(No Model.)

B. F. HARTMAN.
AXLE SPINDLE.

No. 574,418. Patented Jan. 5, 1897.

Fig. 1.

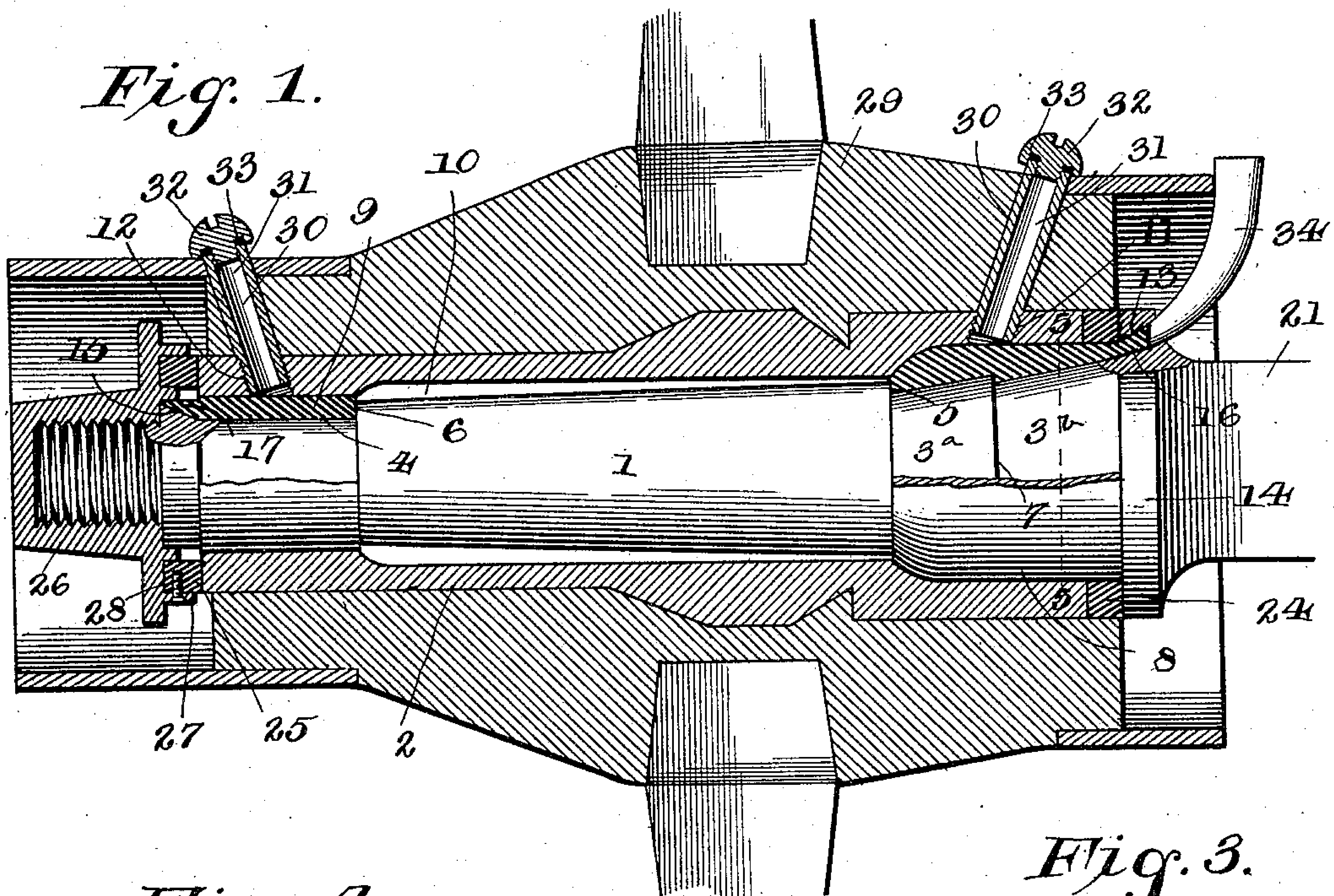


Fig. 4.

