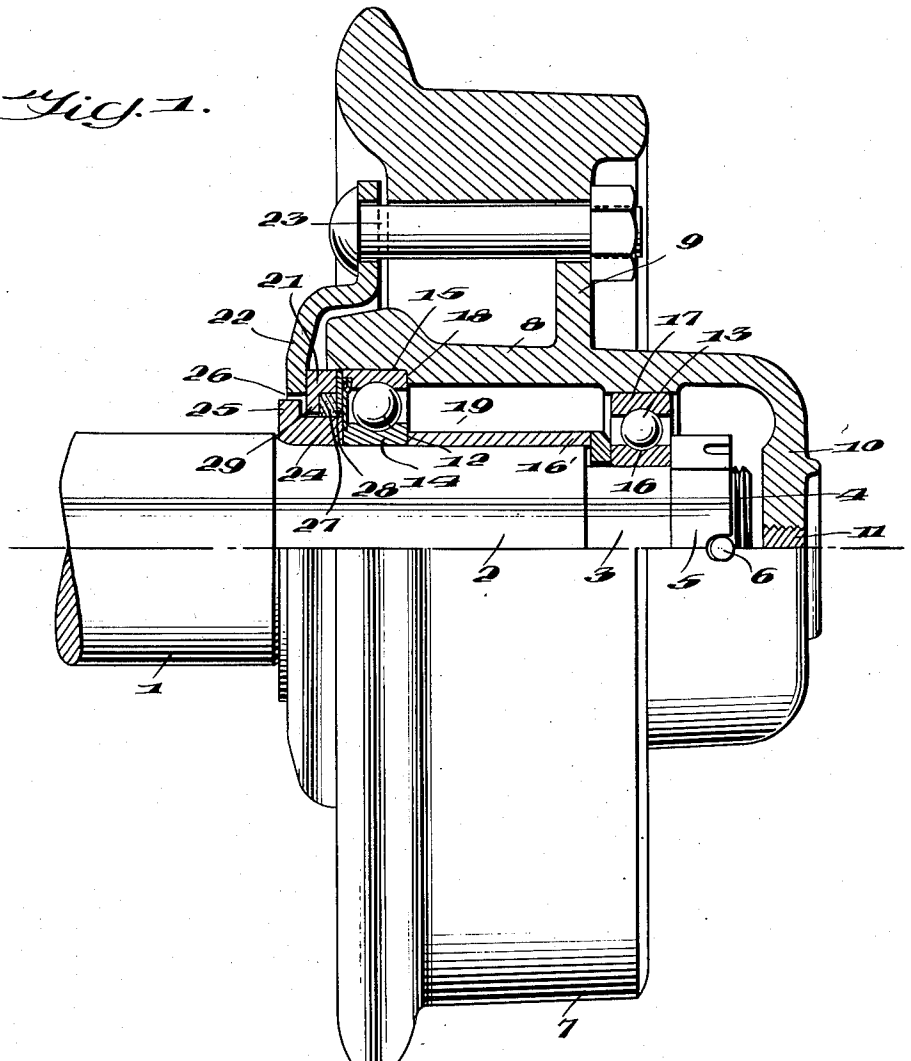
Nov. 6, 1951 H. W. SANFORD ET AL 2,573,735

WHEEL AND AXLE SEAL

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Fig. 1.



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Fig. 2.

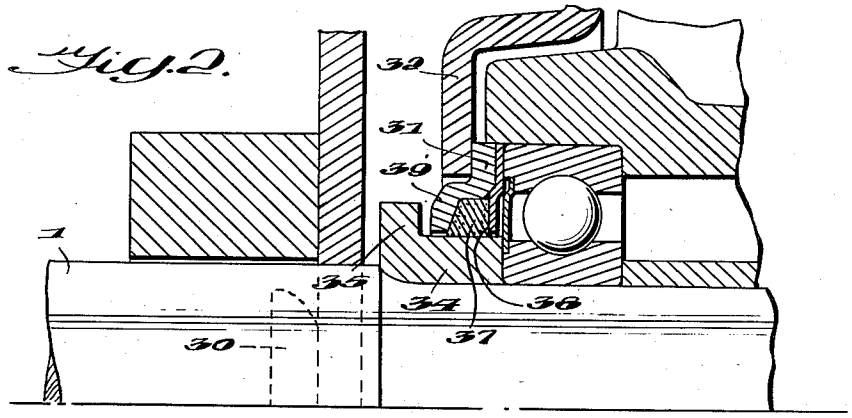


Fig. 3.

