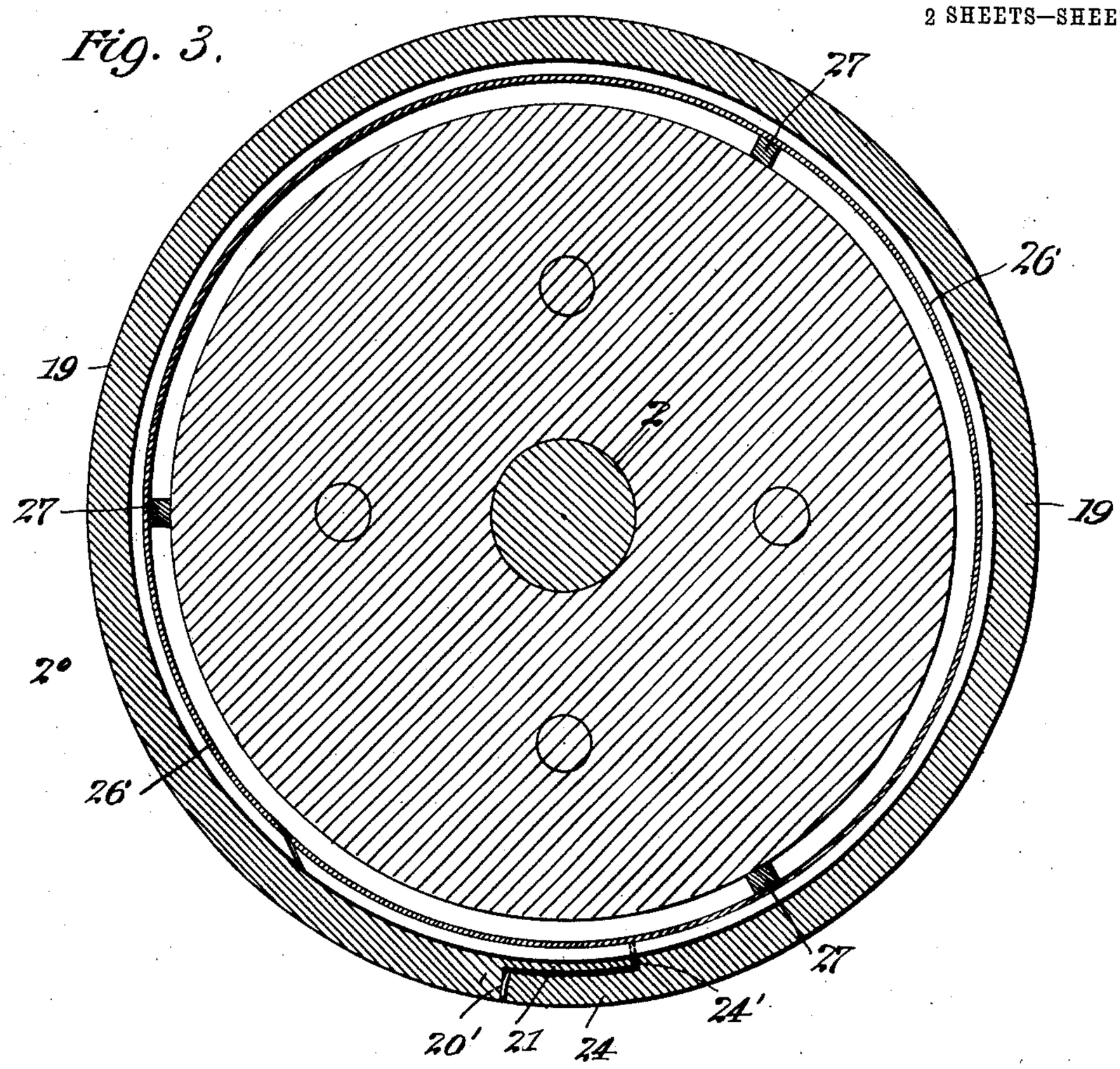


Fig. 6.

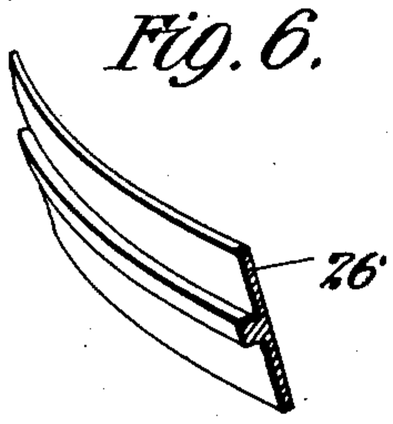


Fig. 4.

