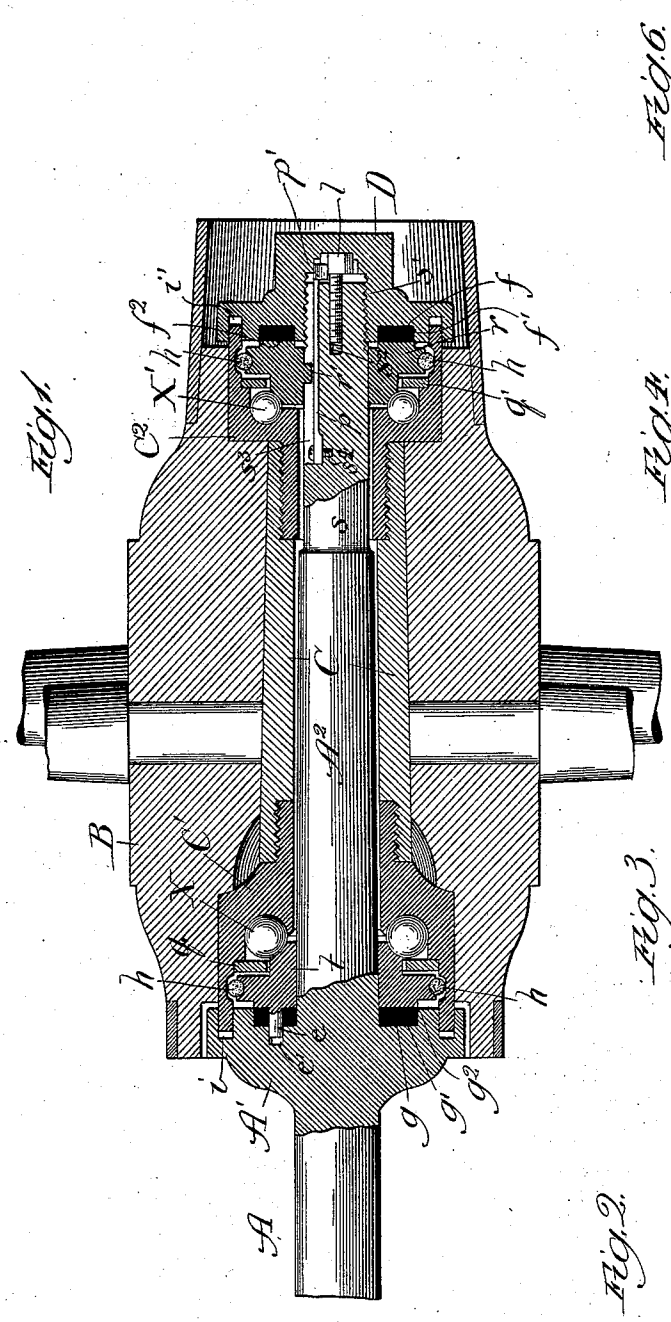
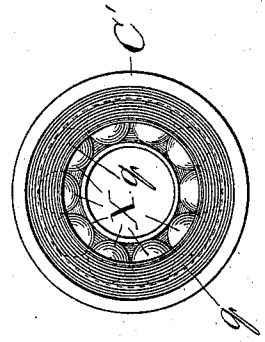
(No Model.) 2 Sheets—Sheet 1.

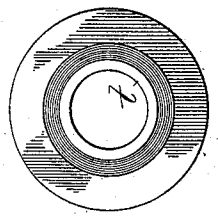
A. C. FARNSWORTH.

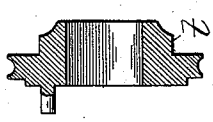
BALL BEARING.

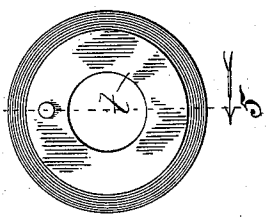
No. 567,309. Patented Sept. 8, 1896.

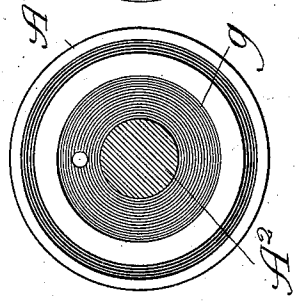












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(No Model.) 2 Sheets—Sheet 2.

A. C. FARNSWORTH.

BALL BEARING.

No. 567,309. Patented Sept. 8, 1896.

