J. HORTON & T. W. KEEN.

ANNULAR METALLIC PACKING.

APPLICATION FILED JAN. 4, 1911.

1,016,689.

Patented Feb. 6, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

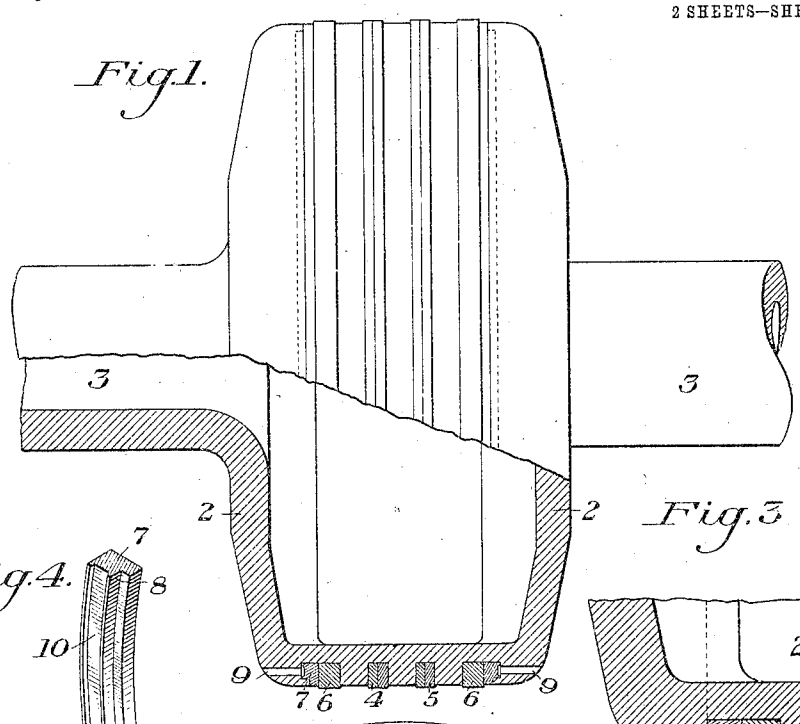


Fig. 4.

Fig. 3

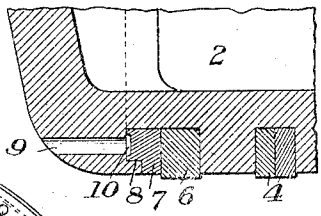
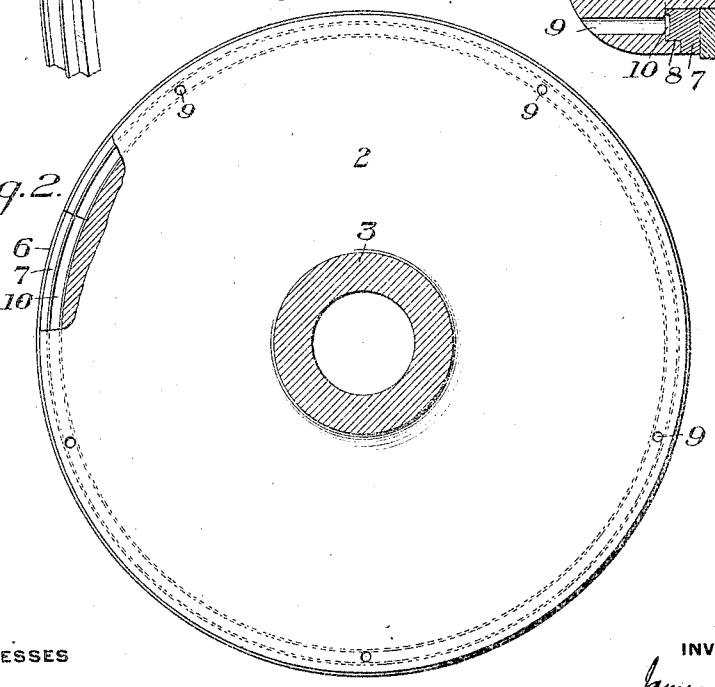


Fig. 2.



