J. J. McGEE.

PISTON PACKING FOR EXPLOSION ENGINES.

APPLICATION FILED SEPT. 5, 1907.

901,023.

Patented Oct. 13, 1908.

2 SHEETS—SHEET 1.

Fig. 1.

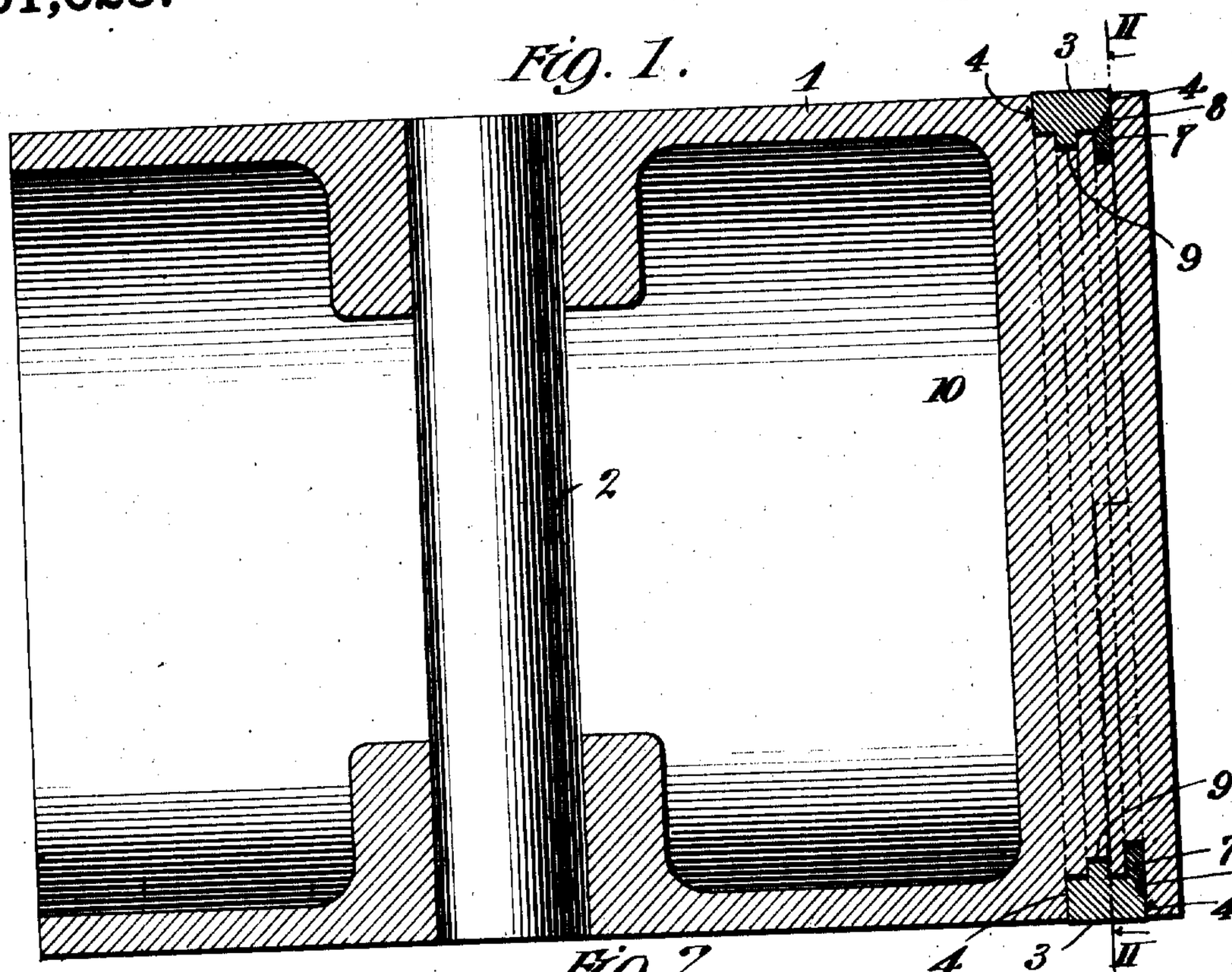


Fig. 2.

Fig. 3.