Fig. 8.

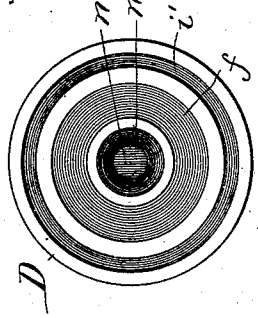


Fig. 12.

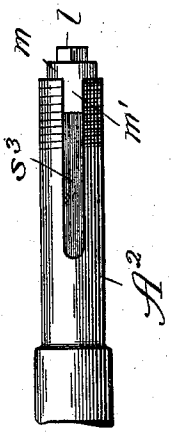


Fig. 15.

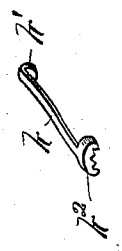


Fig. 11.

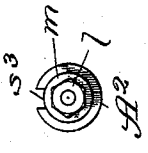


Fig. 14.

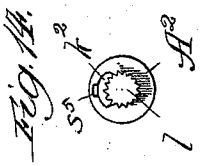


Fig. 7.

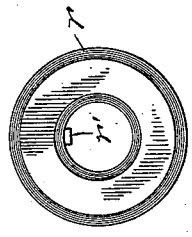


Fig. 10.

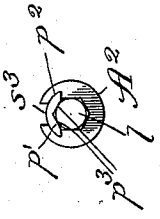


Fig. 9.

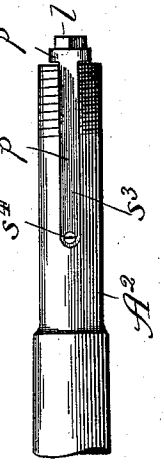
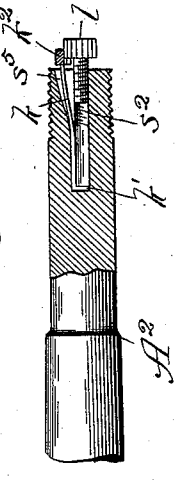


Fig. 13.



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UNITED STATES PATENT OFFICE.

ANDREW C. FARNSWORTH, OF CHICAGO, ILLINOIS, ASSIGNOR TO E. C. RITSHER, OF SAME PLACE.

BALL-BEARING.

SPECIFICATION forming part of Letters Patent No. 567,309, dated September 8, 1896.

Application filed February 4, 1896. Serial No. 577,973. (No model.)

To all whom it may concern:

Be it known that I, ANDREW C. FARNSWORTH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Ball-Bearings, of which the following is a specification.

My invention relates to improvements in the construction of ball-bearings generally, though more especially of ball-bearing axles.

In the drawings herewith I have shown my improvements applied to a ball-bearing axle substantially of the construction shown and described in my application for Letters Patent of the United States, bearing Serial No. 560,998, and filed August 30, 1895.

Referring to the drawings, Figure 1 is a broken and partly sectional view of a ball-bearing vehicle axle and hub with my present improvements of the preferred construction applied thereto; Fig. 2, a section of the axle-spindle, showing the inner face of the head or base portion of the spindle; Fig. 3, a rear face view, Fig. 4 a front face view, and Fig. 5 a sectional view, of an inner bearing-cone or race member; Fig. 6, an end view of one of the ball-boxes with the balls in place; Fig. 7, a face view of an outer bearing-cone or race member; Fig. 8, an inner face view of a cap or jam-nut; Fig. 9, a broken view of the end portion of the spindle shown in Fig. 1; Fig. 10, an end view of the spindle; Fig. 11, a similar view of the construction shown in Fig. 12; Fig. 12, a view the same as Fig. 9, but showing a locking-piece of modified form; Fig. 13, a broken view of the end portion of the spindle, partly in section, and showing a further modification; Fig. 14, an end view of the construction shown in Fig. 13, and Fig. 15 a perspective view of a spring locking-piece employed in the construction shown in Figs. 13 and 14.

A is an axle formed with a flange or head A′ and a spindle A^2. On the spindle at the flange A′ is an annular cone-piece or ball-race member *t*. The outer end portion of the axle is reduced, as shown at *s*, and provided with a screw-thread *s′*. In the end of the spindle is a central-threaded socket s^2. In the constructions shown in Figs. 1, 9, 10, 11, and 12 the spindle is provided on its outer side with a longitudinally-extending groove or recess s^3. Fitting over the end portion of the spindle is an annular cone *r*, also forming an inner ball-race member provided on its inner circumference with a lug *r′*, which, when the cone is placed upon the spindle, enters the groove s^3. The engagement of the lug *r′* with the groove s^3 holds the cone against independent rotation upon the spindle.