WITNESSES

R. A. Balderson

E. B. Fleming

INVENTORS

James Horton

Thos. W. Keen

by Bakewell Byrnes & Kennedy

their attys

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2 SHEETS—SHEET 2.

Fig. 5.

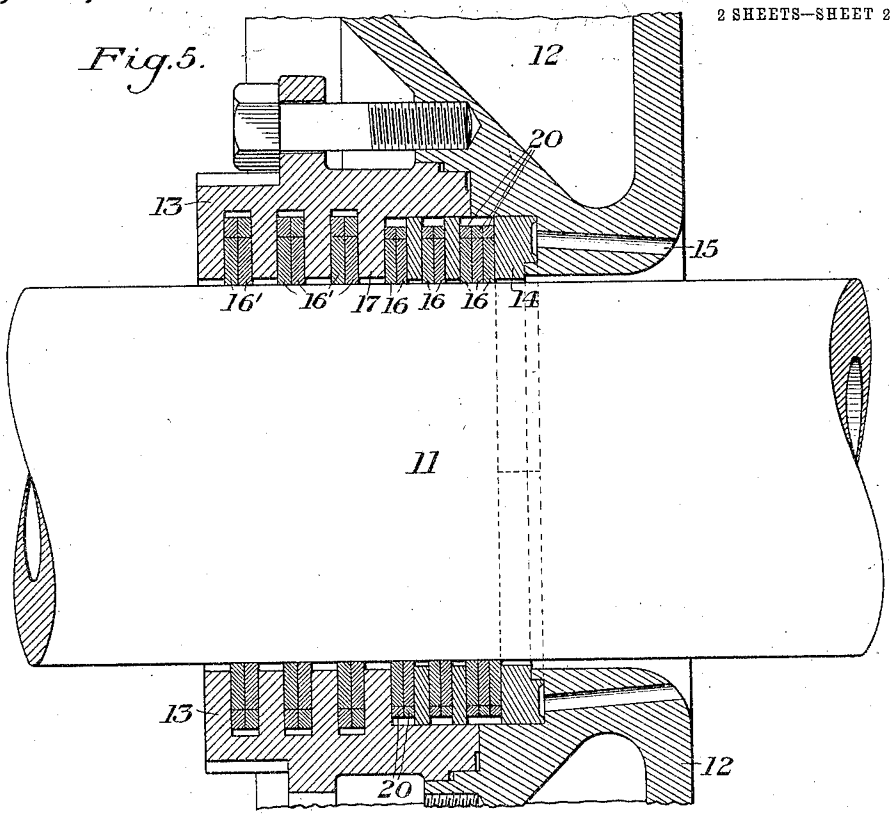


Fig. 6.

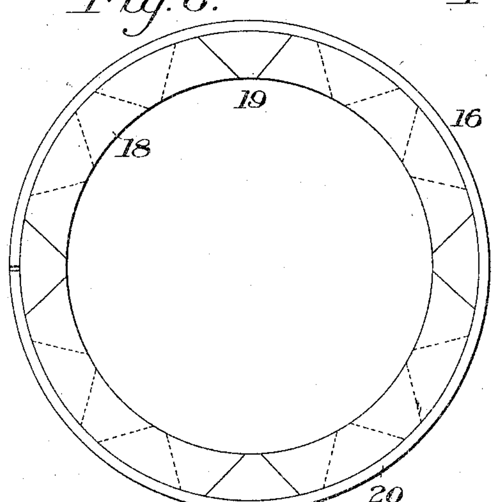


Fig. 7.

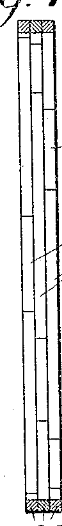


Fig. 8.

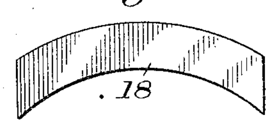
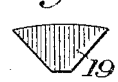


Fig. 9.