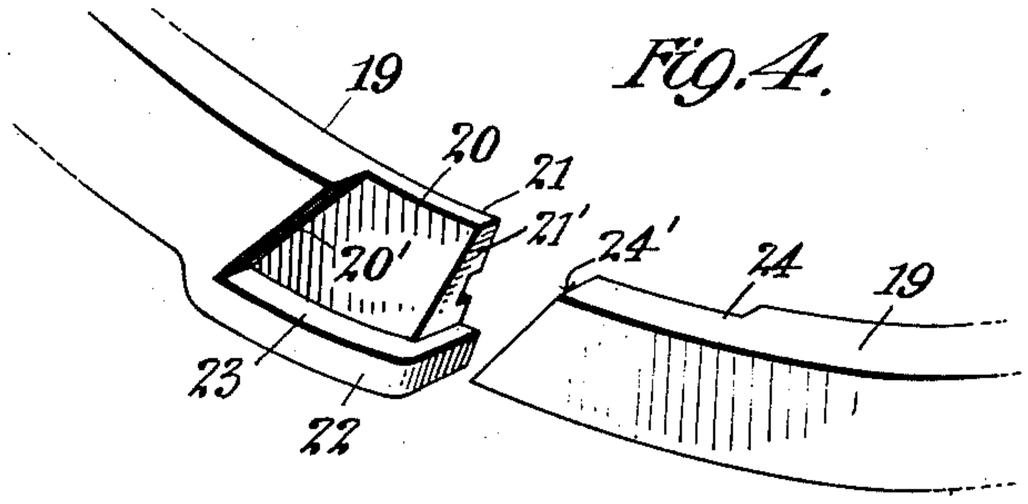


Fig. 7.

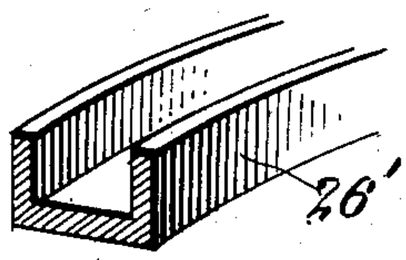


Fig. 5.

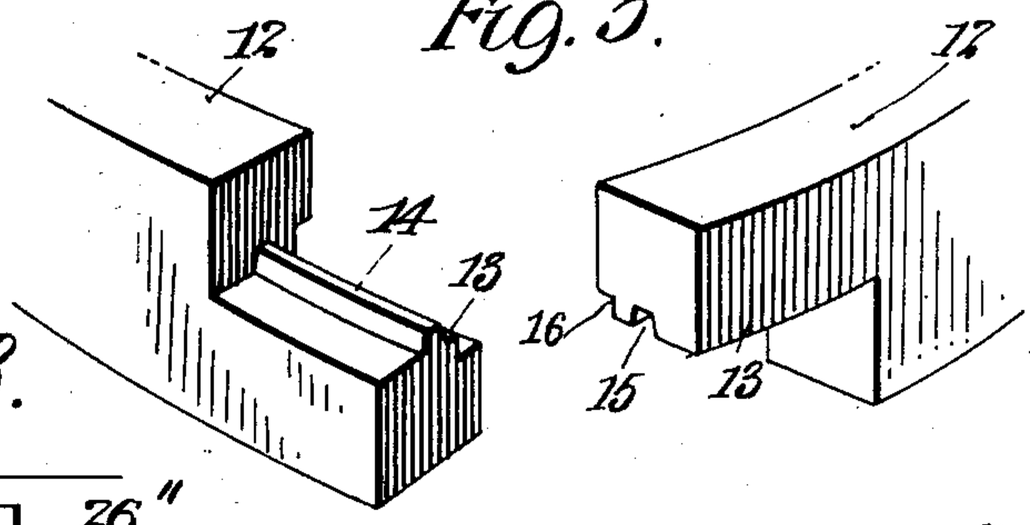
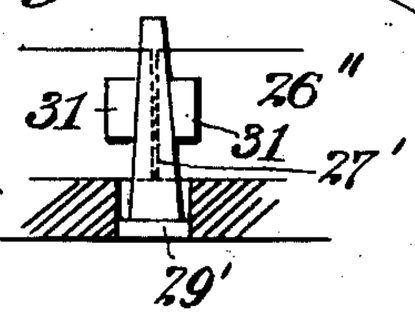


Fig. 8.