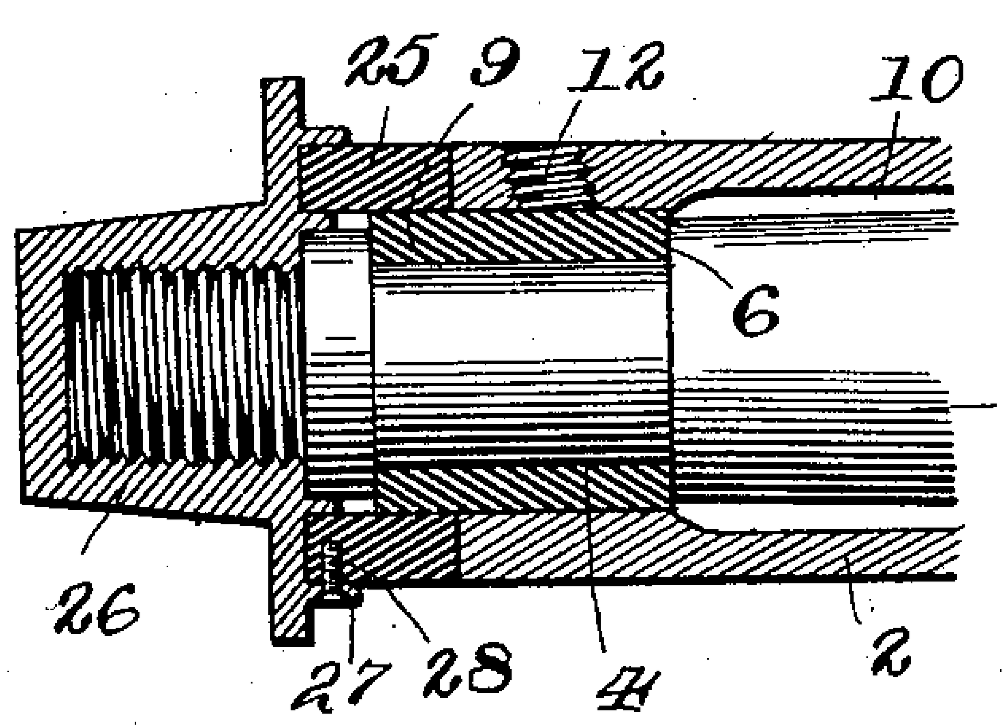


Fig. 3.

