March 31, 1931. J. MELLOR 1,798,268

PACKING FOR RECIPROCATING OR ROTATING MEMBERS

Filed Dec. 11, 1923 2 Sheets-Sheet 1

FIG 1

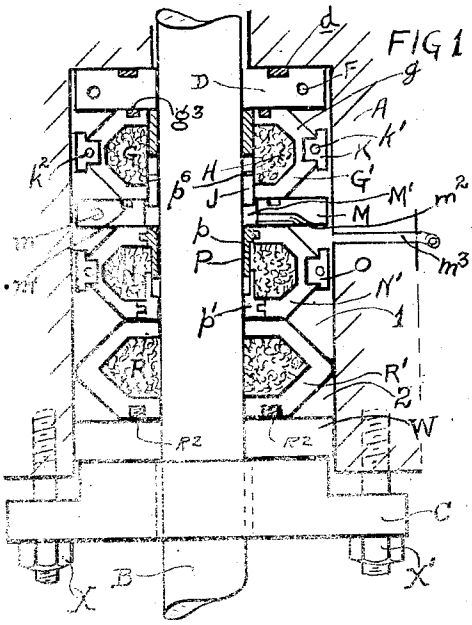


FIG. 2

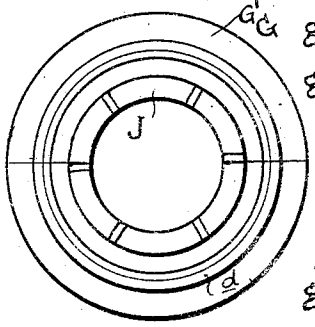


FIG 3

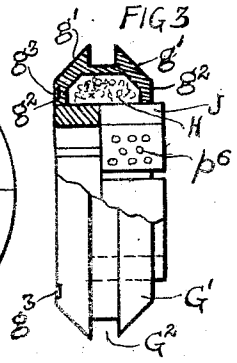


FIG. 4

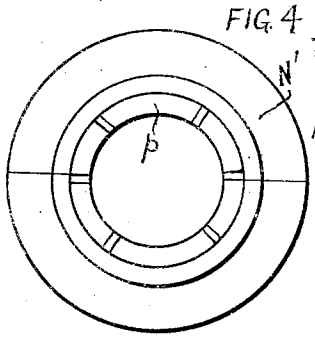


FIG 5

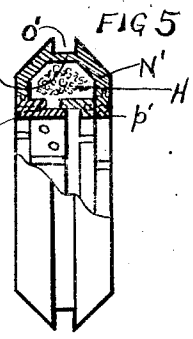


FIG. 6

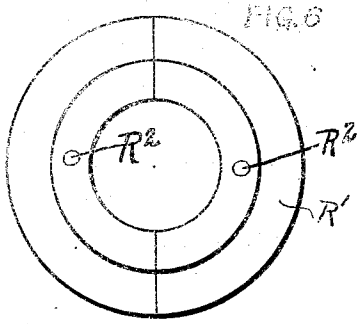


FIG. 7

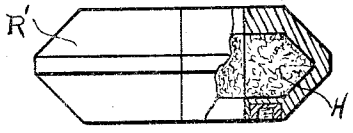


FIG. 8

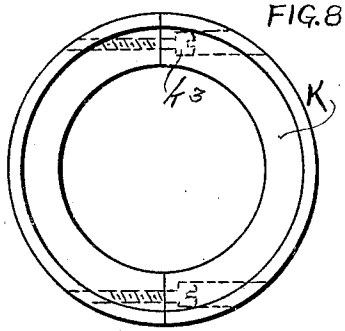


FIG. 9



FIG. 10

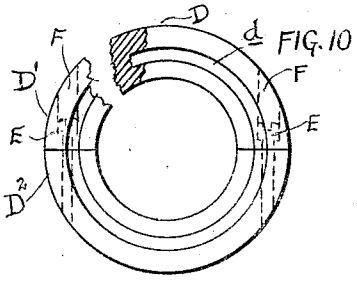


FIG 11

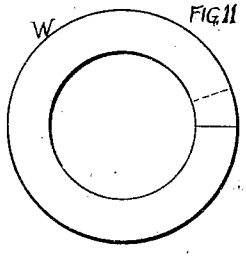
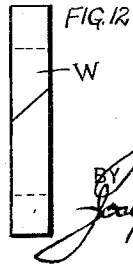


