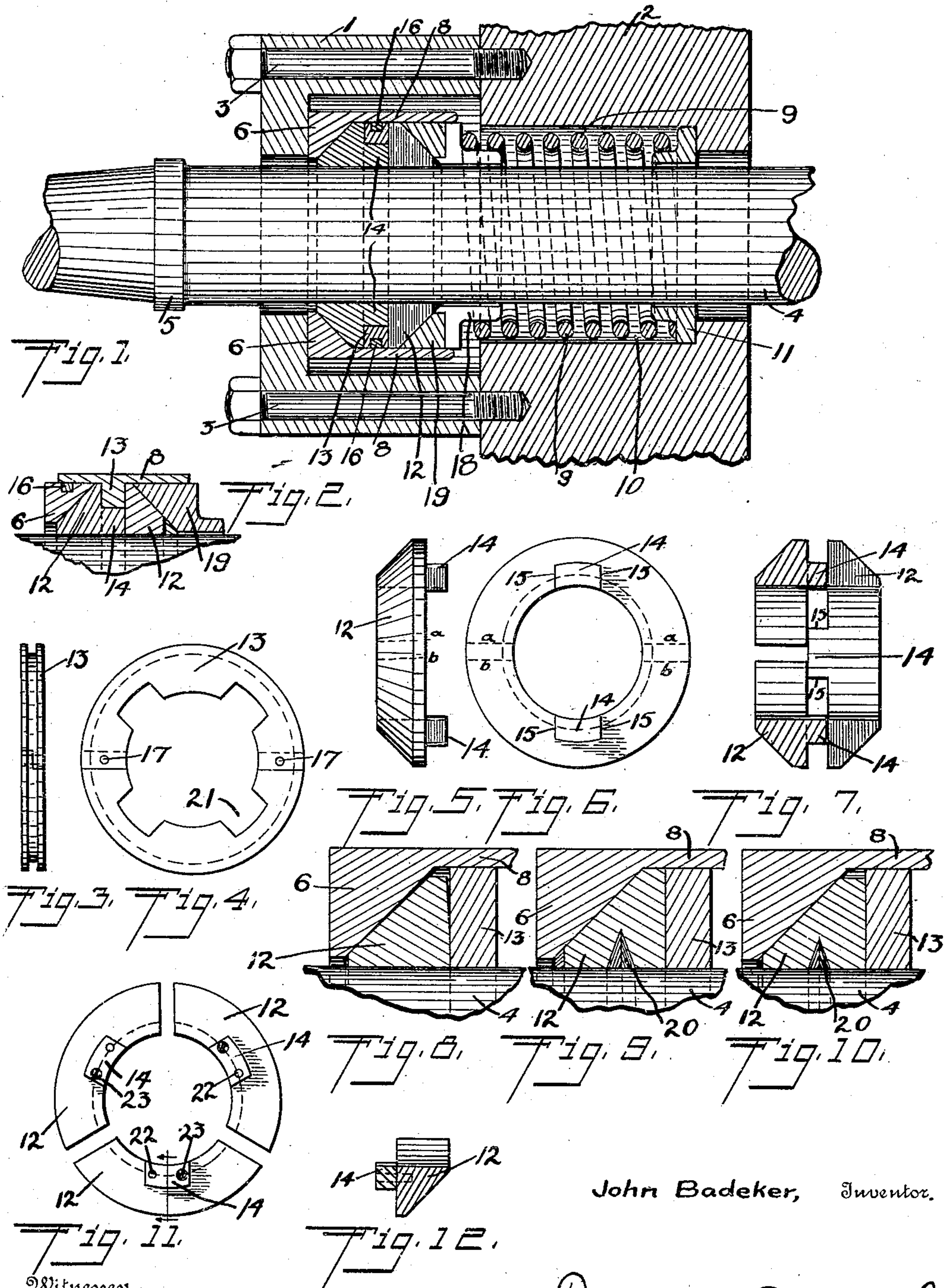


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METALLIC ROD PACKING.
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METALLIC ROD-PACKING.

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To all whom it may concern:

Be it known that I, JOHN BADEKER, a citizen of the United States, and a resident of Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Metallic Rod-Packing, of which the following is a specification.

