

June 5, 1923.

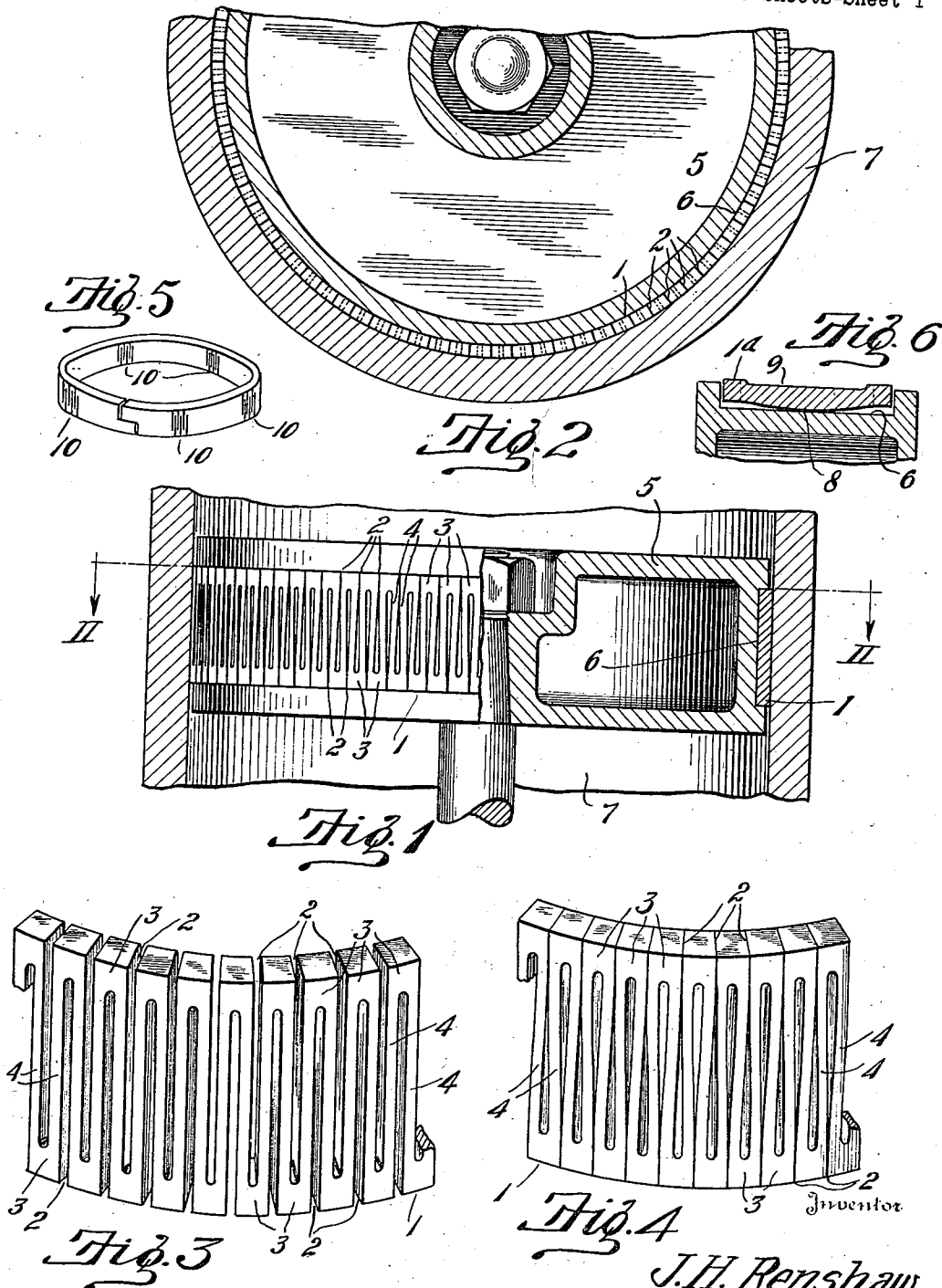
J. H. RENSHAW

1,457,461

METALLIC PACKING

Filed Oct. 3, 1921

3 Sheets-Sheet 1



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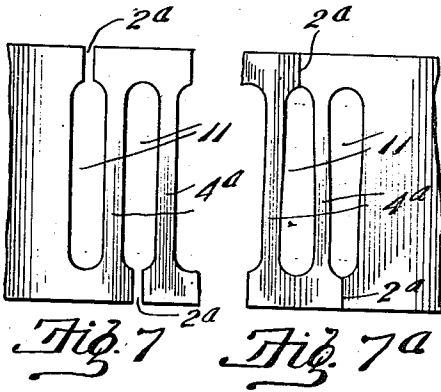