FIG. 12



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FIG 13

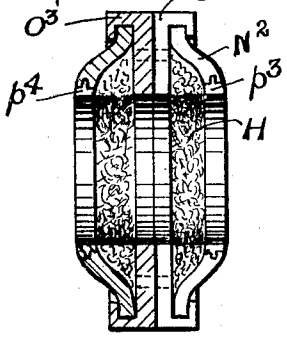


FIG 14

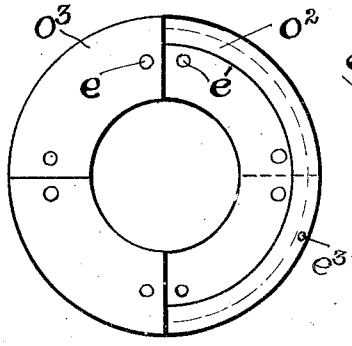


FIG 15

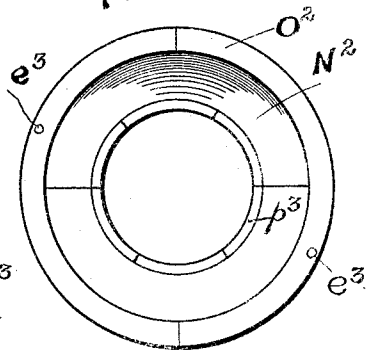


FIG. 16

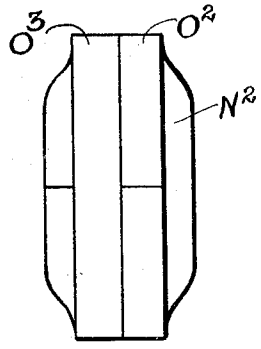


FIG. 17

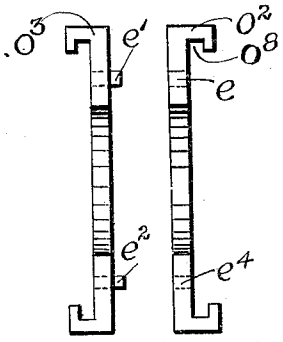


FIG. 18

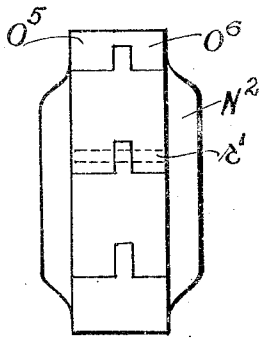


FIG. 19

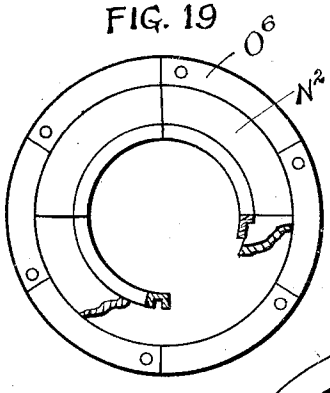


FIG 20

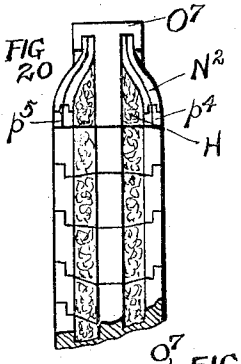


FIG. 21

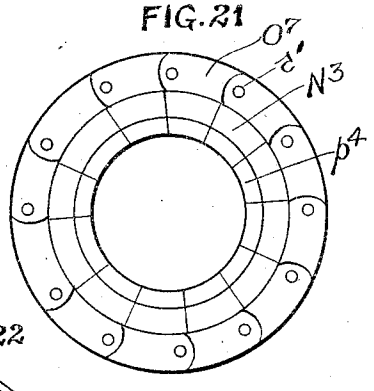


FIG. 22

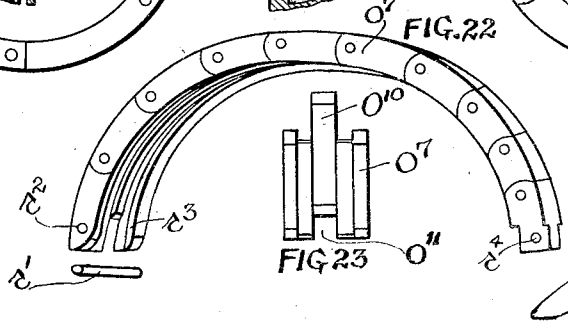


FIG 23

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Patented Mar. 31, 1931

1,798,268

UNITED STATES PATENT OFFICE

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PACKING FOR RECIPROCATING OR ROTATING MEMBERS

Application filed December 11, 1923. Serial No. 679,971.

This invention relates to improvements in packing for the reciprocating or rotating members of engines, compressors, pumps, expansion joints and the like, and particularly to a metallic packing composed of a compressible ring provided with a compressible lubricating material within the same.

Among the objects of my invention is to produce a packing of the type specified which will not bind or become jammed within the box and may be readily removed or applied; which is capable of forming and at all times maintaining a tight joint (1) with the reciprocating or rotating member without binding on said member; (2) which, due to the conformation of the ring and the fact that it is provided at or adjacent to the perimeter of the ring with an initial guiding bend or crease, about which the sides of the ring turn in collapsing movement upon compression, is capable of accurate adjustment for wear, and the application of pressure by the gland or steam or otherwise on its sides, will cause the ring, in its collapsing movement, to be extended radially with substantial uniformity along predetermined or fixed lines and to have sliding contact with the reciprocating or rotating member with a substantially uniform degree of pressure at all points; which provides compensation for the irregular travel of said member in relation to the box, the vibration thereof or for expansion and contraction due to heat and cold; which