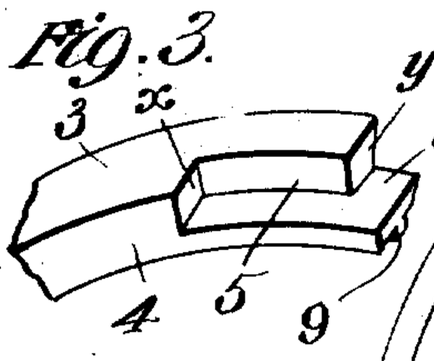
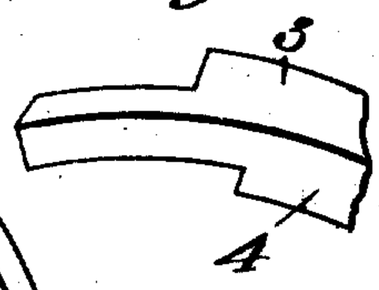


Fig. 3a.



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2 SHEETS—SHEET 2.

Fig. 4.

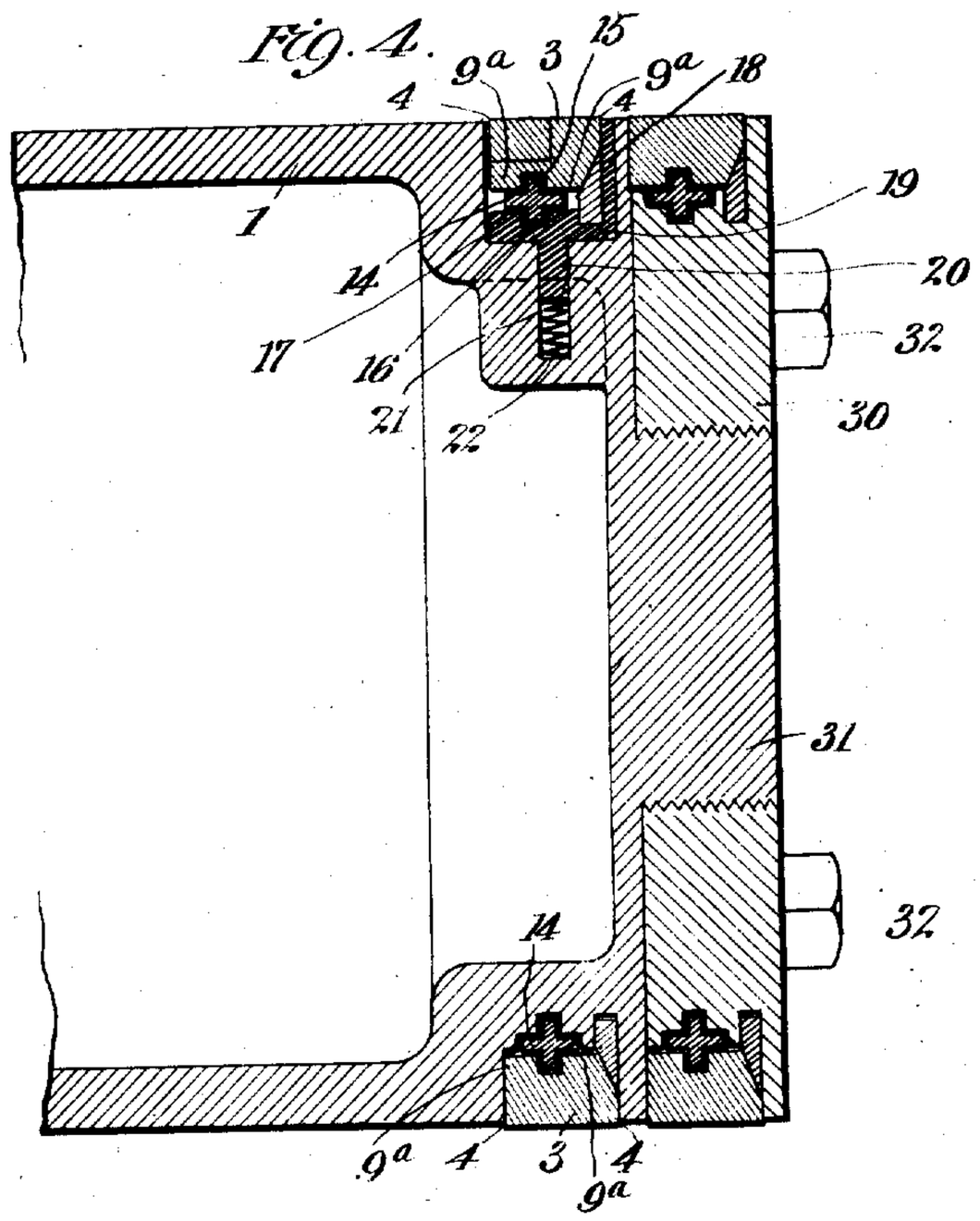


Fig. 5.

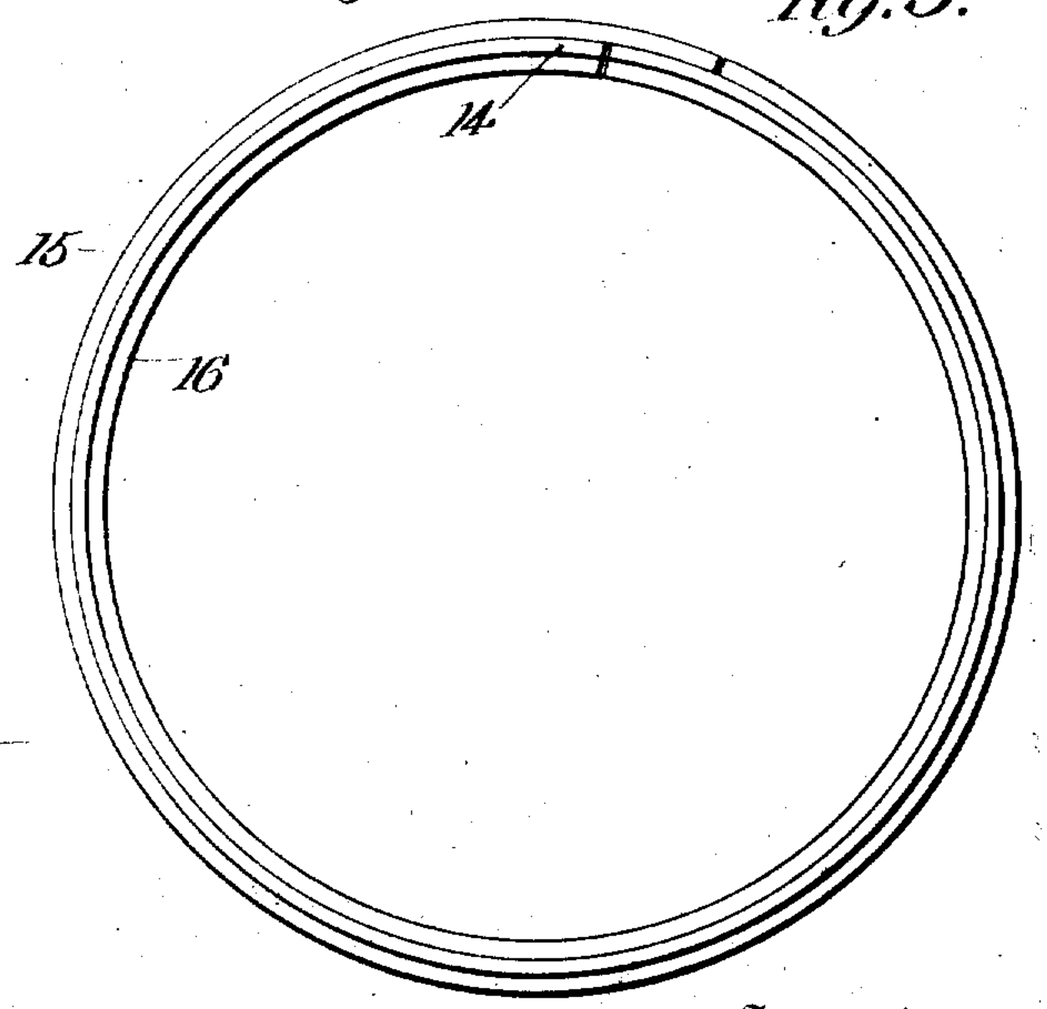


Fig. 6.