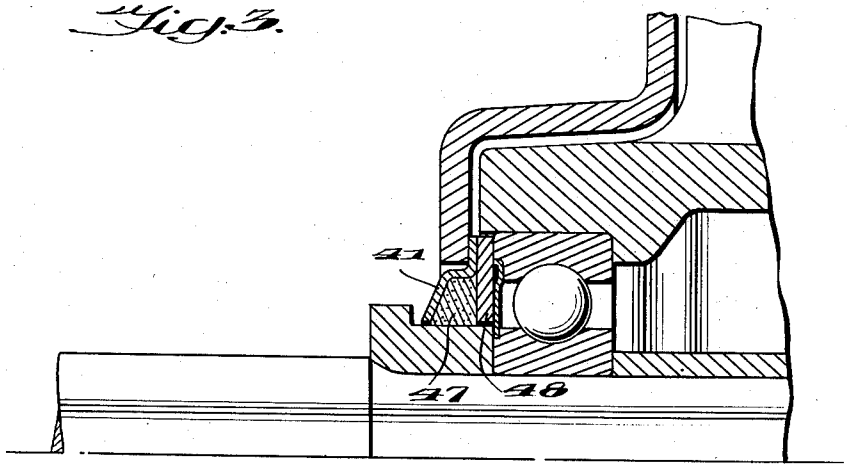
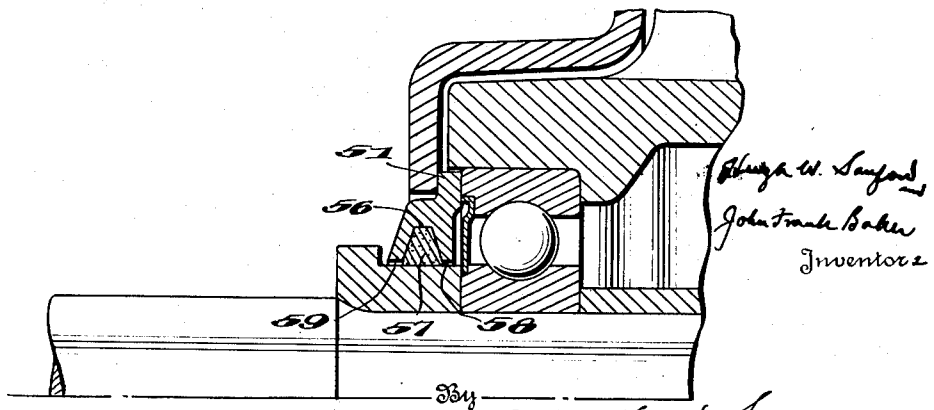


Fig. 4.



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WHEEL AND AXLE SEAL

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Fig. 5.

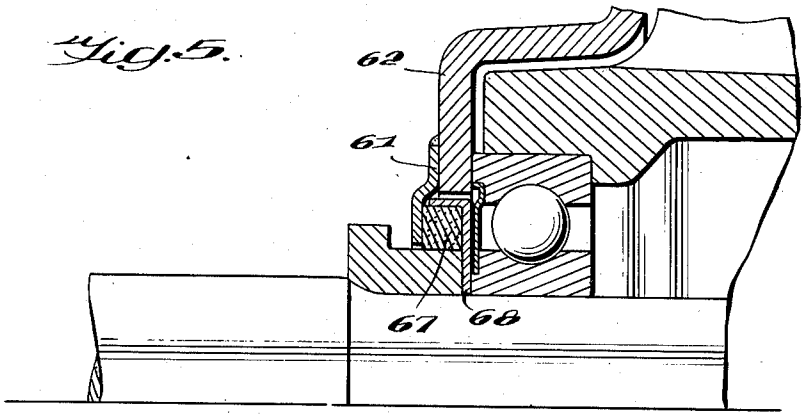


Fig. 6.