maintains a truly aligned concentric position with respect to the member; which is self-lubricating; which is durable and has a relatively long life, provision being made for a sectional reinforcing lining to increase the life of the ring and which provides for the making of a tight sliding joint between component rings and between such ring and the box and gland.

With these and other objects in view, the invention comprises the combination of members and arrangement of parts so combined as to co-act and cooperate with each other in the performance of the functions and the accomplishment of the results herein contemplated, and comprises in one of its adaptations the species or preferred form illustrated in the accompanying drawings, in which:—

Fig. 1 is a longitudinal section of a stuffing box of the usual construction showing the reciprocating or rotating member in place and partially surrounded by a metallic packing embodying my invention;

Fig. 2 is a side elevation of the inner side of a ring shown in Fig. 1;

Fig. 3 is an end view partly in section and partly in elevation of a ring shown in Fig. 2;

Fig. 4 is a side elevation of the middle ring shown in Fig. 1;

Fig. 5 is an end view partly in section and partly in elevation of the ring shown in Fig. 4;

Fig. 6 is a side elevation of a ring preferably formed in two parts and showing tapped holes for use in removal of ring from stuffing box;

Fig. 7 is an end view partly in section and partly in elevation of the ring shown in Fig. 6;

Fig. 8 is a side elevation of the casing ring or housing shown at the upper end of Fig. 1;

Fig. 9 is an end view partly in section and partly in elevation of the casing ring shown in Fig. 8;

Fig. 10 in a side elevation of a two part rigid inner ring for contact with the bottom of the box adapted to carry a sealing material;

Figs. 11 and 12 are, respectively, side and end views of a ring formed of pliable material in one piece and split diagonally to permit the same to be sprung over a moving member and which type of ring may be utilized to embody my invention;

Fig. 13 is a view in cross-section of a modification of ring shown in Figs. 4 and 5;

Fig. 14 is a side elevation of the central segmental housing or casing of the ring shown in Fig. 13 with a section omitted;