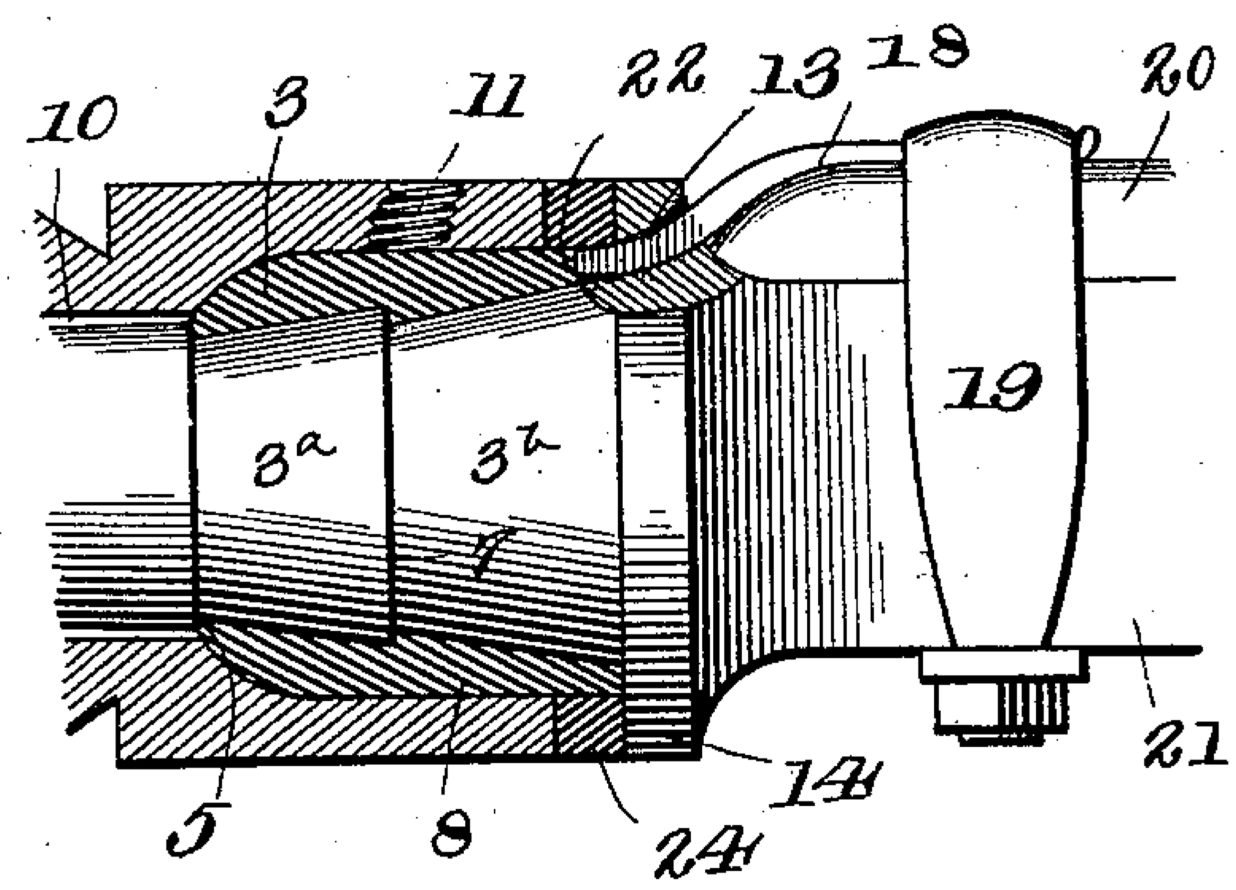
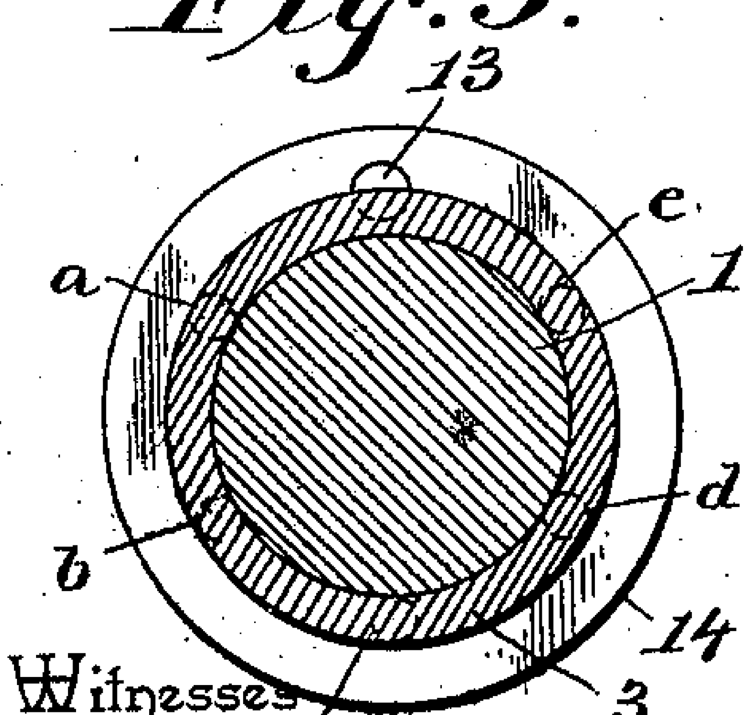


Fig. 5.