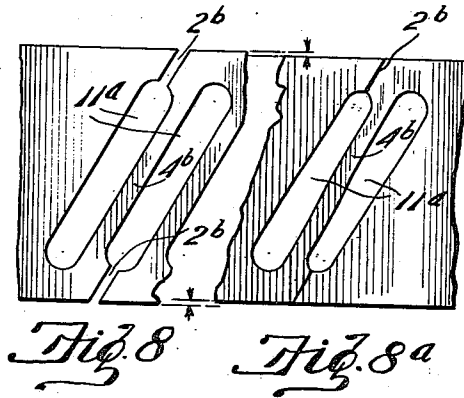
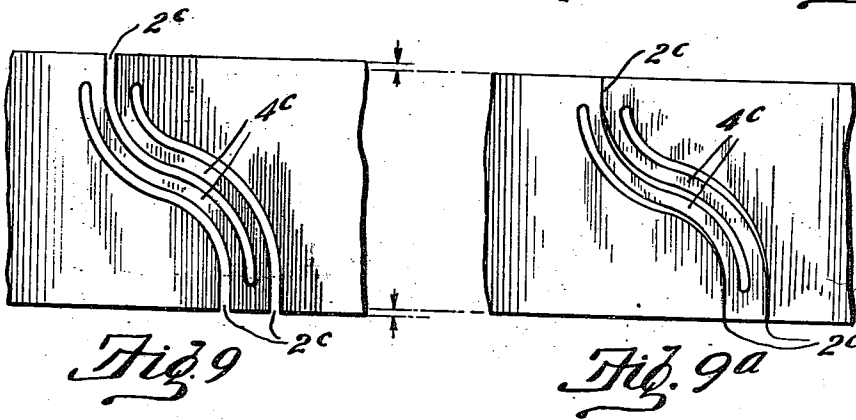
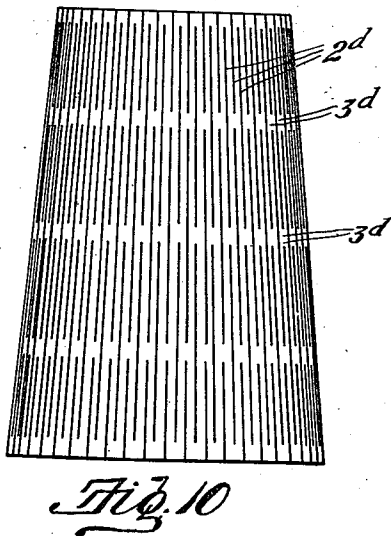
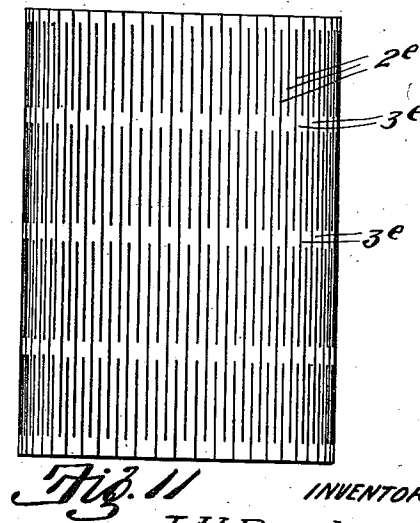
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METALLIC PACKING