WITNESSES

R A Balderson
G. B. Bleming

INVENTORS

James Horton
Thos. W Keen
by Bakewell Byrnes Parmele
Their attys

UNITED STATES PATENT OFFICE.

JAMES HORTON, OF MUNHALL, AND THOMAS W. KEEN, OF SWISSVALE, PENNSYLVANIA.

ANNULAR METALLIC PACKING.

1,016,689. Specification of Letters Patent. Patented Feb. 6, 1912.

Application filed January 4, 1911. Serial No. 600,701.

To all whom it may concern:

Be it known that we, JAMES HORTON, of Munhall, Allegheny county, Pennsylvania, and THOMAS W. KEEN, of Swissvale, Allegheny county, Pennsylvania, have invented a new and useful Improvement in Annular Metallic Packings, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevation, partly in section and partly broken away, showing one form of our invention as applied to a piston; Fig. 2 is a plan view of the same partly broken away; Figs. 3 and 4 are detail views of the rings; Fig. 5 is a sectional side elevation showing our invention as applied to the packing of a piston rod in the cylinder head; Fig. 6 is a plan view of the packing ring arrangement; Fig. 7 is an edge view of Fig. 6; and Figs. 8 and 9 are detail views of parts of the metallic packing.

Our invention relates to the packing of circular or annular parts in reciprocating motors, pumps, &c., wherein one circular part reciprocates past another. It is of especial use in cylinders where a comparatively high pressure is developed, such as in gas engines or other explosive engines, whether single or double-acting.

In the use of pistons in explosive engines, it is found that the high pressure developed, especially at or near the beginning of the ignition stroke, will enter in the rear of the ordinary spring-packing rings and force them out with such pressure that the wear causes shoulders to form in the cylinder at the ends of the stroke. This excessive wear and shouldering gives such cylinders a comparatively short life and cause frequent reboring. The same effect is also seen on the piston rods of engines, this being partly caused by the packings in the head which are nearest the interior of the cylinder. In this case the same general action occurs.

Our invention is designed to lessen or overcome this difficulty, and it consists in providing a fluid-pressed clamping device which will hold the packing ring or rings against excessive outward pressure; as well as largely prevent this pressure from entering back of such rings.

In the drawings, referring to the form of Figs. 1 to 4, inclusive, in which we show a preferred form of the invention as applied to a double-acting gas engine piston, 2 represents the hollow piston body, and 3, 3 the piston rods or piston rod connections leading therefrom. The periphery of the piston is provided with annular recesses to receive the usual split spring packing rings, of which the intermediate rings 4 and 5 may be of the ordinary type and inserted in the usual manner. In the packing ring recesses nearest the working faces of the piston we seat one or more packing rings 6, which may be of the ordinary elastic spring type; and before these are inserted we snap into this annular recess the split clamping ring 7, which is shouldered as shown at 8 so that the base portion is wider than the exposed portion. This ring is split at one point in its periphery, so that it may be snapped into the annular groove, and is preferably of such length that when expanded under the heat of working its ends will substantially abut and prevent the entrance of fluid pressure at this abutting joint. These ends may also, of course, be scarfed or otherwise joined, but are preferably arranged so as to substantially prevent the inlet of fluid.

The face of the piston is provided with a series of inlet holes 9, of which any desired number may be used, these leading into the face of the clamping ring opposite to that face contacting with the packing ring 6. Such face is preferably provided with an annular recess 10 to allow the fluid entering through the holes to pass around and contact with this entire face of the clamping ring. We have shown five of these holes through each face, though any desired number may be used.

In the operation of the device, the fluid pressure in the cylinder enters the holes 9, and by acting upon the recessed face of the clamping ring, will force this clamping ring against the packing ring 6 and thereby clamp it against the opposite wall of its containing recess. The clamping ring is made a careful neat fit, so that little, if any, pressure will pass underneath the clamping ring and packing ring to force the packing ring out. Such a small amount of pressure creeping in is so much smaller than the pressure exerted upon the clamping ring to clamp the packing ring in place, that the packing ring will be held against excessive forcing out against the wall of the cylinder. In a double-acting engine this action, of course, takes place alternately, first on one side of

the piston and then upon the other at the explosion strokes.