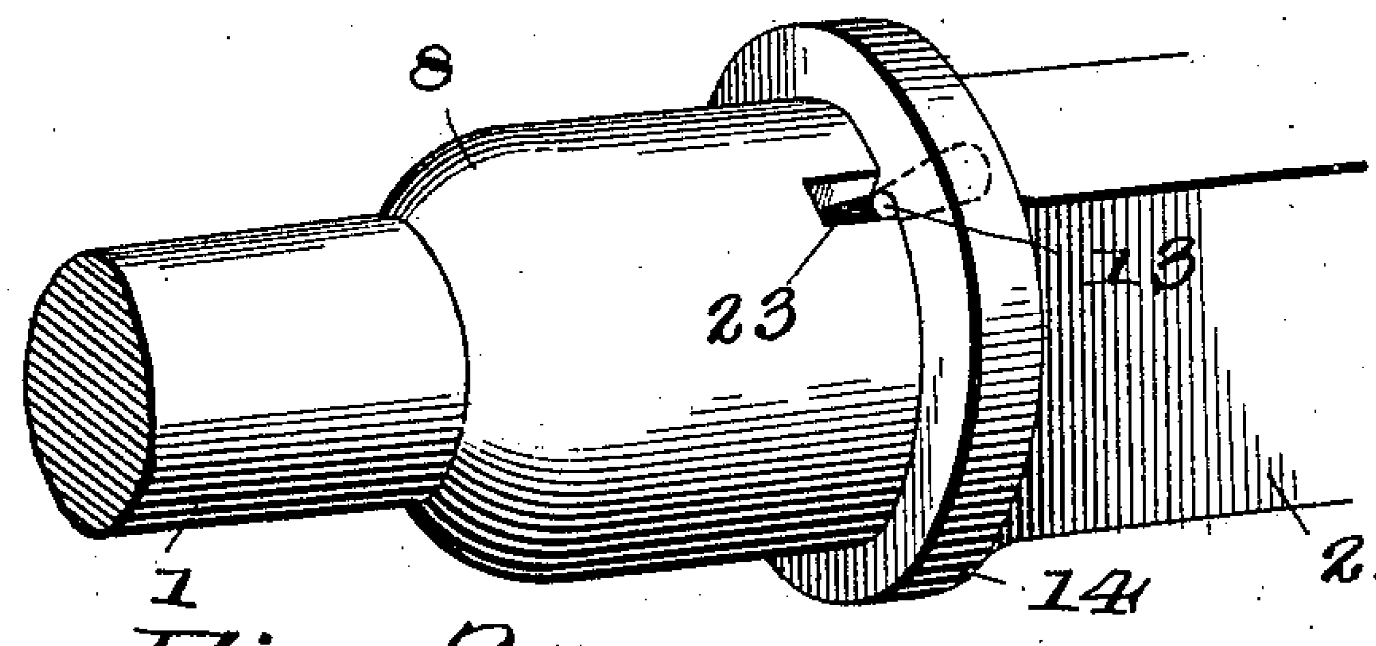


Fig. 2.

Witnesses

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[signature]

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UNITED STATES PATENT OFFICE.

BENJAMIN F. HARTMAN, OF PICKERING, PENNSYLVANIA.

AXLE-SPINDLE.

SPECIFICATION forming part of Letters Patent No. 574,418, dated January 5, 1897.

Application filed December 31, 1895. Serial No. 573,955. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN F. HARTMAN, a citizen of the United States, residing at Pickering, in the county of Chester and State of Pennsylvania, have invented a new and useful Axle-Spindle, of which the following is a specification.

My invention relates to axle-spindles for vehicles, and has for its object to provide means whereby wear may be compensated for at small cost and without the use of skilled labor, the device embodying my invention being applicable to either a new or an old spindle without materially modifying the construction thereof.

Further objects and advantages of this invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a side view of a spindle provided with compensating devices constructed in accordance with my invention, the axle-box being shown in longitudinal section. Fig. 2 is a partial perspective view of the spindle, showing the inner bushing notched or recessed at a point opposite the lead through which the key is introduced for locking said bushing at the desired adjustment. Fig. 3 is a partial side view of the spindle and axle-box, showing a slightly-modified form of locking device for the inner bushing and contiguous washer. Fig. 4 is a similar view of the outer end of the spindle, showing an elongated washer for use in connection with axle-boxes which have become materially shortened by wear. Fig. 5 is a transverse section on the line 5 5 of Fig. 1 through the spindle and the inner bushing to illustrate the different positions which the bushing is adapted to occupy when adjusted to compensate for wear.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