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UNITED STATES PATENT OFFICE.

JOHN J. McGEE, OF NEW YORK, N. Y.

PISTON-PACKING.

No. 840,793. Specification of Letters Patent. Patented Jan. 8, 1907.

Application filed June 29, 1906. Serial No. 323,981.

To all whom it may concern:

Be it known that I, JOHN J. McGEE, a citizen of the United States, residing at the city of New York, in the borough of Brooklyn and State of New York, have invented certain new and useful Improvements in Piston-Packing, of which the following is a full, clear, and exact description.

My invention relates to metallic packing for pistons, and particularly the pistons of steam-engines.

The principal object of the invention is to provide a packing which is perfectly steam-tight, which remains tight in spite of considerable wear, and which imposes only very slight resistance to the free movement of the piston.

A further object of the invention is to provide a strong and practical construction convenient to manufacture and easy to assemble into place.

With these and other objects in view the invention consists in the construction, combination, in the location, and in the arrangement of parts, as hereinafter set forth and shown, and finally particularly pointed out in the appended claims.

In the drawings, Figure 1 is a side view, partly in section, of a piston and packing embodying the principles of my invention. Fig. 2 is a sectional view of the same on the line II II of Fig. 1 looking in the direction of the arrows. Fig. 3 is a section on the line III III of Fig. 1 also looking in the direction of the arrows. Fig. 4 is a perspective view showing the two ends of one of the packing-rings. The two ends are separated to more clearly show the construction. Fig. 5 is a perspective view showing adjacent portions of a pair of sections of the central or bull ring. Fig. 6 is a perspective view showing a portion of a spring-ring which is employed with each of the packing-rings. Fig. 7 is a view showing a slightly-modified form of spring-ring. Fig. 8 is a detail view looking toward a portion of the inside of one of the spring-rings and showing a modified construction of certain expanding-wedges which I employ.

The pistons of steam-engines, gas-engines, compression-pumps, and like machinery are ordinarily provided with circumferential grooves, in which are contained packing-rings which make, or should make, a fluid-tight joint against the cylinder-wall in spite of the continuing wear of the surfaces. The problem of properly packing the piston so as to absolutely prevent leakage in use and at the same time to have sufficient freedom of motion has always been a difficult one and never fully solved. The piston bears against the cylinder-wall throughout a considerable area and, furthermore, travels at a considerable speed, so that the power lost by friction is multiplied to a large figure. Not only is power thus lost and coal and steam wasted, but the increased friction produces increased wear, so that the piston-rings become less tight and eventually leak steam or the fluid used. In carrying out my invention I aim to overcome these defects and to provide a piston which moves with very slight resistance in the cylinder, but which is perfectly tight under all conditions. I further aim to minimize wear, and particularly unequal wear, on the cylinder, piston, and packing-rings and to have such wear as occurs compensated for, so that the piston remains fluid-tight for a long period.

Referring now to the drawings, in which like parts are designated by the same reference-sign, 1 indicates a piston bolted or otherwise secured to the piston-rod 2 and which travels in any suitable cylinder. (Not shown.) The main body of this piston is formed of a casting 3, with flat end faces 4 and cylindrical side walls 5, which, however, are divided from one another by annular ribs 6, carefully machined with flat faces 7. 8 indicates a pair of flat metal disks bolted to the end faces 4 of the piston and forming flat walls 9, which are similar to the opposed walls 7 of the intermediate ribs 6. In this way there are produced three annular grooves or channels circumferentially about the piston. The central one of these channels is denoted by the reference-numeral 10 in the drawings, and the two side channels are indicated by reference character 11.

Within the central channel 10 is contained what I shall term the "bull-ring." This is a ring in one or more sections, preferably three sections, which serves mainly as a bearing or guide for the piston in its movement against the cylinder-walls; but this ring also has a function of keeping the piston steam-tight should the other rings partially fail from any cause to accomplish this. The sections of the central ring or bull-ring are designated at 12 and are conveniently made of phosphor-bronze or some material having wearing and antifriction qualities. The various sections of the bull-ring are lap-jointed together, so as

to secure the double function of a steam-tight joint and a joint which will guide and hold the three sections into a continuous ring. The particular joint which I use in practice is shown best in Figs. 1 and 2 and Fig. 5. Each of the sections 12 has an extension 13, which laps upon the extension of the other and is capable of relative movement thereon.