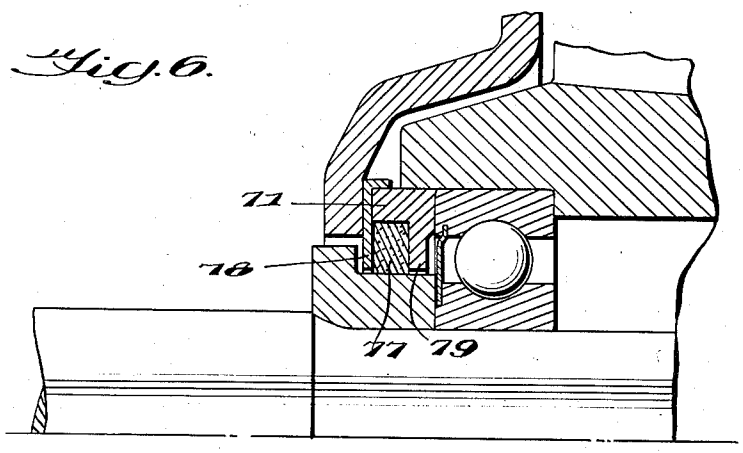
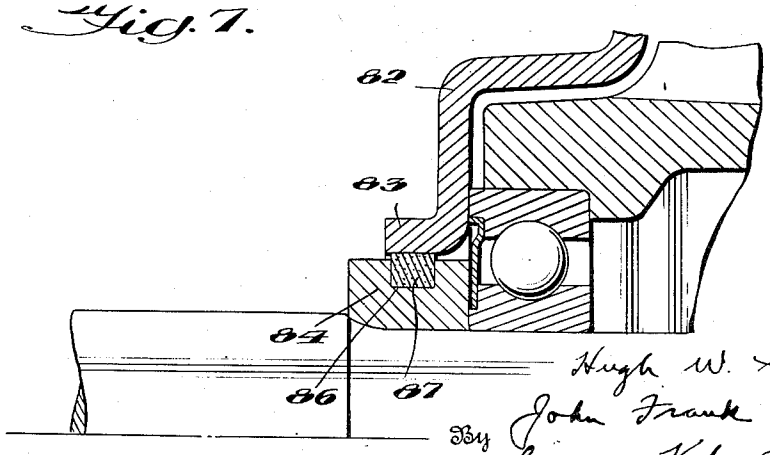


Fig. 7.



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Patented Nov. 6, 1951

2,573,735

UNITED STATES PATENT OFFICE

2,573,735

WHEEL AND AXLE SEAL

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Application January 3, 1946, Serial No. 638,822

8 Claims. (Cl. 295—44)

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This invention relates to wheel and axle seals, and more particularly to a sealing device for closing the space between the wheel bearing and the axle on which it is journaled, particularly for such wheels as are adapted for use in mine cars and the like.

In mine cars of the type where the side sills are spaced very far apart, so as to leave little clearance between the wheel and the adjacent side sill, difficulties have been encountered in the sealing of the bearing assembly, especially where the car is used in a mine in which a great deal of water or moisture is encountered. In such mines, the moisture or water absorbs dirt and forms a muck which gets into the space between the cap at the rear of the wheel and the vertical wall of the car sill. Where the wheel is so mounted that the distance between the cap and the adjacent sill is very short, this wheel has a transverse motion relative to the sill of approximately one-quarter inch. Consequently, when the muck gets down between the cap and the sill, the pressure of the end thrust of the wheel toward the sill tends to squeeze the muck into the crack between the collar on the axle and the cap on the rear face of the wheel. When this muck finds its way into the felt packing usually provided, it causes the packing to become hard when dry and thereafter to be less effective for sealing purposes, and moreover the grit and dirt present in the muck tends to cause the felt to be torn up and destroyed.

This was true even of the packing set forth in the prior patent of Hugh W. Sanford, granted October 23, 1945, No. 2,387,301. In such construction, there was no effective metal seal at the inner face of the felt which would prevent the entrance of muck into the felt that would cause damage thereto. A leather washer over the face of the felt probably would not be effective to exclude the muck and moisture.

The object of this invention is to improve the construction of the seal for the bearings at the inner face of the wheel by providing a seal between the wheel and the axle which will more effectively exclude the muck and moisture from the felt that forms the primary seal for the bearings.

In accomplishing this object, we prefer to enclose the felt packing by a metal portion, flange

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or ring in such manner as to overlap the gap between the hub cap and the axle collar to form a positive obstruction or labyrinth against the admission of muck to the sealing element. By thus enclosing the sealing element within a metal wall at the side where the muck normally would enter, the latter is virtually excluded from finding access to the packing element, whereby the latter is protected and maintained in service for providing an effective packing between the wheel and axle at the inner side of the bearings.