Fig. 15 is a side elevation of ring shown in Fig. 13;

Fig. 16 is an end elevation of the ring shown in Fig. 13;

Fig. 17 is an elevation of sections of the segmental housing or casing of the ring shown in Figs. 13 to 16;

Fig. 18 is an end elevation of a modified

type of ring having the sectional housing or casing formed of hinged members;

Fig. 19 is a side elevation of the ring shown in Fig. 18 in part section showing relation of casing walls and shoe;

Fig. 20 is another modification of the type of ring shown in Figs. 18 and 19, showing the ring in partial section through center;

Fig. 21 is a side elevation of another modified form of the type of housing of the ring shown in Fig. 20;

Fig. 22 is a perspective view of the housing or casing of the ring shown in Fig. 21; and

Fig. 23 is a segment of housing or casing of the ring shown in Fig. 22.

Referring now to these drawings which illustrate preferred embodiments of my invention, and particularly to Figs. 1 to 10 thereof, A (Fig. 1) indicates a stuffing box of usual construction with the reciprocating or rotating member B in place and packed with a metallic packing embodying my invention. As illustrated, said packing comprises a bottom ring D, more particularly illustrated in Fig. 10, one side of said ring D being provided with a countersink or groove *d* in which is inserted a sealing material contacting with the bottom of the stuffing box, so that any roughness on the bottom of the box is compensated for and a substantially sealed joint between this side of the ring and the bottom of the stuffing box is provided. The opposite side of said ring D is preferably plain or flat and the ring is of a diameter sufficient to fit loosely within the stuffing box. Said ring D thus provides a substantially sealed joint with the bottom of the stuffing box and also a smooth flat contact surface for the following ring, and is, as shown in Fig. 10, preferably formed in two parts D′—D² connected together by means of screws E passing through bores F.

The following ring G is inserted in the box in contact with said bottom ring. This ring is preferably of the type more particularly illustrated in Figs. 2 and 3, and comprises, as shown, a hollow compressible shell G′ which, as illustrated, has its outer rim portion substantially triangular in cross-section so as to provide a guiding bend or crease in its outer edge or perimeter, about which bend or bends the ring in its collapsing movement is adapted to move. In the preferred embodiment of my invention illustrated, the said ring is formed of a relatively soft metal such as lead composition and each of the opposite faces or sides has inclined portions *g′* and flat contact portions *g²*. The flat contact portion of the inner face of the ring is preferably provided with a groove *g³* within which may be inserted a sealing material and the face or surface containing said groove is inserted into the box first and abuts against the bottom ring D. In this ring, the periphery of the shell G′ is preferably provided with a circumferential groove G² which forms a seat for a rigid housing ring K. The shell G′ is preferably packed with a porous filler H composed of compounded fibers and lubricating materials and the annular inner face of the shell is provided with a reinforcing lining J formed of a plurality of segmental sections of separate pieces of tough metal so arranged as to permit contraction and expansion circumferentially and in the type of ring shown in Figs. 2 and 3 the shell G′ is adapted in its movement upon compression to slide along laterally on said lining which, as shown, is of a fixed width.

A rigid spacing ring M is now preferably inserted which is preferably provided with a bore M′ large enough to fit over the lining J of the ring G, so that when the shell G′ of the ring G is compressed, this rigid spacing ring will move on over such lining. Said ring is preferably formed in two parts and connected together by screws fitted in the apertures *m* and is also provided with a groove *m′* in its inner face which is adapted to contact with the outer face of the shell G′.

Another compressible ring N is preferably inserted and bears at one side against the spacing ring M. As illustrated more particularly in Figs. 1, 4 and 5, said ring N comprises a shell N′ of substantially similar conformation and composition to the ring G, having in its outer perimeter an initial guiding bend *n* adapted to cause the shell in its collapsing movement to move about the same, being packed with a similar filler and also having in its periphery circumferential groove O′ forming a seat for a rigid housing ring O or K. This ring also has a reinforcing lining P which, as shown, is of somewhat different construction to the lining of the ring G, being preferably formed of a series of segmental portions, each formed of two split parts *p—p′*, one of which has a laterally-extending portion overlapping the other so as to have a lateral sliding movement relatively and these parts *p—p′* are connected to the opposite walls of the shell N′ and move with the same in its collapsing movement.

