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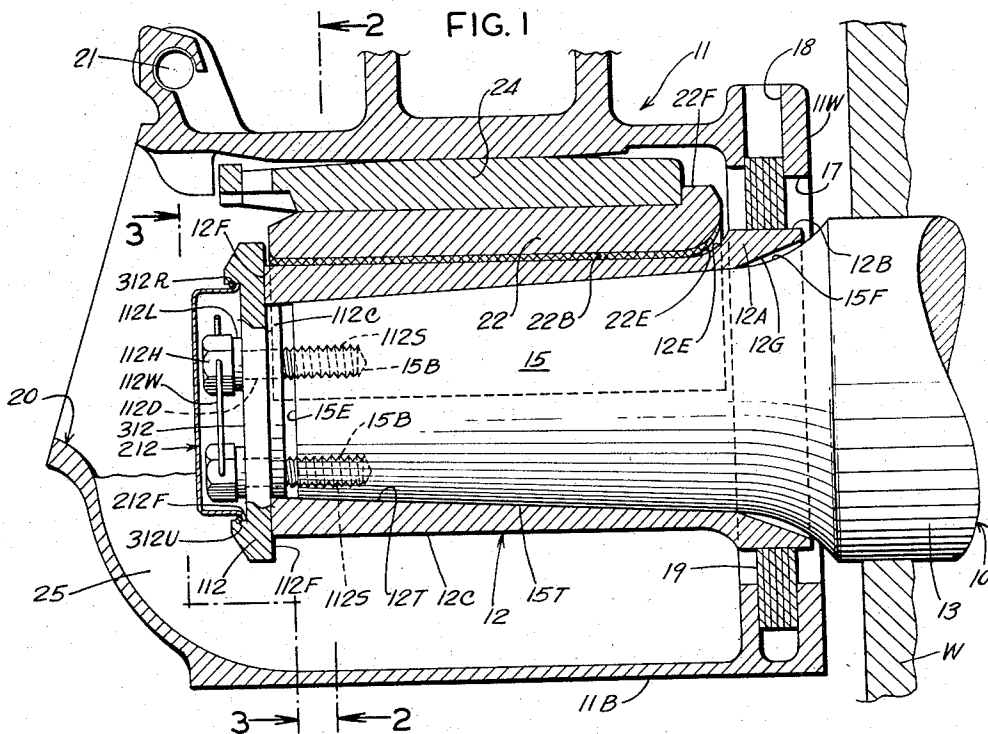
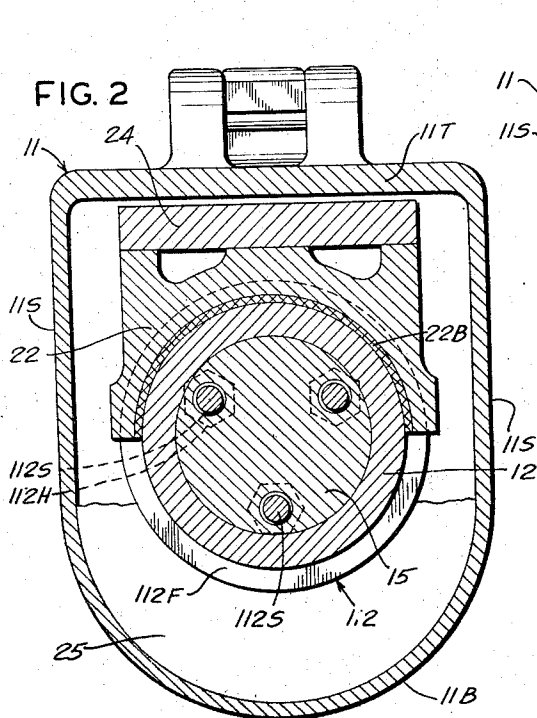
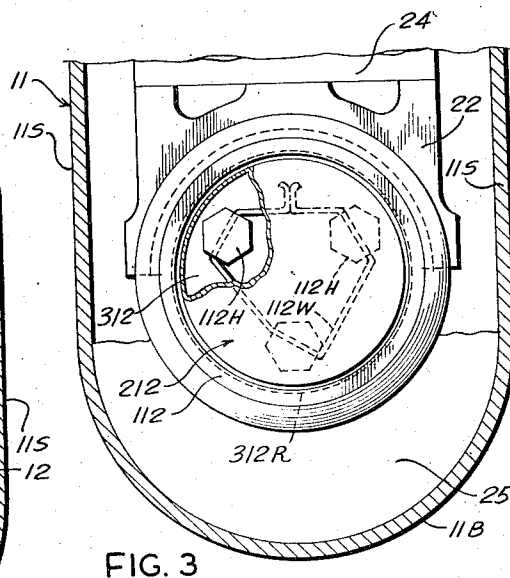
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SLEEVE JOURNALS FOR RAILWAY WHEELS AND THE LIKE