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INVENTOR

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METALLIC PACKING

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3 Sheets-Sheet 3

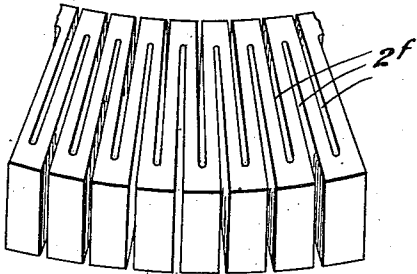


Fig. 12

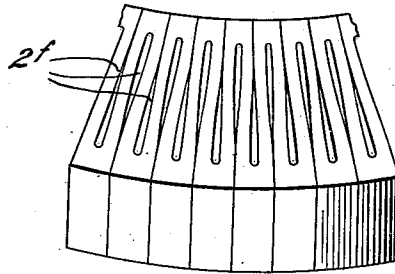


Fig. 12a

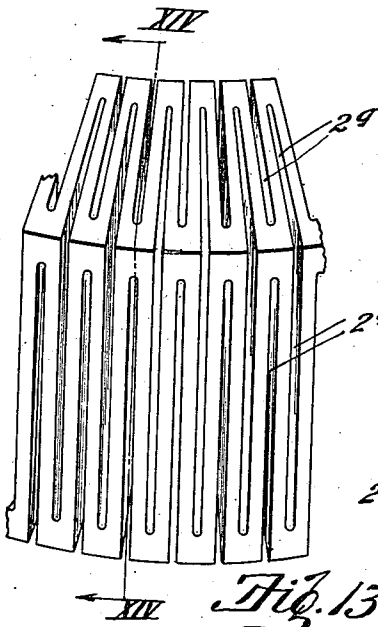


Fig. 13

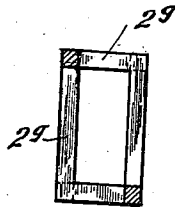


Fig. 14

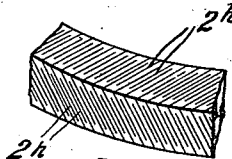


Fig. 15

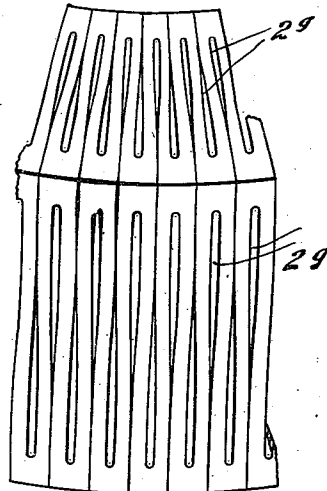


Fig. 13a

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UNITED STATES PATENT OFFICE.

JOSEPH HOWARD RENSHAW, OF CANTON, OHIO.

METALLIC PACKING.

Application filed October 3, 1921. Serial No. 505,176.

To all whom it may concern:

Be it known that I, JOSEPH HOWARD RENSHAW, a citizen of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Metallic Packings, of which the following is a specification.

The invention relates to cylindrical, conical and elliptical packing rings and bushings; and the object of the improvement is to provide a packing ring or bushing with an inherent expanding action in one or more of its three dimensions, when contracted or compressed, and vice versa, as distinguished from a resilient reaction when flexed from normal alinement; and which will contract and expand without distorting the plane of the edges of a ring or the ends of a bushing, or the continuity of any of the surfaces of the same.

The object of the improvement is attained by forming or cutting in the body of a ring or bushing, a series of parallel slots or kerfs in staggered relation, with rows of inflexible bonds at the ends of adjacent kerfs, so proportioned that the bars or plates formed between adjacent kerfs are comparatively thin and will bend laterally only, that is tangentially or circumferentially of the ring, when the relatively thick bonds are compressed to close the kerfs at the sides of the bonds, without deflecting or distorting the bonds from their normal position, and without any bending of the bars edgewise, that is diametrically of the ring.

The invention is illustrated in various forms in the annexed drawing forming part hereof, in which—

Figure 1 is a peripheral elevation section of the improved ring, showing its use on a piston in a cylinder;

Fig. 2, a plan section of the same on line II—II, Fig. 1;

Fig. 3, a fragmentary, perspective view of a piston ring somewhat enlarged, showing the arrangement of kerfs, bonds and bars in normal expanded position;

Fig. 4, a similar view showing the kerfs, bonds and bars in compressed or contracted relation;

Fig. 5, a perspective view of an ordinary split piston ring having sections cut with kerfs to permit a circumferential contraction and expansion.