My invention relates to metallic rod packing and it is the object thereof to provide in a packing of this class means for preventing cohesion of the soft metal segments to each other and consequent failure of the segments to close upon the rod and compensate wear both of the segments and the rod.

One of the well known physical properties of nearly all soft metals is that of cohesion, namely, that two surfaces of like material if placed together and subjected to pressure will unite, to an extent depending among other conditions on the pressure and temperature, to form a practically solid and continuous body of material. Valve rods for locomotives, and other engines in which the travel of the rod is variable, become worn and of smaller diameter near the center of that portion of the rod passing through the packing and it is necessary in packing for such rods that the segments be entirely free to move in and out in order to follow the variations of the rod and prevent leakage around the same during that portion of the stroke in which the smaller portion of the rod passes through the packing. Practically all varieties of metallic packing are intended to so follow and close upon the rod to compensate wear and variation in the diameter thereof, but under service conditions, in which the overlapping or abutting segments of like material are subjected to great pressure and a temperature approaching the melting point of the metal in the segments, cohesion takes place between the metal in the adjoining segments so that the packing is made into a practically solid ring which cannot be closed upon the rod as it is intended should be done.

By the constructions and arrangements employed in carrying out my invention the above mentioned difficulties are overcome and certain other desirable results attained as will be more fully set forth hereinafter.

In the accompanying drawings Figure 1 is a longitudinal sectional view of a packing embodying my invention, Fig. 2 is a detail

showing a slightly modified arrangement of the inclosing sleeve, separator ring and conically-bored annulus, Fig. 3 is a side elevation of the separator ring as constructed for use with a reinforced rod, Fig. 4 is an end view of the same, Fig. 5 is a side elevation of one of the packing rings as cast and bored, and before division into segments, Fig. 6 is an end elevation of the same, Fig. 7 is a longitudinal section of the packing rings showing the relative position of the segments when assembled, Fig. 8 is a detail longitudinal section of a segment showing the way in which leakage may occur in some cases through stretching of the outer portion of the segment and failure of the inner portion of the segment to upset sufficiently to compensate the shrinkage due to stretch in the outer portion of the segment, Fig. 9 is a similar view showing the form of a relief groove in the inner part of the segment to permit uniform reduction of the sectional area of the segment, Fig. 10 is a similar view showing the form of the latter segment when worn, Fig. 11 is an elevation of a packing ring consisting of three instead of two segments and having the lugs on the segments made separate therefrom instead of integral therewith, and Fig. 12 is a detail longitudinal section of one of the segments of said three-segment ring.

In the construction shown in Fig. 1 of the drawings I provide a gland 1 which is secured to the head 2 by studs 3 in the usual manner. The rod 4 shown is of the "reinforced" type having the enlargement 5 thereon, on account of which certain modifications of the packing are required, as will be pointed out hereinafter. Within the gland 1 adjacent to the outer end thereof and encircling the rod is the conically-bored annulus 6, a ground joint being made between the flat front face thereof and the inner face of the gland. From the annulus 6 a cylindrically-bored sleeve 8 extends in toward the head 2, as shown. The follower ring fits within said sleeve and around the rod 4, said ring having a conical bore similar to that of the annulus 6. The follower ring is pressed outwardly by a coil spring 9 placed around the rod and extending back into the stuffing box 10 in the usual manner, the neck ring 11 being provided, where required, to form a guide and seat for the inner end of the coil spring.

Encircling the rod within the sleeve 8 and between the conical bores of the annulus 6 and the follower ring are placed the packing rings 12, which are ordinarily made of soft metal such as babbitt, and the separator ring 13 which is made of a metal harder than that used in the packing rings. The packing rings are each of the form of a conical annulus, having a triangular or wedge-shaped section, and the conical faces thereof fit the conical bores of the annulus 6 and the follower ring, the separator ring 13 being placed between the flat base surfaces of the packing rings, as shown. The rings 12 are each divided into two or more like segments, each of which segments has a lug 14 on the flat base surface thereof, adjacent to the rod 4 and midway between the ends of the segment. The sides 15 of the said lugs are made parallel with each other, the length of the lugs is made just equal to the thickness of the separator ring, and the depth is preferably made about one-half that of the separator ring. In the separator ring adjacent the rod are formed the notches 21, clearly shown in Fig. 4, said notches being of a form identically the same as that of the lugs 14 on the packing segments. When the packing is assembled the lugs 14 fit within these notches in the separator ring, the lugs on one of the packing rings coming opposite the clearance spaces between the ends of the segments forming the other packing ring, this relation being clearly shown in Fig. 7. The separator ring is made to fit snugly within the bore of the sleeve 8 so as to make a steam-tight joint therewith, and to insure tightness of the joint the ring may be grooved and a "snap ring" 16 placed therein as indicated in Fig. 1, in which the sleeve 8 is shown as integral with the annulus 6. In the modified construction shown in Fig. 2 the separator ring is made integral with the sleeve 8 which is separate from and slips over the annulus 6, the snap ring 16 being placed in a groove in the annulus, as shown, in order to make a steam-tight joint between the annulus and sleeve. With either construction the result is the same, in that steam cannot reach the outer packing ring except around the rod through the clearance spaces between the segments forming the inner packing ring.