14 indicates a rib or tongue projecting from the side face of one extension 13, and 15 indicates a corresponding groove or channel in the other extension, which receives said tongue and keeps the two sections properly guided in their required relation. This tongue is particularly convenient in turning and finishing the bull-ring when it is manufactured and in afterward assembling it into place.

The inside surface of the bull-ring is circumferentially recessed or channeled, as clearly shown at 16 in Fig. 1. 17 indicates a spring-ring contained in this groove or channel, so as to about fit the same. This spring-ring is split at one point 18, Fig. 2, and exerts a slight force to impel the sections of the bull-ring outward. The resiliency of this spring is such as to overcome the gravity of the upper sections of the bull-ring, so that these do not sag away from the cylinder-wall under any circumstances. By these means the sections of the bull-ring are held in proper concentric or annular relation with one another, closely fitting within the central groove 10 of the piston. These sections are relied upon to guide the piston within the cylinder-walls and also to furnish a packing in addition to the side rings should it become necessary.

The two side rings 19 and which I shall term the "main packing-rings" are continuous except for one split or division. Referring to Fig. 4, I have illustrated the nature of this split or division. One end of the ring 19 is deeply recessed, as shown at 20, leaving only a thin web 21. 22 indicates an extension of the ring, which is at one side of and out of the plane thereof. This extension has a flat wall 23 in the plane of one of the edges of the ring. The other end of the ring is slightly cut away, as shown at 24, to receive the web 21. The two ends may now be fitted together, in which relation they will form a fluid-tight join . When brought together in this relation, the rings are returned and finished so as to be truly concentric. They are also tempered in such a way as to have little or no outward resiliency in this relation. These main packing-rings 19 are closely contained in the channels 11, above described, where they may be positioned by initially removing the end plates 8. In order to accommodate the extension 22, I provide recesses 25 in the ribs 6, in which such extensions are received.

The main packing-rings 19 have enough resiliency to permit their expansion to accommodate wear of the cylinder-walls; but their spring tension is not such as to cause this expansion without separate means. The separate means which I use in practice consists of spring-rings 26, which may have a T-section, as shown in Fig. 6, or a U-shaped section, as shown in Fig. 7. These rings have one split or division and exert an outward force upon the main packing-rings 19. The purpose of this construction is to avoid the unequal bearing-pressure which would be induced if the spring-pressure were in the main packing-rings direct rather than in the underlying spring-rings.

I provide additional means for expanding the main packing-rings 19 outward, particularly when there is heavy fluid-pressure in the cylinder, and therefore a greater need of efficient packing. I have shown a convenient construction having a plurality of wedges 27, of which three is a convenient number, and which are guided to have a longitudinal movement within the body of the piston, so that their wedge-faces 28 bear against the under side of the spring-rings 26 and expand the latter outward. The ends of these wedges are fitted with little pistons 29, which move in the end plates 8 of the piston. 30 indicates pins which project into recesses of the wedges to limit their movement. The operation of these wedges will be obvious. When the piston is in action and fluid-pressure is exerted against either of the plates 8, the pistons 29 are impelled inward by such pressure, and their wedge-faces 28 become effective to cam outward the spring-rings 26 and the main packing-rings 19.

I have already referred to an alternative construction of the spring 26, and which is illustrated at 26′ in Fig. 7. Other features of the invention may be likewise modified. For example, only a single wedge 27 may be used for each of the main packing-rings, and this may be disposed so as to directly wedge apart the adjoining ends of the spring-ring 26. This construction is illustrated in Fig. 8, in which the abutting ends of the spring-ring 26″ have lugs 31, between which is a wedge 27′, with a piston 29′ thereon, by which it is impelled inward. The wedge 27′ cams apart the lugs 31 and expands the spring-ring 26″ in exactly the same way as the spring-ring 26 was expanded by the three wedges 27.