1 designates an axle-spindle, upon which is fitted an axle-box 2, the latter being exteriorly of the ordinary or any preferred construction. The spindle is reduced at its inner and outer ends to form annular channels or recesses 3 and 4 with the contiguous shoulders 5 and 6 produced by such reduction. The floor of the recess or channel 4 is preferably cylindrical or equidistant at all points from the axis of the spindle, but the floor of the recess or channel 3 is trunco-conical, with preferably a plurality of trunco-conical portions, as shown at 3^a and 3^b. The trunco-conical portions of the inner channel or recess are tapered toward the outer end of the spindle, and hence one or more abrupt shoulders 7 are formed between the contiguous extremities of said portions.

Fitted in each of the channels or recesses is a bushing 8 in the inner channel and a bushing 9 in the outer channel, each exceeding in diameter the intermediate portion of the spindle, whereby the bearing-surfaces of said bushings are more remote from the axis of the spindle than said intermediate portion of the spindle to cause the wear produced by the rotation of the axle-box upon the spindle to be sustained solely by the bearing-surfaces of the bushings. Furthermore, the bore of the axle-box between the contiguous ends of the inner and outer bushings is enlarged, as shown at 10, to form an annular channel designed to serve as a receptacle for lubricating material, the ends of this receptacle being closed by the contiguous extremities of the bushings to prevent grease from working out at the ends of the spindle. Hence by supplying this receptacle with wagon-grease an economical expenditure of the lubricant is insured and the unsightly appearance due to said lubricant working to the extremities of the bearing is avoided. Obviously in applying my invention to old spindles it would be too expensive, under ordinary circumstances, to drill out the bore of the axle-box to form this receptacle, but in constructing new axles I prefer to provide the boxes with this feature. A further advantage of this enlargement of the bore of the axle-box resides in the fact that it gives clearance for the outer bushing in applying or removing the axle-box, and hence even when the outer bearing-surface of the box is worn considerably in use and the diameter of the outer bushing has been increased to compensate for this wear no difficulty will be experienced in applying or removing the box.

The bushings preferably consist of a soft bearing metal, such as Babbitt lead or the equivalent thereof, and in order to insure the accurate fitting thereof to the bore of the axle-box, and also in order to provide for applying the inner bushing to the trunco-conical floor of the inner channel or recess, I mold the bushings upon the spindle, employing the axle-box which is to be mounted thereon as an outer mold. It is desirable to follow this plan particularly in applying the invention to old spindles, when it is necessary to compensate for wear both of the spindle and of the box. Hence in forming these bushings I proceed by arranging the box (the same having been detached from the hub of the wheel) in a position concentric with the spindle and introduce the metal which has been selected to form the bushings in a molten state, and when the material forming the bushings has cooled the shrinkage thereof will be sufficient to remove the exterior surfaces of the bushings from positive contact with the inner surface of the box and will provide a sufficiently snug fit to form a satisfactory bearing.

Various means may be devised for introducing molten metal into the channels or recesses in the spindle, only one, however, being illustrated in the drawings, which shows the box provided at points respectively opposite the inner and outer channels or recesses with gates or openings 11 and 12. After the bushings have been pored it is obviously necessary to remove from said gates or openings the metal which projects up thereinto in order to allow the box, after the shrinkage of the bushings, to rotate freely upon the bearings provided therefor. Said projecting portions of the metal may be removed by boring through the gates or openings after the metal has become hardened.

It is well known that the bearing portions of spindles of the class to which my invention appertains become worn upon the under side and eventually flattened at these points, and hence I have contemplated adjusting the bushings in order to successively present new surfaces for wear at the under side of the spindle. In order to accomplish this and at the same time insure the non-rotation of the bushings, I preferably employ means for locking the same, although the frictional contact of the bushings upon the floors of the channels or recesses is frequently sufficient to prevent rotation, even though the necessary rotation to secure the desired adjustment of the bushings may be accomplished by means of a powerful wrench or other mechanical device. In order to turn the bushings upon the spindle, even under the most favorable circumstances, and at the same time avoid marring or injuring the bearing-surfaces thereof, it is necessary to employ a wrench which will engage said surfaces by frictional contact, and it is preferable to employ a wrench of such a construction as to bear continuously upon the surface of the bushings or at all points around the periphery thereof.