The manner in which the packing operates to prevent escape of steam from the gland will be obvious by reference to the drawings. The ground joint between the face of the annulus 6 and the inside of the gland prevents escape of steam except through the bore of the annulus and the sleeve 8; the follower spring, maintaining a constant pressure between the conical faces of the packing rings and the conical bores of the annulus 6 and follower ring, keeps the segments constantly wedged inwardly to-

ward the rod so that escape of steam is impossible between the segments and the rods; while steam passing through the follower ring and the clearance spaces between the ends of the segments of the inner packing ring is stopped at the separator ring by said ring and the segments of the outer packing ring, the lugs 14 of the outer segments preventing leakage under the separator ring between the same and the rod.

Cohesion or sticking of the packing rings, or the segments thereof, to each other is entirely prevented in this packing because no two soft metal surfaces are engaged except at the ends of the lugs 14 where they pass through the notches in the separator ring and engage the opposite segments, and the two soft metal surfaces thus engaged do not cohere because they are not pressed together with sufficient force, all pressure between the said surfaces being prevented by the separator ring, the thickness of which, as before noted, being made exactly the same as the length of the lugs 14.

As it is desirable that the bore of the separator ring 13 be nearly the same as the diameter of the rod, it is necessary in packing for a reinforced rod to make the ring in two parts in order that it may be placed around the rod. Such a construction is shown in Figs. 4 and 5, the two parts of the ring having overlapping ends which are held together by pins 17. With plain rods not having the reinforcement 5 thereon the ring may, of course, be made without joints and slipped over the end of the rod. With the ordinary amount of reinforcement of the rod the bores of the gland 1, the annulus 6 and the neck ring 11 may be made large enough to pass over the reinforced end of the rod. It is desirable, however, that the follower ring fit more closely to the rod than is necessary for the foregoing parts and to permit such a fit the ring is made in three parts, as indicated in Fig. 1, the same comprising a two-part sleeve 18 fitting around the rod and within the end of the coil spring 9, said sleeve being held together by the continuous ring 19 which has a bore large enough to pass over the reinforcement 5 and which fits over a shoulder formed on the split sleeve, as indicated. For plain rods the continuous ring 19 may be extended to form the entire follower and the split sleeve 18 omitted, as shown in Fig. 2.

In the manufacture of the packing rings the same are preferably cast in a continuous ring having the lugs 14 thereon, as shown in Figs. 5 and 6, the ring being first bored to the size of the rod around which it is to be placed, and then divided into segments by removal of the metal between the dotted lines *a-a* and *b-b* shown in said Figs. 5 and 6. The removal of metal in thus dividing the rings into segments makes the neces-

sary clearance spaces between the ends of the segments to permit the same to close upon the rod as they become worn.

As the packing rings wear and the segments are bent to close them upon the rod there is a tendency to stretch the outer portions of the segments and cause a shrinkage of the metal therein. In some cases this shrinkage of the metal in the outer portions of the segments may be sufficient to cause a leakage, as will be apparent by the exaggerated shrinkage shown in Fig. 8. In such cases the leakage may be prevented by making, in that portion of the segment bearing on the rod, a V-shaped annular groove as shown at 20 in Fig. 9. Such a groove permits the metal in the inner portion of the segment to be upset or displaced thereinto in an amount sufficient to compensate the shrinkage due to the stretch in the outer portion of the segment, so that, as the segment wears, a practically uniform contact is maintained between the straight faces of the segment and the separator ring, and the conical faces of the segment and the bores of the annulus 6 or of the follower ring. Such displacement of metal into the relief groove is shown exaggeratedly in Fig. 10.