B is a hub, and C a sleeve provided with ball-boxes C′ C^2, forming outer ball-race members. In the ball-boxes C′ C^2 are ball-retaining washers *q q′*, which are large enough at their inner circumference to be out of contact with the inner race members *t r*, and operate to hold the balls X X′ against falling out of the ball-boxes when the hub is removed from the axle. On the end of the spindle and screwed upon the thread *s′* is a cap or jam-nut D, which, by bearing against the cone *r*, maintains the ball-bearings in position. Tightening of the jam-nut against the cone *r* presses the ball-bearing surfaces against the balls, and loosening of the jam-nut has the opposite effect. It is desirable in practice that the jam-nut shall be so tightened against the cone *r* that the sleeve and boxes C′ C^2 shall be held against longitudinal play; but the jam-nut should not bear so firmly against the cone-piece as to cause the balls to be bound in their bearings.

Fitting the threaded socket s^2 in the end of the spindle is a set-screw *l*, which may be adjusted to properly limit the distance to which the jam-nut D may be screwed upon the spindle. In the preferred construction I provide a locking-piece for the set-screw *l*, consisting of a spring-stem *p*, extending in the groove s^3 and fastened therein at s^4 and provided at the end of the spindle with a head *p′*, having a segmental outer edge p^2 and an inner engaging edge p^3, adapted to fit against the head of the set-screw *l*. The set-screw shown in the figures, in the preferred construction, has a head of hexagonal form, and the engaging-edge p^3 of the locking-piece is angular to fit a corner of the head of the set-screw. In the base or outer inner part of the jam-nut D is a recess *n*, large enough to receive the head of the set-screw, and a recess *n′*, of somewhat greater diameter, to afford an

annular shoulder just large enough to receive the head or lock p'. When it is desired to change the adjustment of the ball-bearings, the jam-nut D may be removed from the spindle and the set-screw l turned. In the turning of the screw the lock p' yields against the resistance of the spring p. The screw is turned as described until it projects the desired distance beyond the end of the spindle to afford a stop for the inner end n of the jam-nut, which will permit the latter to be screwed so far upon the end of the spindle as to bear with desired force against the cone r. When the jam-nut is screwed upon the spindle, the lock p' enters the recess n', and the annular shoulder formed thereby operates to hold the lock in unyielding engagement with the head of the set-screw to prevent turning of the latter.

In the modified construction shown in Fig. 12, I provide a lock consisting of a ring m, having an outer circumference approximating the circumference of the recess n' and an angular inner circumferential edge just capable of receiving the head of the set-screw l. The ring is provided at one edge with a stem m', fitting the recess s^3 of the spindle. The head of the set-screw l, employed when the ring m is used, may be hexagonal, as shown, so that it may be adjusted by stages of a one-sixth revolution and secured against rotation by means of the lock.

In the modified construction shown in Figs. 13, 14, and 15 no recess s^3 is provided in the outer circumference of the spindle, but a recess s^5 is provided in one side of the threaded socket s^2, the recess flaring at the end, as indicated in Fig. 13. The locking-piece consists of a spring-stem k, having a base-flange k' and a set-screw engaging head or lock k^2. The locking-piece is inserted into the threaded socket s^2 to extend at its flange across the base of said socket and along its stem portion in the recess s^5, the head k^2 being beyond the end of the spindle. In this construction I prefer to employ a set-screw l, having a serrated circumferential face, forming a ratchet, the inner or engaging face of the lock k^2 being serrated to intermesh with the head of the set-screw. When the jam-nut is removed the set-screw l may be turned, during which operation the locking-head k^2 will yield against the resistance of the spring k. When the jam-nut is screwed upon the spindle, its recess n' will engage the locking-head k^2 and hold it in engagement with the set-screw, as in the other constructions. The ends of the boxes C' C^2 revolve in annular grooves i i', located, respectively, in the flange A' and jam-nut, and in the cones t r and adjacent surfaces of the boxes I provide coincident grooves for annular, preferably felt, washers h h. This construction renders the ball-races dust-proof without materially interfering with the antifriction nature of the bearings. I also provide in the flange A', about the spindle, a recess g for a cushion g', and in the jam-nut an annular recess f for a cushion f'. When the parts are in place, the cushion g' bears against an annular shoulder g^2 on the cone t and the cushion f' bears against an annular shoulder f^2 on the cone r. The cushions f' g' may be of leather or rubber, to render them slightly resilient. The cushions operate to produce a slightly-yielding engagement between the races and balls, and will neutralize shocks against the balls under the force of impacts due to the wheel's traveling over a rough road. They will thus tend to prevent breaking of the balls. The cushions will also tend to prevent rattling of the parts and render the bearings noiseless. The cone t is prevented from turning by a pin e thereon, which passes through an opening in the cushion g' into a socket e' in the head A'.