In order to guard against accidental displacement of the bushings, however, I preferably employ a suitable locking device, and in the construction illustrated the lead or sprue-hole 13 is formed in the shoulder 14 at the inner end of the spindle, and a similar lead 15 in the spindle beyond the outer end of the outer channel or recess, integral projections 16 and 17 on the inner and outer bushings extending, respectively, into said leads 13 and 15. When the bushings are applied to the spindle in the manner above indicated or in a molten state, these projections are formed simultaneously with the bushings by a portion of the molten metal flowing into the leads, but when it is preferred to have an independent securing device I employ a locking-arm 18, (shown in Fig. 3,) which is secured at one end under or to the clip 19, which is usually employed for connecting the wood and metal portions 20 and 21 of an axle. The outer end of said locking-arm projects through the lead 13 into a suitable opening 22, formed in the inner end of the inner bushing. It is obvious that in order to lock the inner bushing by means of the arm 18 at any desired adjustment it is simply necessary to bore or cut a small notch similar to that shown at 22 in Fig. 3 at a point opposite the lead 13 when the bushing is in the desired position.

When the other form of locking device, consisting of an integral projection of the bushing, is employed, it is necessary, in order to allow rotary adjustment of the bushing, to detach said projection, this being done by means of a knife or fine saw or similar implement inserted between the collar 14 and the contiguous end of the bushing to sever the projection, and after the bushing has been turned to the desired position a notch 23, as shown in Fig. 2, is cut in the inner end of the bushing in alinement with the lead 13, and sufficient molten metal, preferably of the kind of which the bushing is formed, is poured through the lead to form a new projection, which is thus integrally connected with the bushing. In this way the bushing is capable of a plurality, as, for instance, six, positions, and hence the wear upon the bearing-surface of the bushing is evenly distributed. When the bushing has been adjusted to apply the wear as above described, and is therefore reduced in diameter with approximate uniformity, the operation described for forming a new bushing may be repeated by arranging the box concentric with the spindle and pouring molten metal through a suitable gate or opening to fill the space caused by said wear. The adjustment of the outer bushing is accomplished as above described in connection with the inner bushing, the projection 17 being first detached and subsequently re-formed by introducing molten metal through the lead 15.

When the box is free, by reason of the reduction of its length by wear, to vibrate longitudinally upon the spindle, lost motion in this direction may be taken up by means of washers 24 and 25, disposed between the extremities of the box and the shoulder 14 and cap-nut 26, respectively, said cap-nut being of the ordinary or any suitable construction, threaded upon an outer extremity of the spindle. In order to prevent looseness or rotation of the outer washer 25, if it is desired to prevent the same, said part may be secured to the flange 27 of the cap-nut by means of suitable set-screws 28. It is desirable to lock this washer in place when it is elongated, as shown in Fig. 4, to compensate for wear in an old bearing. The washers may be and preferably are constructed of Babbitt metal.

In the drawings I have shown ordinary forms of bearing-surfaces for the bushings to suit the common construction of bearing-surfaces in the box, the bearing-surface of the outer bushing being cylindrical, while the bearing-surface of the inner bushing is conical; but I desire to be understood that I do not limit myself to any particular construction of bearing-surface, as this feature may be varied to suit circumstances and preferences, and inasmuch as the bushings may be and preferably are formed by the use of an outer mold, consisting of the axle-box which is to fit thereon, it is obvious that the bearing-surfaces of the bushings will correspond accurately with the construction of the box without special preparation.