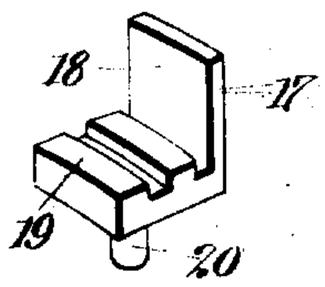


Fig. 7.

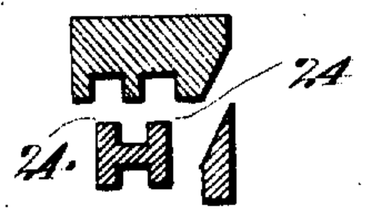
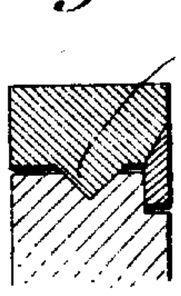


Fig. 8.



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UNITED STATES PATENT OFFICE.

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PISTON-PACKING FOR EXPLOSION-ENGINES.

No. 901,023. Specification of Letters Patent. Patented Oct. 13, 1908.

Application filed September 5, 1907. Serial No. 391,419.

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 for Explosion-Engines, of which the following is a full, clear, and exact description.

My invention relates to a construction of piston ring or packing, particularly for use in hydrocarbon engines, for automobiles, etc., where up to the present time thoroughly satisfactory results have not been obtained. Reference is also to be had to my companion applications Serial Nos. 392,974 and 392,975.

Unless the cylinders and pistons of explosion engines are made with the very greatest care, being finished, ground and lead-lapped with painstaking and expert workmanship, there is considerable leakage. The difficulty is aggravated by the fact that in explosion engines the cylinders are water-cooled while the piston is not, so that the latter expands in use and must have its main core or body very loose to avoid binding in the cylinder bore. On the other hand, the power of explosion engines is peculiarly sensitive to losses of pressure during the compression stroke, especially in engines where the compression is carried up to a very high degree. It is not usual for an explosion engine to hold the compression for more than a few seconds, when the crank is turned over and held for the purposes of making a test. In my experiments, I have discovered that the loss of pressure takes place almost entirely beneath the piston ring or rings and particularly at the joint thereof. In order to overcome this trouble, I have adopted a rather complicated construction which is found to hold the compression in practice.

I will first fully describe the preferred ordinary embodiment of my invention, with the aid of the drawings, and thereafter point out the theoretical principles involved.

In the drawings: Figure 1 is a sectional view of a piston for an explosion engine having a packing ring embodying the principles of my invention; Fig. 2 is a section on the line II—II of Fig. 1 looking in the direction of the arrow; Figs. 3 and 3ª are perspective views of the respective ends of a single packing ring showing the formation of the lap or joint; Fig. 4 is a sectional view showing a slightly modified construction; Fig. 5 is a side view of one of the rings employed therein; Fig. 6 is a perspective view showing a detail; Fig. 7 is a detail sectional view of slight modification; Fig. 8 is another sectional view showing a slightly different modification.

Referring to the drawings in which like parts are designated by the same reference sign, 1 indicates the main body of the piston having the usual transverse pin 2 to receive the pitman or connecting rod.

3 indicates the main packing ring with parallel end faces 4 fitting snugly in a groove of the piston body 1. The ring 3 is springy and has a single lap or joint. In this respect, it is of the ordinary construction.

The joint or lap which I have adopted is intended to overcome the defect of ordinary piston ring joints which allow the gases to pass down through one side of the joint underneath the ring, and up through the other side of the joint. For this purpose I cut and spread the ring, and then mill one end as shown in Fig. 3, the essential characteristic being a flat face 5 parallel with the faces 4, and a peripheral face 6 co-axial with the exterior surface of the ring and extending beyond the end of the face 5. The other end of the piston ring shown in Fig. 3ª is milled to fit the end shown in Fig. 3, in all respects.