While I prefer to construct my improvements as shown and described, they may be modified in the matter of details without departing from the spirit of my invention as defined by the claims.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a ball-bearing axle, the combination with a threaded spindle, hub thereon and hub-retaining jam-nut screwed upon the spindle, said spindle having a threaded socket in its end, of a set-screw adjustable in the said threaded socket and at its end affording a stop for the jam-nut, and locking means on the spindle for the set-screw, substantially as described.

2. In a ball-bearing axle, the combination with a threaded spindle, hub thereon and hub-retaining jam-nut screwed upon the spindle, said spindle having a threaded socket in its end, of a set-screw adjustable in the said threaded socket and at its end affording a stop for the jam-nut, and a movable set-screw locking-piece upon the spindle fitting and engaging the head of the set-screw, substantially as described.

3. In a ball-bearing axle, the combination with a threaded spindle, hub thereon and hub-retaining jam-nut screwed upon the spindle, said spindle having a recess and a threaded socket in its end, of a set-screw adjustable in the said threaded socket and at its end affording a stop for the jam-nut, and a set-screw locking-piece having a stem portion in said recess and a head portion to engage the head of the set-screw, substantially as described.

4. In a ball-bearing axle, the combination with a threaded spindle, hub thereon and hub-retaining jam-nut screwed upon the spindle, said spindle having a recess and a threaded socket in its end, of a set-screw adjustable in the said threaded socket and at its end affording a stop for the jam-nut, and a set-screw locking-piece having a resilient stem portion fastened in said recess, and a head portion to engage the head of the set-screw, substantially as described.

5. In a ball-bearing axle, the combination with a threaded spindle, hub thereon and hub-retaining jam-nut screwed upon the sleeve, said spindle having a recess and a threaded socket in its end, of a set-screw adjustable in the said threaded socket and at its end affording a stop for the jam-nut, a set-screw locking-piece having a stem in said recess and a head to engage the head of the set-screw, and a shoulder in the jam-nut engaging said locking-piece and holding it in its set-screw engaging position, substantially as described.

6. In a ball-bearing for wheels, a hub provided at opposite end portions with boxes C′, C^2, forming outer ball-race members, an axle having a spindle threaded along its outer end portion, and a flange provided with a recess *i* to receive the end of the box C′, a bearing-cone *t* on the spindle at the box C′, a bearing-cone *r* on the spindle at the box C^2, the said cones having circumferential recesses, annular washers *h* confined in the said cone-recesses against the adjacent surfaces of the boxes, and a jam-nut D for the cone *r* on the threaded part of the spindle, provided with an annular recess *i′* to receive the end of the box C^2, substantially as and for the purpose set forth.

7. In a ball-bearing for wheels, a hub provided at opposite end portions with boxes C′, C^2, forming outer ball-race members, an axle having a spindle, threaded along its outer end portion, a flange A′ at the base of the spindle having a recess *i*, to receive the end of the box C′, and a recess *g*, a cushion *g′* in the recess *g*, a bearing-cone *t* on the spindle at the cushion *g′*, a bearing-cone *r* on the spindle in the box C^2, a jam-nut D, on the threaded part of the spindle, having a recess *i′* to receive the end of the box C^2, and a recess *f*, a cushion in the recess *f* bearing against the cone *r*, the cones having circumferential recesses, and annular washers *h* confined in the said cone-recesses against the adjacent surfaces of the boxes, all constructed and arranged to operate, substantially as and for the purpose set forth.

ANDREW C. FARNSWORTH.

In presence of—
M. J. FROST,
J. H. LEE.