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1

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SLEEVE JOURNALS FOR RAILWAY WHEELS AND THE LIKE

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7 Claims. (Cl. 308—41)

This invention relates to journals for railway wheels and the like and particularly to sleeved journals affording replaceable wearing surfaces for such journals.

It is the custom in common railway practice to afford projecting journals at the ends of the axle so that these journals are disposed outwardly of the planes of the wheels that are mounted on the axle, and these journals are arranged to be disposed beneath and in supporting relationship with respect to the babbitt-lined journal bearings that are afforded in the journal boxes of the railway car. The form and dimensions of the journal boxes, the journal bearings and of the bearing surfaces of the journals are in practice relatively well standardized so as to facilitate upkeep and replacement in respect to the railway equipment. The journals are arranged to cooperate with the journal bearings not only to afford the desired rotative cooperation, but also to limit endwise displacement of the journal boxes with relation to the axle, such endwise cooperation being attained by engagement of outwardly facing journal fillets on the journal with the rounded inner end edge surfaces of the journal bearings. Relatively rigid limits of permissible wear in such journals have been established in the industry in the interests of safety and operating efficiency. Thus one one-half inch reduction in journal diameter is permissible, while, as to fillet wear on such journals, a total wear in the two fillets in an endwise direction of but eleven-sixteenths of an inch is currently considered to be the allowable limit.

These limits have been established primarily to prevent excessive starting and running friction and to minimize the possibility of waste grabs where waste from the bottom of the journal box tends to follow under-sized journals into wedged relation between the journal and the journal bearing. Such waste grabs are recognized not only as a cause of interrupted lubrication and excessive wear, but also as one cause of hot boxes.

According to the standard practice now followed, the wearing surfaces of the journals are afforded as integral parts of the axle upon which the wheels are mounted, and this, of course, makes it necessary to replace the entire axle when the bearing surface of the journals become unduly worn. Such complete replacement of the axles is relatively costly. This objection to the use of journals of the aforesaid character has been recognized, and efforts have been made to afford replaceable bearing surfaces on such railway journals. So far as I am aware, the various proposals that have been made in this regard have never met with any degree of acceptance and as to most of such prior proposals I believe that this has been due to excessive cost as well as the reduction in the strength of the journals, which was inherent in the arrangements that were thus proposed.

In my prior Patent No. 2,543,154, an improved form of replaceable sleeve journal structure was disclosed whereby many of the objectionable characteristics of the prior art were overcome, and it is the primary object of the present invention to further simplify and improve re-

2

placeable sleeve journals of this general character. Further and related objects of the invention are to simplify the manufacture as well as the mounting of the replaceable journal sleeves, to simplify the formation of the axle stubs upon which the journal sleeves are mounted, and to assure long and safe usefulness of the journal sleeves. Further objects are to enable the collar of the journal structure to be separately replaced, thus to avoid replacement of the entire journal sleeve in many instances, and to afford a structure which presents smooth annular surfaces on the rotating journal so as to avoid waste grabs. Still another object is to enable a replaceable sleeve journal to be secured in place by means which are simple in character and which are not subject to damage in usual handling procedures.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show a preferred embodiment of the present invention and the principle thereof and what I now consider to be the best mode in which I have contemplated applying that principle. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

Fig. 1 is a fragmental vertical sectional view of one end of a railway axle in its operative relation to a journal box and equipped with the sleeved journal of the present invention;

Figs. 2 and 3 are vertical sectional views taken along the lines 2—2 and 3—3, respectively, of Fig. 1;

Fig. 4 is a view similar to Fig. 1 and showing further details of the journal;

Figs. 5, 6 and 7 are outside elevational, side elevational and inside elevational views of the end cap;

Fig. 8 is a longitudinal sectional view of the sleeve; and

Fig. 9 is a left-hand end elevational view of the sleeve shown in Fig. 8.