I provide means for keeping the packing ring 3, with one of its flat side faces 4 pressed tightly against the wall of its containing groove. The purpose of this is to preclude the gases passing beneath the ring, and also to avoid wear, for if the piston ring can be kept tightly against one of its walls at all times, the usual knocking in its groove is prevented and the resultant wear almost entirely overcome. The piston ring is thus kept properly fitting, which is highly important, as a little wear may cause considerable leakage, especially in rings of the ordinary sort. The means which I employ for keeping the piston ring borne against the wall of its groove includes a spring ring 7, the outer edge of which is conical. The conical face 8 of this ring is directed toward the packing ring 3 and bears constantly thereagainst, the packing ring being correspondingly beveled or coned as shown, so as to receive the constant bearing engagement. The spring resiliency of the ring 7 is, of course, radially outward, and a component

of this force is imparted to the packing ring 3 impelling it outward as is desired; but another component of the spring pressure of the ring 7 is in an endwise direction against the packing ring 3, so that the latter is borne tightly against a side wall of its containing groove. This effectively prevents wear and leakage in the manner above-mentioned.

As above noted, the leakage past the piston ring is almost entirely beneath the ring and not between it and the cylinder wall. This is partly overcome in my construction by the form of lap joint shown in Figs. 3 and 3ª, and particularly by the wedge or spring ring 7 which keeps the piston ring tight in its groove. It is obvious that the reaction of the packing ring against the spring ring 7 keeps the ring 7 against the opposite wall of the groove, so that a gas-tight fit in both directions is insured. As an additional precaution I ordinarily form a rib or tenon 9 on the under side of the packing ring which enters a corresponding groove 10 in the piston body. This rib or tenon 9 obviously acts as a gate to cut off the flow of gas beneath the packing ring at all points about its circumference. From another aspect the piston body may be said to be formed with an annular rib 9′ integrally continuous throughout its entire circumference and lying alongside the tenon 9 and coöperating therewith to form a gate. The result is substantially a gas-tight joint. On account of the means taken to prevent wear, it is possible to use copper instead of cast iron as a material, which is very advantageous in that it does not cut the cylinder walls under any circumstances, and moves with less friction and less lubrication. I consider this as an important practical advantage resulting from the structure of my invention, although, of course, not in itself constituting a feature of my invention.

In Fig. 4 a slight modification is shown adapted to a very large piston. In this figure the parts corresponding to those of Figs. 1 to 3ª inclusive are correspondingly denominated by reference characters, and need not be again described. In place of the rib or tenon 9, I form a pair of tenons 9ª on the packing ring and coöperating with a spring ring 14 ordinarily of steel, so as to be very resilient. The form of this ring is that of a Greek cross in sectional outline, the inner and outer ribs 15 and 16 entering the groove between the tenons 9ª in the packing ring 3 and a corresponding groove in the piston body 1, so as to make a gas-tight engagement. The two lateral ribs of the ring 14 give it stiffness or resiliency. Also in this form of the invention, I make use of a box or part 17, the essential characteristic of which is a wall 18 adapted to fit tightly against the side face 4 of the packing ring 3 at the location of a joint therein. The part 17 has a portion 19 underlying the packing ring and a stem 20 fitting in a hole 21 so as to be anchored in place. 22 indicates a spring forcing the part 17 outwardly. It is evident that if this box or part is kept with its wall 18 opposite the joint of the packing ring, and constantly pressed outward, that it constitutes an effective barrier to prevent the gases from flowing through the joints of the packing ring. This device is, of course, merely an extra precaution, the ring being itself adapted to wholly prevent the flow of the gases therethrough. In Fig. 7, a spring ring of H-form is shown in place of the cross-shaped ring 14. This form of ring has a double rib or tenon 24 in place of the single rib or tenon 15 to, coöperate with the packing ring and prevent the flow of gases therebeneath. In Fig. 8, the packing ring is shown with an internal V-shaped tenon 25 in place of the tenon 9 shown in Fig. 1. These are merely illustrated as obvious modifications, not departing from the spirit of the invention.

An additional feature is illustrated in Fig. 4. In some cases, the packing rings are so stiff, that they cannot be sprung over the body of a piston into their grooves. In such cases, it is possible to make use of a circular plate or disk 30 threaded on to a boss 31 at the end of the piston and secured by bolts 32. The plate 30 is merely reduced in diameter at one side, and properly formed to receive the packing rings, etc., after which it is secured upon the boss 31 and bolted in place. In this way, the packing rings may be assembled without springing them over the end of the piston.