It may be noted here that while the inter-engagement of the lugs 14 on the segments with the notches in the separator ring serves to maintain the segments in their proper relative positions, and while the said lugs also serve to strengthen the segments in the center where they are most liable to be broken by the bending incidental to their closing upon the rod, these are not the primary function of the lugs, it being necessary to provide the same in order to make a "break of joints" in the packing and prevent leakage through the same by steam passing through the clearance spaces between the segments of one ring, thence under the separator ring and around the rod to the clearance spaces between the ends of the segments of the other packing ring. It may also be noted that while the primary purpose of the relief grooves 20 is as described, said grooves, when employed, may also serve as chambers in which oil may collect and assist in lubrication of the rod.

In Figs. 11 and 12 is shown a slightly modified form of the packing in which the packing rings are divided into three segments, and the lugs 14 instead of being made integral therewith are made separate therefrom and are secured thereon by means of small screws 23 and dowel pins 22. By this construction the packing rings may be made of any suitable material, such as brass, bronze or other hard bearing-metal, since it is unnecessary for the segments to be bent in order to close them upon the rod with sufficient uniformity, and, on account of the lugs 14 being made separate from the seg-

ments, the latter are of such form that they may be readily machined and need not be cast to exact form.

Now, having described my invention, what I claim and desire to secure by Letters Patent is:—

1. A metallic rod-packing, comprising a conically-bored annulus, a follower ring having a conical bore, packing rings having the form of conical annuli and fitting within the conical bores of the annulus and follower ring, each of said packing rings comprising like segments having clearance spaces between the adjacent ends thereof, a separator ring of material different from the packing rings, said separator ring being disposed between the packing rings and there being on each of the segments lugs adjacent to the rod and extending through the separator ring to engage the segments of the other packing ring, and an inclosing sleeve surrounding the packing rings and the separator ring.

2. A metallic rod-packing comprising a conically-bored annulus, a follower having a conical bore, said follower being pressed yielding toward the annulus, packing rings encircling the rod and fitting within the conical bores of the annulus and follower, said packing rings having flat opposed faces, a separator ring of material different from that of the packing rings and disposed between said flat faces of the packing rings, and lugs on the packing rings extending through the separator ring, the length of the lugs being the same as the thickness of the separator ring.

3. In a metallic rod-packing, packing rings of soft metal each comprising segments having clearance spaces between the ends thereof, means for pressing the segments yieldingly toward the rod, a separator ring of hard metal disposed between the packing rings, and means on each segment engaging the separator ring to maintain the segments in proper relative position.

4. In a metallic rod-packing, packing rings each comprising non-abutting segments of soft metal, means for pressing the packing rings yieldingly against the rod and toward each other, a ring of hard metal disposed between the adjacent faces of the packing rings, and lugs on each of the soft metal segments, each of said lugs passing through the hard metal ring to engage the two adjacent ends of the segments of the opposite packing ring, and the length of said lugs being such that the hard metal ring may prevent sufficient pressure between the engaging surfaces of soft metal to cause cohesion between said surfaces.

5. In a metallic rod-packing, two packing rings each comprising non-abutting segments having lugs thereon adjacent to the bore thereof, and a separator ring placed

between the packing rings, there being in said separator ring adjacent to the rod notches of the same form as the lugs on the segments, the lugs extending through said notches to engage the segments of the opposite packing ring, and each lug engaging the adjacent ends of two segments for the purpose set forth.

6. In a metallic rod-packing, packing rings each comprising non-abutting segments having lugs thereon adjoining the bore thereof, a separator ring disposed between said packing rings, and means for yieldingly pressing said segments toward

the rod, there being notches in the separator ring adjoining the bore thereof, the lugs on the segments each entering one of the notches in the separator ring and extending through said ring to engage the adjoining ends of two segments of the opposite packing ring.

In testimony whereof I have hereunto subscribed my name in the presence of two witnesses.

JOHN BADEKER.

Witnesses:

D. O. BARNELL,
ROY G. KRATZ.