For purposes of disclosure, the invention is herein illustrated as embodied in a railway axle 10 that is operatively associated at its opposite ends (only one of which is shown) with conventional journal boxes 11, only one of which is shown, through the use of sleeved journals 12 embodying the features of the present invention. The axle 10 has conventional wheel seats 13 formed thereon and defining the locations of wheels W that are associated with the wheel seats 13 in the conventional manner. It is outwardly of the wheel seats 13 that the axle is conventionally associated with the journal boxes 11, and under the present invention, the projecting outer ends of the axle 10, in the portions thereof that ordinarily constitute the journals of the axle, are formed as gradually tapered mounting stubs 15 upon which the journal sleeve 12 is mounted so that these journal sleeves 12 may cooperate with the elements within the journal box in the same way as the usual journals of such a railway axle.

The journal sleeves 12 are, under the present invention, arranged to cooperate with the conventional and standardized components of the usual journal box 11, and as will be evident in Figs. 1, 2 and 3 of the drawings, such a journal box 11 includes a bottom wall 11B that is arcuate in form, and side walls 11S which extend upwardly and are joined by a top wall 11T. The top wall 11T is arranged to be seated against and secured to an element of the truck in any conventional way, and the inner end of the journal box is closed by a wall 11W in which an aperture 17 is provided to afford clearance through which the end of the axle may extend into the

journal box. The inner wall 11W of the journal box 11 has a downwardly opening slot 18 formed therein to receive a conventional dust guard 19 which surrounds and cooperates with the journal in a contacting relationship in accordance with standard practice. The outer end of the journal box 11 has an opening 20 formed therein which is normally closed by a journal box lid (not shown) that is pivoted on an axis 21 as shown in Fig. 1.

In the top of the journal box a conventional journal bearing 22 is mounted so as to face downwardly and rest upon the upper surface of the journal of the axle, and while this journal bearing 22 is herein shown as being of the flat back type, it must be kept in mind that other journal bearings of known and accepted types may be used. The bearing 22 is accurately located in the journal box by conventional means including vertical positioning webs and a positioning wedge 24 disposed between the journal bearing 22 and the top wall 11T of the journal box. The journal bearing 22 is accurately located in the journal box in an endwise direction by a flange 22F formed at its inner end so as to engage the inner end of the wedge 24, and it should be noted that the inner end edge of the babbitt liner 22B of the journal bearing is provided with a rounded edge 22E for cooperation with the usual outwardly facing filleted surface of the conventional journal. In the use of such journal boxes, the lower portion of the journal box is filled with waste and a supply of oil in this waste 25 is transmitted by a wick effect to the lower surface of the journal, thereby to be carried upwardly as the journal rotates in contact with the babbitt liner 22B of the journal bearing 22.

Under and in accordance with the present invention, the journal sleeve 12 is mounted on the mounting stub 15 so as to cooperate in an accurately determined relationship with the journal bearing 22, its rounded end surface 22E, and with the dust guard 19, and this is attained in such a way that the journal sleeve 12 may readily be removed at most any place where equipment is afforded for removing axles from the truck. Moreover, under the present invention, the journal sleeve 12 is associated with the mounting stubs of the axle 10 in such a way that the desired concentric relationship between the axle and the journal sleeves may readily be attained, and when so mounted, the journal sleeves cooperate with the usual journal box and journal bearings without the necessity for modifying such conventional elements in any way. Furthermore, the journal sleeves 12 are so formed and related to the axle that adequate strength is maintained in the axles and continued proper seating or fit of the sleeve on the mounting stub is assured while at the same time enabling the mounting and dismounting operations to be readily and easily performed.

To this end, the mounting stubs 15 have a gradually tapered surface 15T concentric with the axis of the axle and at its inner end the tapered surface 15T is joined to the larger diameter wheel seat 13 by a gradually tapered fillet 15F that is disposed in substantially the same endwise position that is usually occupied by the conventional dust guard seat. At its outer end, the mounting stub 15 terminates in a flat end surface 15E that lies in a plane perpendicular to the axis of the mounting stub. In this end surface 15E, a plurality of threaded bores 15B are formed that are perpendicular to and spaced equally about the longitudinal axis of the stub 15, and these bores 15B function in the fastening of the journal sleeve 12 on the stub 15, as will hereinafter be described.