The invention may be embodied in different forms, several of which are illustrated in the accompanying drawings in which:

Fig. 1 is a half section through a car wheel journaled on an axle which latter is shown in elevation, and illustrating one embodiment of this seal; and

Figs. 2 to 7 are detail vertical sectional views showing other forms of the seal as modified embodiments of the invention.

Referring to Fig. 1, an axle is designated generally by the numeral 1, provided with an axle journal 2, terminating at its outer end in a reduced journal portion 3. The extreme end of the reduced portion 3 is externally screw-threaded at 4 to receive thereon a nut 5 adapted to be adjusted and locked in place by a cotter pin 6.

Surrounding the axle 1 is a wheel which is illustrated as a car wheel provided with a tread 7 and hub 8 connected together integrally by a web or spokes 9. The inner end of the hub 8 is initially open, but the outer end (toward the outer side of the wheel) is closed by an integral end wall 10, which is provided with an orifice in which a plug 11 is fitted and through which lubricant may be introduced into the hub of the wheel for lubricating the bearings therein.

The hub 8 surrounds the journal portions 2 and 3 of the axle and is journaled thereon by two sets of anti-friction bearings 12 and 13, which are shown as ball bearings, and these are spaced apart axially of the hub toward the inner and outer sides of the wheel. However, one-way end-thrust roller bearings may be used instead of ball bearings, if desired.

The set of ball bearings 12 is provided with an axle race 14 and a hub race 15 fitted respectively on the axle journal 2 and within the wheel hub 8. The set of anti-friction bearings 13 is provided

with an axle race 16 and a hub race 17 fitted respectively upon the axle journal portion 3 and within the wheel hub 8.

Although the hub race 17 is not confined axially by the wheel hub, the axle race 16 is confined at one side by the nut 5. The axle races 14 and 16 are confined at their opposed sides by spacing means generally designated at 16'. A lubricant chamber 19 is formed between the spaced bearings 12 and 13. The hub race 15 is confined at one side by abutting against a shoulder 18 in the hub 8.

The hub race 15 is held in clamped relation against the shoulder 18 by a pressure ring 21 which telescopes into the inner end of the hub 8 in pressure relation, although not abutting in the form shown, with the hub race 15. The opposite edge of the pressure ring 21 projects from the inner end of the hub in position to receive thereagainst a retaining hub cap generally indicated at 22 that surrounds the inner end of the hub. This cap 22 forms a closure cap or ring at least partially closing the open inner end of the wheel hub. The cap 22 and ring 21 are adapted to be drawn in an outward direction relative to the wheel by retaining bolts 23, which extend through the peripheral portion of the cap 22 and through the web or spokes of the wheel, to provide for the application of pressure to the ring 21 sufficiently to apply a clamping action to the hub race 15 in the wheel hub.

The structure as described above is similar generally to that set forth in the prior patent to Moore, No. 2,112,859, granted April 5, 1938.

Provision is made for sealing the inner end of the hub to confine lubricant therein within the lubricant chamber 19 that surrounds the axle between the bearings 12 and 13. For this purpose, an axle collar 24 surrounds the inner end of the axle journal 2 and is fixed thereon to be held stationary by the axle while the wheel rotates relative thereto.

The axle collar 24 is concentric with the pressure ring 21 and has a radially surrounding flange 25 extending toward the periphery of the opening in the center of the hub cap 22 in a transverse vertical plane passing through the center portion of said cap with a relatively narrow crack generally indicated at 26 therebetween.

Surrounding the axle collar 24 and between said collar and the pressure ring 21, is a packing ring 27, preferably formed of felt or other suitable packing material. This packing ring 27 is confined on one side by a washer 28 which is interposed between the pressure ring 21 and the hub race 15 and clamped therebetween so as to rotate with the wheel. At its opposite side, the packing ring 27 is confined by an integral flange 29 formed on the metal pressure ring 21 at the inner edge of said ring toward the open side of the wheel. The flange 29 extends continuously throughout the circumference of the pressure ring 21 and projects radially inwardly in overlapping relation with the flange 25, spanning the crack 26, having a relatively narrow crack between the inner edge of said flange and the periphery of the axle collar 24.