Fig. 6, a fragmentary section of a modified form of piston ring;

Figs. 7, 7^a, 8, 8^a, 9 and 9^a are fragmentary peripheral plans of rings showing modified forms of the slots and kerfs;

Figs. 10 and 11 are side elevations, respectively, of elongated, conical and cylindric bushings, containing a plurality of rows of kerfs forming bars and bonds;

Figs. 12 and 12^a and 13 and 13^a are fragmentary perspective sections of rings showing other modified forms of slots or kerfs;

Fig. 14 is a section on line XIV—XIV, Fig. 13; and

Fig. 15, a fragmentary perspective section of a solid ring, showing slots or kerfs like Fig. 13, located in oblique planes.

Similar numerals refer to similar parts throughout the drawings.

For use as a cylindric ring 1, as shown in Figs. 1 to 4, inclusive, the ring is first cast or otherwise formed of solid resilient metal, after which a series of radial slots or kerfs 2 are cut across the ring, alternately from opposite edges thereof, as shown in Fig. 3, each kerf terminating short of the other edge of the ring far enough to leave a deep inflexible bond 3 between the alternate kerfs cut from that edge, and the cuts or kerfs are spaced from each other so as to form comparatively thin bars 4 between the adjacent portions of the kerfs, which will bend circumferentially but not diametrically by a circumferential compression of the ring, and without deflecting or distorting the thicker deep bonds from the plane of the edges of the ring as shown in Fig. 4.

For use on a piston 5, having a ring seat 6 in its periphery, the ring may be circumferentially expanded from normal position to pass over the rim of the piston and will contract to normal position in the seat thereof. The parts are so proportioned that the ring must be circumferentially compressed from normal position to enter a cylinder 7, as shown in Fig. 2; in which position the resilience of the reversely bent bars 4 tends

to circumferentially expand the ring into normal position so that every portion of the periphery of the ring is pressed uniformly and with equal force against the inner face of the cylinder.

The inflexibility of the bonds 3 maintains them in their normal plane when the ring is compressed to abut their sides, as shown in Figs. 1 and 4, and it is evident that the circumferential resiliency of the ring causes it to fit the inner face of the cylinder, even though it is worn by use to be slightly conical or elliptical.

The thickness of the bars between the kerfs is proportionally less than the thickness of the wall of the ring or bushing, so that the bars will flex or bend circumferentially only, and will not bend or flex diametrically of the ring; which diametrical inflexibility of the bars prevents any buckling of the same between the bonds, and maintains a true geometric shape of the ring or bushing as a whole.

The ring may be made to more readily adapt itself to a cylinder worn out of true, by forming the ring 1^a with the modified section shown in Fig. 6 wherein the inside face is convexed in the middle to form a rocker rib or zone 8 bearing upon the piston seat 6; and the outer face of the ring is recessed to form an annular channel 9 in the outer edges of the bars, so that only the faces of the bonds will impinge the cylinder.

It will be understood that the width of the kerfs or cuts between the bonds is so narrow, that when the ring is compressed in use, and the bars are reversely bent circumferentially of the ring, the adjacent sides of the bonds are always maintained in parallel relation, and will either be in abutment throughout their whole extent or will have such a slight space between them that if lubricating oil or water of condensation enters therein, the space will be filled and sealed thereby, so as to aid in maintaining a steam tight joint.

It is preferred to cut the series of kerfs entirely around a continuous ring, but it is obvious that a split or a segmental ring may be made circumferentially expansible by cutting a series of kerfs in a portion or portions 10 of the ring as shown in Fig. 5.

In the modifications shown in Figs. 7, 7^a, 8 and 8^a, enlarged slots 11 or 11^a may be cast or otherwise formed in the intermediate portion of the ring, either parallel with the axis of the ring as shown in Figs. 7 and 7^a, or inclined thereto, as shown in Figs. 8 and 8^a; so that the alternate kerfs 2^a and 2^b need only be cut from the edges of the rings into the ends of the slots.