The journal sleeve 12 has a cylindrical outer surface 12C, and its inner surface is formed with a taper 12T that matches the taper 15T of the mounting stub 15. At its outer end, the journal sleeve 12 has a flat end surface 12F that is perpendicular to the axis of the surface 12C. At its inner end the journal sleeve 12 has an outwardly projecting annular flange 12A that affords a cylindrical dust guard seat 12B, and the cylindrical surface 12C is

joined to the dust guard seat 12B by a rounded journal fillet surface 12E which cooperates with the rounded end surface 22E of the journal bearing.

When the journal sleeve 12 is being put in position on the tapered surface 15T of the mounting stub 15, it is desirable that the location of the journal sleeve be determined by engagement of the tapered surfaces with each other and that there be no interference due to engagement of other surfaces. For this reason, the journal sleeve 12 has its inner end counterbored to afford a frusto-conical surface 12G that is disposed radially inwardly from the dust guard seat 12B, and the surface 12G is arranged, as will be evident in Fig. 1, so that it does not at any point come into engagement with the filleted surface 15F of the mounting stub. Moreover, the arrangement is such that the inner end 12H of the journal sleeve 12 is spaced substantially from the fillet surface 15F of the mounting stub. With this arrangement, the endwise mounting movement of the sleeve 12 onto the mounting stub 15 serves merely to engage the tapered surfaces 12T and 15T. When the sleeve 12 is thus located, the end surface 12F is located in an outward axial direction from the end surface of the stub 15E, thus to afford a clearance space within a short outer portion of the sleeve 12 for purposes that will appear hereinafter.

The journal sleeve 12 is held in place against undesired outward displacement primarily by a shrink fit of the sleeve 12 on the stub 15 so as to firmly engage the tapered surfaces 12T and 15T, but additional retaining means are also afforded which under the present invention serve to afford the usual projecting flange-like collar at the outer end of the journal. Thus a separately formed end plate 112 is provided which has a flat inner annular surface 112F adapted to abut the end surface 12F of the sleeve, and a projecting circular locating boss 112C is afforded on the plate 112 which defines the radially inward limit of the surface 112F. This projecting circular boss 112C is adapted to extend endwise with a snug fit into the outer or small end of the sleeve 12, as shown in Fig. 1, thus to be located in the clearance space afforded within the outer portion of the sleeve, and when the plate 112 is thus located in a concentric relation to the sleeve 12, the edge of the plate 112 extends outwardly beyond the cylindrical surface 12C to afford a collar adapted to engage the outer end surface of the journal bearing 22, as will be evident in Fig. 1. The separate formation of the collar enables this element to be replaced in many instances without the necessity of replacing the entire sleeve journal, and this effects economy of use. Moreover, the separate formation of the collar enables the present structure to be used with full 360° bearings. The studs 112S preferably have a retaining or locking wire 112W extended through transverse openings in the heads thereof, and the heads of the studs 112S as well as the wire 112W are housed by means presenting unbroken annular surfaces so as to avoid the possibility of engagement and displacement of the waste by the screw heads during rotation of the journal. Such means comprise a cup shaped cap 212 having an outward flange 212F on the end of its side wall. The flange is adapted to fit into an annular pocket 312 formed concentrically of the plate 112 and in the outer surface of the plate. The edge of the pocket 312 is undercut, as at 312U, and the cup 212 is held removably but securely in place by a snap ring 312R that may be put in place to engage the undercut 312U while at the same time engaging the flange 212F.

In the manufacture of the journal sleeve 12, the body thereof is initially formed by processes of forging from a suitable medium carbon steel, and is thereafter annealed to relieve the forging stresses. The various surfaces of the journal sleeve are turned and ground and are hardened by conventional heat treating processes to produce the desired hardened wearing surface. The mounting stubs 15 are also carefully formed as by grind-

ing so as to assure proper endwise and concentric relationship of the sleeve and the stub when the sleeve is put in position by processes of shrinking on the mounting stub 15.