Thus the felt or packing ring 27 is confined between the metal flange 29 and the metal washer 28 both rigid with the wheel, so as to rotate therewith, whereby the packing ring will have a frictional bearing only at its edge which bears on the axle collar. The washer 28 may be made sufficiently thin and resilient, so as to bend when the felt is packed tight between this washer and the flange 29, so as to press the felt resiliently against the flange which would tend to cause the felt to work its way inwardly toward the axle collar as wear takes place on the felt.

The felt or packing ring 27 is so disposed between the rotatable wheel and the stationary axle collar 24 as to exclude dirt and foreign matter from the wheel bearings. At the same time, this felt or packing ring is confined on its inner side by a metal flange 29, extending over substantially the entire inner face thereof in overlapping relation with the crack 26 as to exclude muck from the felt and thus protect it from the destructive effect of the muck and other foreign matter. There is no tendency for the felt to rub against the shoulder on the axle collar as the wheel revolves, which would have a destructive effect on the felt.

In this form, the axle collar 34 has its flange 35 generally indicated at 31 has laterally and inwardly inclined flange 39, which parts are so shaped as to be capable of stamping from heavy sheet metal in forming the ring instead of the machined ring disclosed above. The packing 37 is enclosed between the flange 39 and a washer 38 which is laterally offset to provide a spring action yieldably pressing the packing ring 37 toward the inclined flange 39 to increase the tendency to press the packing inwardly to take up for wear.

In this form, the axle collar 34 has it flange 35 spaced from the vertical plane through the inner edge of the hub cap 32, although this relation may be varied according to the lateral disposition of the side sills of the car. One of these sills is indicated generally at 30 supported upon the axle 1 and having means connected therewith for mounting the car body thereon.

In the further morification shown in Fig. 3, a lighter stamped pressure ring is shown generally at 41 but used in connection with a heavy steel washer 48 for confining the felt packing 47 therebetween. The ring 41 is constructed to have lateral resiliency acting on the felt packing tending to press the same inwardly.

In Fig. 4, the pressure ring 51 has an internal groove 56 therein to receive the felt packing 57 embraced on opposite sides by flanges 58 and 59 on the ring and which flanges form opposite sides of the groove 56. In this form, the extra washer is not required, inasmuch as the flanges serve to confine opposite sides of the packing ring.

Referring to Fig. 5, the hub cap 62 abuts directly against the hub race of the inner bearing without an intervening pressure ring. Accordingly, a confining ring 61 is welded to one side of the hub cap 62 to enclose the felt packing 67 at the inner open face of the wheel. The opposite side of the packing ring 67 is enclosed by a cupped washer 68 which also extends inwardly between the axle race and the axle collar.

The form of the invention shown in Fig. 6, has the pressure ring 71 reversed with respect to its position in Fig. 1, whereby the washer 78 is disposed at the inner face of the packing ring 77, while the flange 79 is formed integral with the pressure ring 71 at the outer face of the packing ring. The washer 78 is thus disposed remote from the ball bearing assembly where there is no danger of its bending and pressing against the seal which is provided between the races.

Because of the overlapping relationship be-

tween the rear hub cap and the shoulder on the axle collar in Figs. 1 and 6, there is no possibility of dirt or muck dropping down vertically between the outer face of the shoulder of the axle collar and the inner face of the hub cap. This dirt or muck would first have to pass in horizontally through the crack as marked 26 in Fig. 1. Thus we form a labyrinth in the designs shown in Figs. 1 and 6. Because of the nature of these two forms, we can pack this crack 26 with a heavy waterproof grease at the time of mounting the wheel, and thus form an added seal against the entrance of dirt or muck.

Still another modification is shown in Fig. 7, in which the felt packing 87 is inserted into a groove 86 formed in the axle collar 84. In this form, the packing ring remains stationary although bearing against a lateral flange 83 formed on the hub cap 82, so as to seal the crack therebetween.

While the invention is illustrated in different embodiments, it is obvious that the invention is not limited to these specific forms but that it may be employed in many ways within the scope of the claims presented.

We claim:

1. In a hub having an open inner end adapted to receive an axle therein and to be journaled on said axle, a ring arranged at the axial inner end of said hub and having a radially extending inner portion thereof to close said end portion of said hub, a collar adapted to fit about the axle and spaced radially inwardly from said ring, said collar having a portion thereof extending radially outward, a packing ring adjacent the open end of the hub in position to seal the space between said hub and the axle collar, and a metal ring disposed axially laterally of said packing ring in overlapping relation with the outwardly extending portion of the collar and the radially extending portion of the first-mentioned ring in position to prevent the admission of foreign matter into the packing ring.

