No. 670,313. Patented Mar. 19, 1901.

J. W. DICKINSON, JR.

BALL BEARING.

(Application filed Sept. 15, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

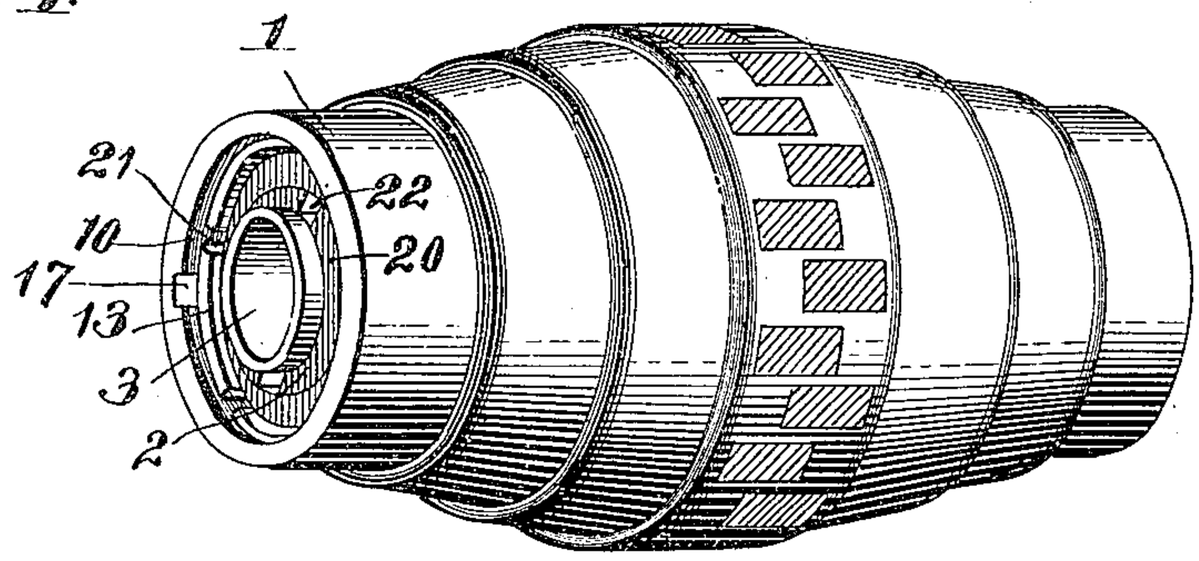


Fig. 2.