The sleeve 12 is made from a steel material that has a coefficient of thermal expansion that is substantially the same as the coefficient of thermal expansion of the stub 15, and with this relationship between the materials of the sleeve and the stub, a proper relationship between these elements is maintained throughout the life of the bearing sleeve, despite any wide variations in temperature to which the assembly may be subjected. When the sleeve 12 is to be put in position on the mounting stub, the sleeve is heated and thus expanded by placing the same in a container of boiling water or oil, and when the sleeve has expanded to the requisite extent, a parting substance such as chalk, white lead or the like is applied to the inner surface 12T of the sleeve. The sleeve is then put in position on the mounting stub 15 and the tapered surfaces are brought into firm engagement by application of endwise clamping movement to the sleeve 12. This is done by placing the end plate 112 in position and tightening the three cap screws 112S into the threaded sockets 15B on the mounting stub 15. This clamping action is applied while the sleeve 12 is still in its expanded condition, and then upon cooling of the sleeve, the sleeve shrinks and attains a firm gripping and centering action upon the stub 15. The journal sleeve 12 is thus held in place on the stub 15 by the shrinkage pressure as well as by the mechanical endwise pressure that has been applied by the several cap screws 112S and the end plate 112.

The sleeve journal as it is thus mounted in position on the axle affords a replaceable bearing surface that has the required outer collar and inner flange, as well as the required dustguard seat, and the journal sleeve assembly of the present invention is adapted for simple and economical manufacture, and may be readily and easily mounted on or removed from the axle at almost any railway shop where facilities are available for removing the axle from the truck.

From the foregoing description, it will be apparent that the present invention affords an improved and simplified sleeve bearing assembly for railway journals, and this assembly is of such a character as to insure long and safe usefulness in the field and enable mounting and dismounting of the journal sleeves in the currently available shop facilities of railroads.

Thus while I have illustrated and described the preferred embodiment of my invention, it is to be understood that this is capable of variation and modification, and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. A journal sleeve assembly detachably mounted on the projecting end of a railway axle for rotation therewith and comprising a sleeve-like body affording inner and outer ends and having an inner annular flange at said inner end, said body having a cylindrical outer bearing surface extended continuously between said outer end and said inner flange and having an annular journal fillet surface defined at the inner end of said cylindrical bearing surface by the adjacent side surface of said inner flange, said body having an inner mounting surface of a gradually tapered frusto-conical form with the large end of said mounting surface disposed adjacent the inner end of said body, said outer end of said body having an end surface lying in a plane perpendicular to the axis of the body and connecting said inner and outer surfaces, a separately formed end plate of a diameter substantially larger than the diameter of said bearing surface and having a centering boss on one face thereof engaging the outer end portion of said inner mounting

surface to center the plate with respect to the outer end of the body and afford a projecting collar having a thrust bearing surface thereon facing toward the inner end of said body, and threaded means extended through said plate and into the end of an axle to hold such plate in said relation and for rotation with said body on the axle and spaced from the outer end of said axle so as to be entirely out of contact therewith.

2. In a railway axle and journal assembly, an axle having a wheel seat and an outwardly tapered mounting stub extended beyond said seat and having a stub end face disposed in a plane perpendicular to the axis of said stub, a sleeve-like body affording inner and outer ends and having an inner annular flange at said inner end, said body having a cylindrical outer bearing surface extended continuously between said outer end and said inner flange and having an annular journal fillet surface defined at the inner end of said cylindrical bearing surface by the adjacent side surface of said inner flange, said body having a tapered inner mounting surface substantially complementary to said tapered mounting stub, and said outer end of said body having an end surface lying in a plane perpendicular to the axis of the body and connecting said inner and outer surfaces of said body, said body being disposed on said stub for rotation therewith with the tapered surfaces of said body and said stub engaged with a shrink fit and with said outer end surface of said body spaced in an axially outward direction from said stub end surface to afford a clearance space within said body and outwardly of said stub end surface, a separately formed end plate of a diameter substantially larger than the diameter of said bearing surface and having a centering boss on one face thereof mounted in said clearance space and engaging the outer end portion of said inner mounting surface to center the plate with respect to the outer end of the body and afford a projecting collar on said body, said collar having a thrust bearing surface thereon facing toward the inner end of said body and means extended through said plate and said clearance space and engaged at the end of said stub to hold such plate and said body in said relation on said stub and to secure the plate to said stub for rotation therewith, said centering boss being spaced from said stub end face such that said end plate is entirely out of contact with said axle.