In order to provide for repairing an axle-spindle from time to time without removing the axle-box from the hub, I employ a construction shown in Fig. 1, wherein the hub 29 is provided with openings 30, in which are fitted lead tubes 31, communicating with and preferably threaded at their inner ends into the gates or openings 11 and 12 in the axle-box, the outer ends of said lead tubes being provided with removable caps 32, threaded or otherwise firmly secured in place and closing down upon suitable compressible washers 33 to prevent grease or other lubricant from working out to the surface of the hub. When it is necessary to repair a spindle, the above-described channels or recesses at the inner and outer ends thereof should be formed and the spindle inserted in the axle-box, after which the molten metal may be poured through the lead tubes. In the same way subsequent repair, after the successive adjustments of the bushings have been accomplished, may be attained by removing the caps of the lead tubes and introducing further molten metal to fill the spaces formed by the wear. It will be understood that these lead tubes may be arranged either in a diametrical position or in the inclined position shown in the drawings, the latter position being preferable in that it provides for forming the opening in the hub by means of a boring implement without interference with the spokes of the wheel. The lead tubes above described are also adapted to perform the function of lubricant-receptacles which may be filled with absorbent packing and saturated with oil or grease to be fed to the bearing-surfaces of the bushings. Obviously this absorbent material can be readily withdrawn when it is desired to employ the tubes for the purpose of introducing molten metal to renew the bushings.

In introducing molten metal to form the key or locking device for preventing the accidental turning of the bushing after it has been adjusted, I employ a funnel such as that illustrated in Fig. 1 at 34, said funnel being curved, whereby its inlet end is in approximately vertical position, while its outlet end corresponds approximately in inclination with the leads in the collar of the axle.

In Fig. 5 I have shown a cross-section of the spindle and inner bushing to illustrate the different positions which the bushing may occupy when adjusted to compensate for wear, the different points at which the locking device may be adjusted, whether an integral projection of the bushing or a locking-rod such as that illustrated in Fig. 3, being indicated, respectively, at *a*, *b*, *c*, *d*, and *e* in dotted lines. In other words, these points as lettered may be arranged successively in alinement with the opening 13, which is formed in the collar of the spindle to bring different parts of the surface of the bushing at the lower side of the spindle in position to receive the wear due to the downward pressure of the spindle upon the lowermost side of the axle-box.

The locking-arm which intersects or crosses the joint between the inner end of the bushing 8 and the contiguous wall of the channel in which said bushing is fitted is thus severable only in the plane of the joint by means of a saw or chisel or similar tool capable of insertion at this point, said locking-arm being normally concealed by reason of fitting in the said opening in the wall of the channel or the collar of the spindle. A concealed locking device is preferable in this relation for the reason that it does not then detract from the appearance of the wheel and is not liable to be encountered by other objects and displaced.

It will be understood that various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

Having described my invention, what I claim is—

1. An axle-spindle having an annular channel or recess, a soft-metal bushing fitting in said channel or recess and held by the end walls thereof from longitudinal movement, and a securing device severably attached to the bushing and engaging the spindle to prevent rotary movement of the former, said means being severable from the bushing to allow rotary adjustment without endwise movement of the latter, substantially as specified.

2. An axle-spindle having an annular channel or recess, a soft-metal bushing fitted in the channel or recess and held by the end walls thereof from longitudinal displacement, and a concealed locking-arm severably attached to the bushing at its inner end and fitting in an opening in the spindle, whereby said locking-arm extends transversely across the joint between the end of the bushing and the contiguous end wall of the channel or recess, to provide for severing the locking-arm in the plane of the joint to allow rotary adjustment of the bushing, substantially as specified.

3. An axle-spindle provided in its collar with a sprue-hole, a bushing revolubly mounted upon the spindle contiguous to said sprue-hole and provided with a notch registering with the same, and a projection or locking-arm formed by the introduction through the sprue-hole and into the notch of molten metal, substantially as specified.

4. An axle-spindle having a sprue-hole and provided contiguous thereto with a revolubly-adjustable soft-metal bushing formed by introducing molten metal between the spindle as a core and a suitable mold, and a projection or locking-arm on the bushing extending into said sprue-hole to lock the bushing at the desired adjustment, adjustment of the bushing being permitted by severing said projection or locking-arm, and the bushing being adapted for locking at a different adjustment by introducing molten metal through the sprue-hole and into contact with the bushing, substantially as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

BENJAMIN F. HARTMAN.

Witnesses:
DANIEL JONES,
SAML. WILSON.