Still another ring R is inserted which, like the rings G and N, is compressible and comprises a shell R′ of similar composition and packed with a similar filler of fibrous material compounded with a lubricating material, and has a substantially similar conformation, having an initial guiding bend in its perimeter, but in this ring, unlike the rings G and N, the outer rigid housing ring and the reinforcing lining is omitted. The shell of this ring has a bore which is adapted to fit the rotating or reciprocating member snugly and the outer periphery is adapted to contact with the wall of the stuffing box so as to completely seal the space between the box and said member. All

of the rings G, N and R are preferably segmental as shown in Figs. 2, 4 and 6 respectively, are formed in two complementary parts and these complementary parts in the case of the rings G and N are fastened together by a rigid housing ring K which is likewise formed in two parts and fastened together by screws k^3 which are inserted through holes k^2 in one part and enter bores k^1 in the other part as more particularly illustrated in Figs. 8 and 9.

From the above, it will be seen that because the rings G—N and R have initial guiding bends at the perimeters, and because the action of the pressure induced by the gland tends to force these sides together and into a straight line, the pressure of the gland as resultant from the tightening of the nuts X and X′ will cause a constant and controllable pressure of the annular surfaces of the rings inwardly against the liners and the reciprocating or rotating member, and the internal compounded fibrous filler will be compressed toward the rod and will release in partial amounts the lubricant. The confinement of the rings G and N by the rigid casing or housing rings assists in obtaining this result in these rings without binding on inner walls of the box.

It will be noted that there are open spaces 1 and 2 between the rings which give freedom for movement of the ring in a radial direction away from the rotating or reciprocating member in case the pressure produced through the gland movement becomes excessive. This leaves the resultant position and shape of the ring as effective as before and avoids possible damage to rings or members.

It will be seen furthermore that by the use of my invention, I am enabled to form a vaporous or liquid tight packing. This is preferably accomplished, as shown, by first inserting a bottom ring similar to Fig. 10 with its smooth side exposed to the following ring of the type shown in Fig. 2, the grooved side of the ring entering first. The lining on the annular surface of this ring is of a tough bearing metal so that frictional heat will not be sufficient to distort it in case of neglect temporarily of sufficient lubrication. The lining has a face the entire width of the ring so that in the absence of sufficient lubrication the sides will not have a tendency to drag together and is split through the center to permit offset segmental divisions. This lining also projects on one side to act as a guide for the following ring of a design similar to Fig. 10. The following compressible ring of the design illustrated in Figs. 4 and 5, preferably has a lining on its inner annular surface internally divided and overlapping on its circumference to permit of collapse horizontally and is segmentally divided to admit of contraction under compression. Both compressible rings G and N being bound in a casing or housing of rigid construction, maintain their respective circumferential size and shape under compression, but have freedom of movement radially within the box. The ring R has a side groove R^2 (see Fig. 1) outward toward the gland for insertion of the flexible sealing material. This ring contacts with the reciprocating or rotating member and the inside wall of the box, and spreads inwardly and outwardly under the compression induced by setting up on nuts X and X′. A ring W of the type shown in Figs. 11 and 12 then preferably follows and also contacts with the said member and with the internal surface of the box after which the gland C is applied.

The segmental linings are preferably provided with perforations or holes p^6 through which the lubricating material is adapted to pass to the reciprocating or rotating member.