3. A journal sleeve assembly adapted for detachable mounting on the projecting end of a railway axle to afford a journal surface and a journal fillet thereon and comprising a sleeve-like body affording inner and outer ends and having an inner annular flange at said inner end affording a peripheral dust guard seat, said body having a cylindrical outer bearing surface extended between said outer end and said inner flange and having an annular journal fillet surface defined at the inner end of said cylindrical bearing surface by the adjacent side surface of said inner flange, said body having an inner mounting surface of a gradually tapered frusto-conical form with the larger end of said mounting surface disposed at substantially the same endwise location as said journal fillet surface, said body having an internal clearance surface formed between said larger end of said mounting surface and the inner end of said body and afforded as a frusto-conical surface of a substantially greater taper than said mounting surface and disposed radially inwardly with respect to said dust guard seat, said outer end of said body having an end surface lying in a plane perpendicular to the axis of the sleeve and connecting said inner and outer surfaces, and a separately formed end plate of a diameter larger than the diameter of said bearing surface and having a centering boss on one face thereof mounted in the outer end portion of said inner mounting surface to center the plate with respect to the outer end of the sleeve and afford a projecting collar thereon, said plate having a plurality of openings formed therethrough in which are disposed threaded means for engaging the end of an axle to hold such plate in said relation, an annular

undercut groove in the other face of said plate and disposed so that all of said openings are located radially inwardly of said groove, a cup shaped cap disposed with its rim in said groove, and a snap ring in said groove holding said cap in place.

4. An end plate assembly for use as an element of a journal sleeve structure for holding a journal sleeve in position and affording an annular outer end collar, said assembly comprising a circular plate having a diameter greater than the diameter of the bearing surface of the journal sleeve with which it is to be used, and said plate having a projecting entering boss on one face thereof to snugly enter and engage the outer end of such a sleeve, said plate having a plurality of bores therethrough for passage of fastening screws, a cup shaped cap having its rim engaged with the other face of said plate in concentric relation to enclose the outer ends of such fastening screws, and spring means securing said cup removably in position.

5. An end plate assembly for use as an element of a journal sleeve structure for holding a journal sleeve in position and affording an annular outer end collar, said assembly comprising a circular plate having a diameter greater than the diameter of the bearing surface of the journal sleeve with which it is to be used, and said plate having a projecting entering boss on one face thereof to snugly enter and engage the outer end of such a sleeve, said plate having a plurality of bores therethrough for passage of fastening screws, a cup shaped cap having its rim engaged with the other face of said plate in concentric relation to enclose the outer ends of such fastening screws, an annular flange on said other face in outwardly spaced concentric relation to such rim, said flange having an undercut groove on its radially inward face, and a snap ring disposed in said groove and engaging said rim to hold said cup in position.

6. An end plate assembly for use as an element of a journal sleeve structure for holding a journal sleeve in position and affording an annular outer end collar, said assembly comprising a circular plate having a diam-

eter greater than the diameter of the bearing surface of the journal sleeve with which it is to be used, and said plate having a projecting entering boss on one face thereof to snugly enter and engage the outer end of such a sleeve, said plate having a plurality of bores therethrough for passage of fastening screws, a cup shaped cap having an outwardly flared rim engaged with the other face of said plate in concentric relation to enclose the outer ends of such fastening screws, an annular flange on said other face in outwardly spaced concentric relation to such flared rim, said flange having an undercut groove on its radially inward face, and spring means securing said cup removable in position.

7. An end plate structure for use as an element of a journal sleeve structure for holding a journal sleeve in position and affording an annular outer end collar, said end plate structure comprising a circular plate having a diameter greater than the diameter of the bearing surface of the journal sleeve with which it is to be used so as to thereby afford a projecting thrust collar, and said plate having a projecting entering boss on one face thereof to snugly enter and engage the outer end of such a sleeve, said plate having a plurality of bores therethrough for passage of fastening screws, an annular flange formed concentrically with and on said other face of said plate in outwardly spaced relation to such openings, and said flange having an undercut groove in its radially inward face.

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