The operation will be clear from the preceding description. The bull-ring 10 furnishes a bearing or guide for the piston in its movement and is so formed as to constitute a packing-ring as well. The main packing-rings 19 fit closely upon the cylinder-walls and are uniformly impelled outward thereagainst by the underlying spring-rings 26, together with such additional pressure as is exerted by the wedges when the piston is doing heavy duty. Under these circumstances the wear is evenly distributed both on the bull-ring and on the main packing-rings. Should the lower section of the bull-ring wear more rapidly than

the upper section by reason of gravity, the bull-ring may be turned around to equalize this wear. In all cases the spring-ring 17 prevents the upper section sagging away from the cylinder-walls should excessive wear occur. The main packing-rings 19 may wear to a considerable extent without losing their true cylindrical outline. This is by reason of the fact that they have no appreciable spring tension of their own which would cause them to wear unevenly. All of the spring tension is furnished by the interior rings and parts, which are not exposed to wear. The nature of the joint in the main packing-rings 19 is such as to absolutely prevent leakage of steam. The tongue 24 fits into the cavity 20, in which relation the end 24′ abuts against the wall 20′ of the recess 20. The wall 20′ and the end 24′ are both inclined so that wear may occur without separating the two surfaces to any appreciable extent. If, however, the surfaces separate through an appreciable interval, leakage of steam cannot occur by reason of the extension 23, which closes the end of this opening. In like manner this extension is of sufficient length to close the gap at the end 21′ of the web 21. This web is quite thin in practice, so that this gap is inconsiderable in any case.

It will be seen that my piston is suitable for light or heavy duty in a steam-engine or in any relation where it is employed. When used with a steam-engine, the spring-rings have enough elasticity to press outward the packing-rings when the steam-pressure is light; but when the steam-pressure becomes heavier the temperature in the cylinder becomes also correspondingly raised and the resiliency of the spring-rings is impaired by the extra temperature; but at this time the extra pressure exerts a force on the small wedges 27 or 27′, as the case may be, so that the packing-rings are pressed outward by the wedges with sufficient force, even if the spring-rings partially lose their tension by reason of the heat. This is a very important feature of the invention and overcomes a defect which has been noticed in pistons, particularly those of large cylinders—namely, that they leak steam or fluid at the high pressures while perfectly tight when doing light duty.

While I have described my invention mainly in connection with pistons of the ordinary form, it is evident that it is applicable for use as a piston-valve. When used in this relation, the sectional bull-ring makes an ideal piston-valve, which fits against its seat in spite of continued wear.

What I claim is—

1. A piston construction for steam-engines comprising a main frame or casting having flat end faces and having a circumferential groove midway between such faces, a bull-ring contained in such groove, said bull-ring being interiorly channeled, a spring-ring in such channel, packing-rings received in said frame or casting, spring-rings for impelling said packing-rings outward, flat metal disks fastened to said flat end faces of the frame or casting, pistons working in said disks, and wedges on said pistons and bearing against the spring-rings of said packing-rings to force the latter outward.

2. A piston construction for steam-engines comprising a frame or casting having flat end faces and having a central circumferential groove, a bull-ring in said groove, a spring for normally impelling said bull-ring outward so as to support the weight thereof, packing-rings received in grooves or channels adjacent the end faces of said frame or casting, metallic disks fastened upon said end faces and adapted to hold said packing-rings in place, a plurality of wedges working inwardly from the end faces of the piston, and small pistons integral with said wedges and open to the steam-pressure at the ends of the piston for impelling said packing-rings outward.

3. A piston construction for steam-engines comprising a frame or casting having a central bull-ring, and having reduced portions adjacent the two end faces thereof, metallic disks bolted on said end faces, packing-rings supported by said metallic disks, and pistons moving in said metallic disks and having wedges to impinge against said packing-rings to impel the same outward.

4. A piston construction for steam-engines comprising a frame or casting having a bull-ring and having reduced portions adjacent to its ends, packing-rings received in said reduced portions, a pair of metallic disks supported upon the end faces of said frame or casting and supporting said packing-rings in place, spring-rings beneath said packing-rings and adapted to impel the same outward, and pistons working through said metallic disks and having wedges adapted to impel said spring-rings outward.

5. A piston construction for steam-engines comprising a frame or casting having a bull-ring and having reduced portions adjacent to its ends, packing-rings received in said reduced portions, a pair of metallic disks supported upon the end faces of said frame or casting and supporting said packing-rings in place, spring-rings beneath said packing-rings and adapted to impel the same outward, and a plurality of small pistons acting on each packing-ring and adapted to impel the same outward.

In witness whereof I subscribe my signature in the presence of two witnesses.

JOHN J. McGEE.

Witnesses:

WALDO M. CHAPIN,

MAY BIRD.