2. In a wheel including a hub having an open inner end adapted to receive an axle therein to be journaled thereon, a packing ring of fibrous material at the open inner end of the hub in position to seal the hub from the entrance of foreign matter through said open inner end, a closure cap at the inner end of the hub and at least partially closing said open inner end thereof, and a metal ring disposed axially laterally between the packing ring and said closure cap and projecting radially inwardly of the radial inner edge of said closure cap substantially to the inner edge of the packing ring.

3. In a wheel including a hub having a closed end and an opposite open end adapted to receive an axle therein to be journaled thereon, a packing ring of fibrous material at the open end of the hub in position to seal the hub from the entrance of foreign matter through said open end, a closure cap at the open end of the hub and at least partially closing said open end thereof, means for detachably connecting the closure cap with the wheel for removal of the wheel from the axle upon detachment of the closure cap therefrom, a pressure ring at one side of the closure cap, and metal ring means connected with said pressure ring and extending radially inwardly on opposite sides of the packing ring, one of said last-mentioned metal ring means being disposed between the packing ring and the closure cap and extending radially inwardly from the inner edge of the closure cap substantially to the radial inner edge of the packing ring.

4. In a wheel including a hub having a closed end and an opposite open end adapted to receive an axle therein to be journaled thereon, a packing ring of fibrous material at the open end of the hub in position to seal the hub from the entrance of foreign matter through said open end, a closure cap at the open end of the hub and at least partially closing said open end thereof, means for detachably connecting the closure cap with the wheel for removal of the wheel from the axle upon detachment of the closure cap therefrom, and a pressure ring interposed between the closure cap and the interior of the hub radially outwardly of the packing ring, said pressure ring having an integral metal flange extending radially inwardly beyond the inner edge of the closure cap substantially to the radial inner edge of the packing ring to prevent the admission of foreign matter thereto.

5. The combination of a wheel having a hub adapted for rotatably encircling an axle and to be journaled thereon, said hub having a closed end and opposite open end, a closure cap connected with the wheel and extending inwardly toward the axis of the hub in overlapping relation with the open end of the hub at least partially closing said open end, means for detachably connecting the closure cap with the wheel for removal of the wheel from the axle upon detachment of the closure cap therefrom, a pressure ring at the open end of the hub and interposed between said closure cap and the interior of the hub, a packing ring of fibrous material radially inwardly of the pressure ring in position to seal the space between said pressure ring and an axle collar, said pressure ring having an integral metal flange thereon extending radially inwardly between said packing ring and the cap beyond the inner edge of said closure cap and substantially to the inner diameter thereof.

6. In a wheel including a hub having an open inner end adapted to receive an axle therein, a packing ring of fibrous material adjacent the open inner end of the hub in position to seal the hub against the entrance of foreign matter thereinto, a pressure ring having spaced opposite sides and an inner face toward the axis of the hub between the sides embracing and enclosing the packing ring with said sides extending radially inwardly substantially to the radial inner edge of the packing ring, and means for anchoring said pressure ring rigidly to the hub to rotate therewith.

7. In a wheel including a hub having an open inner end adapted to receive an axle therein, a packing ring of fibrous material adjacent the open inner end of the hub in position to seal the hub against the entrance of foreign matter thereinto, a pressure ring having spaced opposite sides and an inner face toward the axis of the hub between the sides embracing and enclosing the packing ring with said sides extending radially inwardly substantially to the radial inner edge of the packing ring, said sides and face being constructed in one integral piece in rigid relation to each other, and a closure cap secured to the inner end of the hub and anchoring the pressure ring thereto.

8. In a wheel including a hub having a closed end and an opposite open end adapted to receive an axle therein, a packing ring of fibrous material at the open end of the hub in position

to seal the hub against the entrance of foreign matter through said open end, a closure cap at the open end of the hub and at least partially closing said open end thereof, and a pressure ring interposed between the closure cap and the the interior of the hub with a metal flange thereon extending radially inwardly in overlapping relation with the packing ring, said flange being of yieldable material and arranged to bear yieldably against a side of the packing ring.

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