Under certain conditions it is necessary, in order to meet the requirements of particular stuffing boxes and also in order to provide for conditions of high pressure or temperature, it is desirable to use modifications of the packing rings hereinabove shown and described, and with this in view I have, in Figs. 13 to 23, shown a series of such modifications. Thus in Figs. 13 to 16 I have shown a type of ring having a more rigid housing, frame or casing. Thus in these figures O^2 is a casing or housing formed in semicircular segments having annular grooves O^8 (see Fig. 17), within which grooves the perimetal edges of the sides N^2 (see Fig. 13) are maintained, the sides N^2 being bent or tapered toward the periphery of the ring so that the ring will have a hollow portion which is compressible by external pressure exerted at the sides and said sides will be guided to move under compression about the perimeter or edge of the said bent portion N^2, which perimetal edge portion within the groove remains constant and is held in fixed position by the confining housing O^2. The shoe p^3 on the angular surface N^2 is shown surrounding the bore of the ring.

In Fig. 14 one of the sections of the housing O^2 is removed showing the apertures e into which pins e' fit to effect a rigid ring.

In Fig. 15 I show apertures e^3 comprising holes drilled and tapped for the purpose of enabling the ring to be withdrawn from the stuffing box by a suitable screw threaded implement.

In certain instances where the reciprocating or rotating members are not new or else are imperfectly made it is desirable to make the housing O^7 (Fig. 21) rigid to the extent of the length of the circumferential arc of such reciprocating or rotating member but said casing is preferably made flexible to the extent of accommodating rod variations due to such imperfections or wear, so that under compression the packing ring becomes ellip-

tical to the extent that the major axis never quite equals the diameter of the stuffing box into which it is fitted. In such cases I preferably provide a segmental housing of the construction shown in Figs. 18 to 23. In these figures the elements of the housing O^6 (Fig. 18) or O^7 (Figs. 21 to 23) are joined in overlapping mated ends comprising projections O^{10} and countersinks O^{11} connected together by pins p' which extend through apertures p^2. In other respects the packing ring is similar to that shown and described in Figs. 13 to 16.

In certain embodiments it is also desirable to lubricate the interior of the stuffing box with oil and for this purpose I have provided a pipe m^3 extending through the wall of the stuffing box and also provided a bore M^2 in the solid ring M for permitting oil or similar lubricating material from the pipe m^3 to have access to the rod B.

The ring R′ is preferably provided with tapped holes R^2 which are adapted to receive the threaded ends of an implement to permit a pull to be exerted upon the said ring for the purpose of withdrawal of the same from the stuffing box A. The inner rings, in view of the rigid housings K and O, do not contact with the stuffing box and therefore may be readily withdrawn without the use of implements.

Having described my invention, I claim:—

1. A packing ring comprising a substantially hollow shell composed of a plurality of hollow segmental sections, each segment having sides inclining toward a perimetric portion about which the sides of said shell are guided to move under pressure exerted axially of the shell against the sides thereof, a rigid ring T-shaped in cross section also composed of sections, and means for securing said rigid sections to each other to fasten the hollow segmental sections together.

2. A packing ring comprising a substantially hollow shell composed of a plurality of hollow segmental sections, each segment having sides inclining toward a perimetric portion about which the sides of said shell are guided to move under pressure exerted axially of the shell against the sides thereof, a segmental lining shoe on the inner annular surface of said hollow shell, a segmental rigid ring composed of sections, and means for securing said rigid sections to each other to fasten the hollow segmental sections together.

3. A packing ring comprising a substantially hollow shell composed of a plurality of hollow segmental sections, each segment having sides inclining toward a perimetric portion about which the sides of said shell are guided to move under pressure exerted axially of the shell against the sides thereof, said shell being provided in said perimetric portion with a groove and a relatively rigid ring seated in said groove and composed of a plurality of segmental sections secured to each other to fasten the hollow ring sections together.

4. A packing ring comprising a substantially hollow shell composed of a plurality of hollow segmental sections, each segment having sides inclining toward a perimetric portion about which the sides of said shell are guided to move under pressure exerted axially of the shell against the sides thereof, said shell being provided in said perimetric portion with a groove and a relatively rigid ring T-shaped in cross section seated in said groove and also composed of a plurality of segmental sections secured to each other to fasten the hollow ring sections together.

In witness whereof, I have signed my name to the foregoing specification.

JOHN MELLOR.