Considered from a theoretical standpoint, the present piston packing is gas-tight for the following reasons: It is a fact that in a properly constructed ring leakage does not occur between it and the cylinder walls. The leakage might occur between the right hand face 4 of the packing ring 3 (in Fig. 1) and the wall of its containing groove. The gases passing through this opening would, however, meet the wedge ring 7 which is pressed outwardly by its own resiliency. The gases could not get by this ring, except perhaps at the joint thereof. Should they get past, they will be intercepted by the tenon 9, and still more efficiently by the left hand face 4 of the packing ring which is kept tightly borne against the wall of its groove. The latter is a feature of special importance, because it keeps the gases which leak into the space beneath the packing ring under pressure therein, so that these gases keep the ring borne outward against the cylinder wall. A very slight leakage of the gases into the space beneath the packing ring is therefore not particularly objectionable. The only remaining possible place for

leakage is at the lap joint of the ring 3, as shown in Figs. 3 and 3ª. Gases might leak past the face *x* (Fig. 3); but these would be intercepted by the wall 5, and as this wall is not subjected to wear, there is no reason why it should not remain permanently tight. The gases leaking into the space *x* cannot pass downward under the ring because they are intercepted by the surface 6, and this is likewise true on the other side of the ring at the surface *y*. The surfaces 5 and 6 are important ones in the construction, and these are very carefully finished. Neither is subjected to wear in use so that it should remain tight indefinitely. With a packing ring of this sort, it is found that leakage is almost entirely overcome.

What I claim, is:—

1. In combination with a piston body having a groove, a packing comprising a packing ring having an interior web or tenon, said groove being recessed at its bottom to receive said web or tenon, and a spring wedge ring with a conical outer edge engaging said packing ring to force the same endwise and outward.

2. In combination with a piston body having a groove, a packing comprising a packing ring having a transverse width to exactly fit the width of said groove, and a spring wedge ring with a conical outer edge engaging said packing ring on an interior surface thereof and entirely within said groove, to force such packing ring endwise and outward.

3. In combination with a piston body having a groove, a packing comprising a packing ring having a transverse width to exactly fit the width of said groove, and an expansible wedge ring with a conical outer edge engaging said packing ring at an interior surface thereof within said groove to force the packing ring endwise and outward.

4. A packing for pistons comprising a packing ring, a spring wedge ring with a conical outer edge engaging said packing ring to force the same endwise and outward, and an additional spring ring beneath the packing ring and forcing the same outward.

5. A packing for pistons comprising a packing ring, a spring wedge ring with a conical outer edge engaging said packing ring to force the same endwise and outward, and an additional spring ring beneath the packing ring and forcing the same outward, said last mentioned ring having a rib or tenon engagement with the packing ring to constitute a steam-tight joint therewith.

6. A packing for pistons comprising a packing ring having a joint, and a part having a plate extending alongside the joint with a flat face engaging the same, said part being constrained at a predetermined angular position on the piston.

7. A packing for pistons comprising a packing ring having a joint, a part having a plate extending alongside the joint with a flat face engaging the same, said part being constrained at a predetermined angular position on the piston, and a spring for impelling said part outward.

8. A packing for pistons comprising a packing ring, a spring wedge ring with a conical outer edge engaging said packing ring to force the same endwise and outward, and a spring ring of cross-shaped sectional outline beneath the packing ring and bearing the same outward.

9. A packing for pistons comprising a packing ring with parallel end faces and having a single joint, said joint having one flat face parallel to said end faces and located between the same, and a curved face co-axial with the outside surface of the ring but of smaller diameter, and a spring wedge ring with a conical outer edge engaging said packing ring to force the same endwise and outward.

10. In combination with a piston having a threaded protuberance or boss thereon, a plate having one edge of reduced diameter, and bolted to the piston, whereby a groove is produced to contain a packing ring, and a packing ring within said groove.

11. A packing for pistons comprising a packing ring having its interior surface formed with a rib or tenon, and a spring ring with a conical outer edge engaging said packing ring to force the same endwise and outward.

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

JOHN J. McGEE.

Witnesses:

WALDO M. CHAPIN,

MAY BIRD.