In the modifications shown in Figs. 9 and 9^a, the kerfs 2^c may be cut or formed along reverse curves; and it is evident that the inclination given to the bars 4^b and 4^c

between the kerfs will decrease the width of the ring when it is contracted circumferentially, thus causing the ring to contract or expand in width when it contracts or expands circumferentially, so as to more neatly fit the sides of a channel seat.

In the conical bushing or sleeve shown in Fig. 10, and in the cylindric bushing or sleeve shown in Fig. 11, series of laterally-adjacent, longitudinally-aligned staggered radial kerfs 2^d and 2^e are cut, cast or milled in rows around the sleeve, extending lengthwise in the general direction of the axis of the sleeve, with inflexible bonds 3 at the ends of alternate kerfs at each end of the sleeve, and inflexible bonds 3^b and 3^c between adjacent ends of aligned kerfs intermediate the ends of the sleeve, so as to form annular rows of flexible resilient bars between annular rows of bonds.

In the modification shown in Figs. 12 and 12^a, the kerfs 2^f are located radially from the inner and outer sides of a ring, and the sides of the kerfs should be radially cut, especially along side the bonds.

In the modification shown in Figs. 13, 13^a, and 14, slots or kerfs 2^g are cut from two sides of a ring, which may be segmental and hollow, as shown in Fig. 14, or may be solid, as shown in Fig. 15; in which latter event the bars will take the form of thin resilient plates or sheets.

As shown in Fig. 15, slots or kerfs 2^h cut from two sides may be located in oblique planes, so that the ring will contract or expand in all its three dimensions, when compressed or tensioned circumferentially.

I claim:

1. A metallic packing having a series of laterally adjacent kerfs in staggered relation, with rows of bonds at alternate ends of adjacent kerfs, and resilient bars between the kerfs flexible circumferentially and inflexible diametrically of the packing.

2. A metallic packing having a series of laterally adjacent kerfs in staggered relation with rows of bonds at alternate ends of adjacent kerfs and flexible resilient bars between them, said bars being larger in a diametrical than in a circumferential direction whereby they are flexible circumferentially and inflexible diametrically of the packing.

3. A metallic packing having a series of laterally adjacent kerfs in staggered relation, with rows of inflexible bonds at alternate ends of adjacent kerfs and resilient bars reversely flexible circumferentially of the packing, whereby the adjacent sides of the bonds are maintained in parallel relation and may abut throughout their whole extent by a circumferential compression of the packing.

4. A metallic packing sleeve having a series of laterally-adjacent longitudinally-

aligned kerfs in staggered relation extending lengthwise in the general direction of the axis of the sleeve, with inflexible bonds at the ends of alternate kerfs at each end of the sleeve and inflexible bonds between the ends of aligned kerfs intermediate the ends of the sleeve, there being annular rows of flexible resilient bars between annular rows of bonds.

10 5. A metallic packing having a series of laterally adjacent kerfs forming bar members in staggered relation, with rows of bonds at alternate ends of adjacent kerfs having a relative proportioning with respect
15 to the thickness and depth of the bar members intervening between said kerfs, whereby flexing action thereof will be confined to a direction circumferentially of the packing.

20 6. A metallic packing having a series of laterally adjacent kerfs forming bar members in staggered relation, with rows of bonds at alternate ends of adjacent kerfs

having a relative proportion to the circumferential thickness and diametrical depth of the bar members intervening between the said kerfs, whereby flexing action will be confined to the bar members circumferentially of the packing and whereby the adjacent sides of the bonds are maintained in parallel relation that they may abut throughout their whole extent by a circumferential compression of the packing. 25 30

7. A metallic packing having a series of laterally adjacent kerfs in staggered relation with rows of inflexible bonds at alternate ends of adjacent kerfs and resilient bars reversely flexible toward each other and otherwise inflexible, whereby the adjacent sides of the bonds are maintained in parallel relation to abut throughout their whole extent when the packing is compressed to close the kerfs between the bonds. 35 40

JOSEPH HOWARD RENSHAW.