As the intermediate packing rings 4 and 5 are located between the outer packing rings, there is little or no need of arranging these with the clamping rings and supply ports as above described, though they may be so arranged if desired.

In Figs. 5 to 9, inclusive, we show the invention as applied to the packing gland in the head of a cylinder and surrounding the piston rod. In this case 11 is the piston rod, 12 the head of the cylinder, and 13 the gland which is removably tap-bolted to the head. This gland may contain a series of metallic packing rings 16 and 16′ of any usual or desirable type, and especially for the rings in the groove nearest to the interior of the cylinder we apply our invention as above disclosed. In this case 14 is the two-piece clamping ring, which is otherwise similar to the ring of the first form, and 15 are the pressure holes leading to the recessed face of this ring. These holes allow fluid to pass through the head of the cylinder and to the face of the ring so as to clamp the packing rings 16 firmly in place. We have shown three sets of these rings, one set containing three, and the other two sets containing two each, in the gland, these being pressed against the dividing wall 17 of the gland, by the fluid pressure on the clamping ring. The packing rings 16 in the form shown, each comprise two shapes, one shown at 18 in Fig. 8, and the other at 19 in Fig. 9. The annulus is made up of these alternate shapes, and the joints of one annulus are arranged in staggered relation to those of the next and held by the encircling spring ring 20. In this case, a relatively stationary packing around a relatively movable cylinder, the action is, of course, the same as in the case of the movable piston carrying the rings, except that the packing action is a contracting one around the piston rod. By the word "expansible" in our claims we intend to cover either outward expansion or inward expansion; as for example, in the two forms shown.

The advantages of our invention will be obvious to those skilled in this art, since excessive outward pressure on the packing rings is avoided, and thereby excessive wear and shouldering of the cylinders or piston rods is lessened or avoided.

The system is simple, may be cheaply made, and is not liable to get out of order. The amount of pressure upon the clamping rings will be proportionate to the pressure exerted by the explosive charge.

The invention may be applied to single or double-acting cylinders, the form and arrangement of the fluid-pressure-actuated clamping device may be varied; and other changes may be made without departing from our invention.

We claim:—

1. A packing device for piston heads having an annular groove on each end thereof, a split packing ring seated in each groove, a sectional clamping ring seated in each of said grooves for clamping the rings against the walls of the grooves, there being ports leading outwardly through the walls of the piston heads from the grooves, said ports being arranged to permit fluid pressure to act upon the clamping rings to force them in a longitudinal direction to clamp the packing rings against the walls of the grooves to prevent expansion of the packing rings by fluid pressure, each of said clamping rings being arranged to be acted upon by the fluid pressure when the piston is moved in one direction and free from the action of the fluid pressure during its movement in the other direction and means for preventing radial movement of the clamping ring sections; substantially as described.

2. A packing device for fluid pressure cylinders having an annular groove, a split packing ring seated in said groove, a sectional clamping ring seated within said groove, there being ports from said groove to admit fluid pressure to the side of the clamping ring to clamp the packing ring against the wall of the groove to prevent expansion of the packing ring by fluid pressure, and means for preventing the expansion of the clamping ring by the fluid pressure; substantially as described.

3. A packing device for piston heads, having an annular groove, a split packing ring seated in said groove, an annular flange extending over a portion of said groove, and a sectional clamping ring seated within said groove under said flange, there being ports through the side of the piston head to admit fluid pressure to the side of the clamping ring to clamp the packing ring against the wall of the groove to prevent expansion of the packing ring by the fluid pressure; substantially as described.

In testimony whereof, we have hereunto set our hands.

JAMES HORTON.
THOMAS W. KEEN.

Witnesses:
J. A. HAMILTON,
W. H. CORBETT.