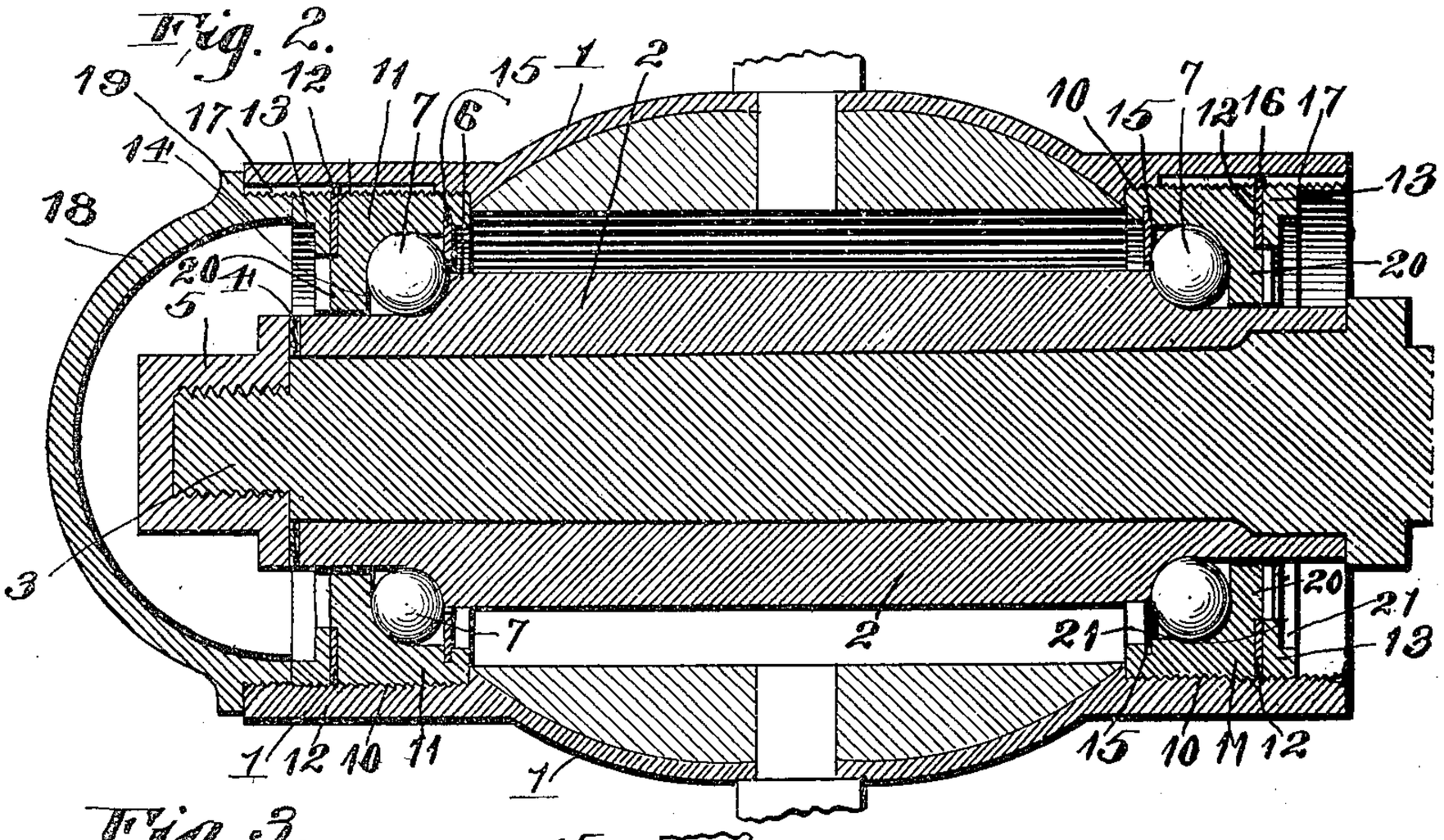
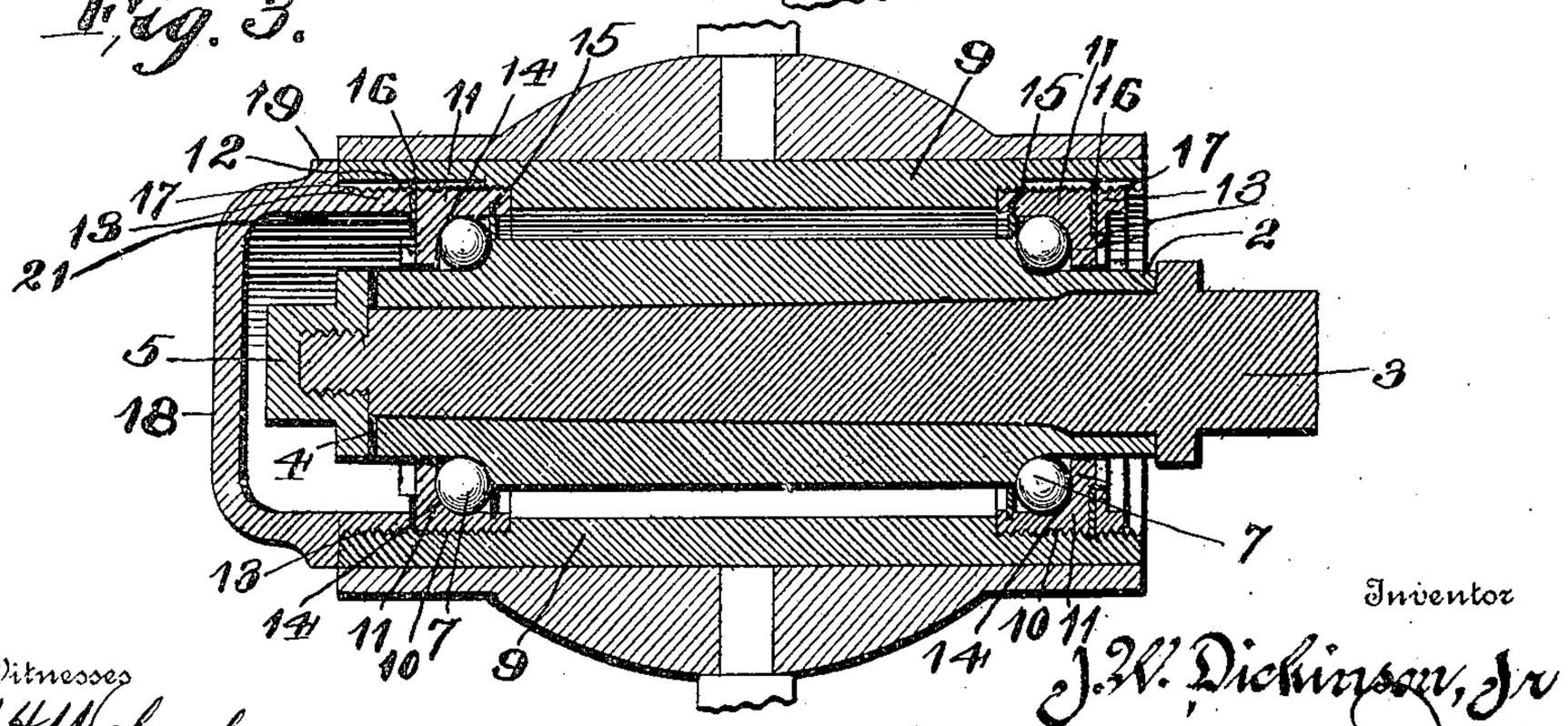


Fig. 3.



Witnesses
G. H. Walmsley,
Clarence Shaw

Inventor
J. W. Dickinson, Jr
by Pierce & Co
Attorneys

No. 670,313. Patented Mar. 19, 1901.

J. W. DICKINSON, JR.

BALL BEARING.

(Application filed Sept. 15, 1900.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 4a.

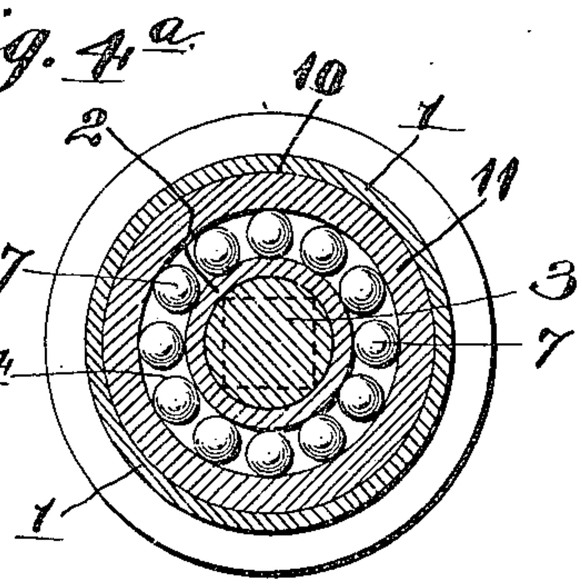


Fig. 4.

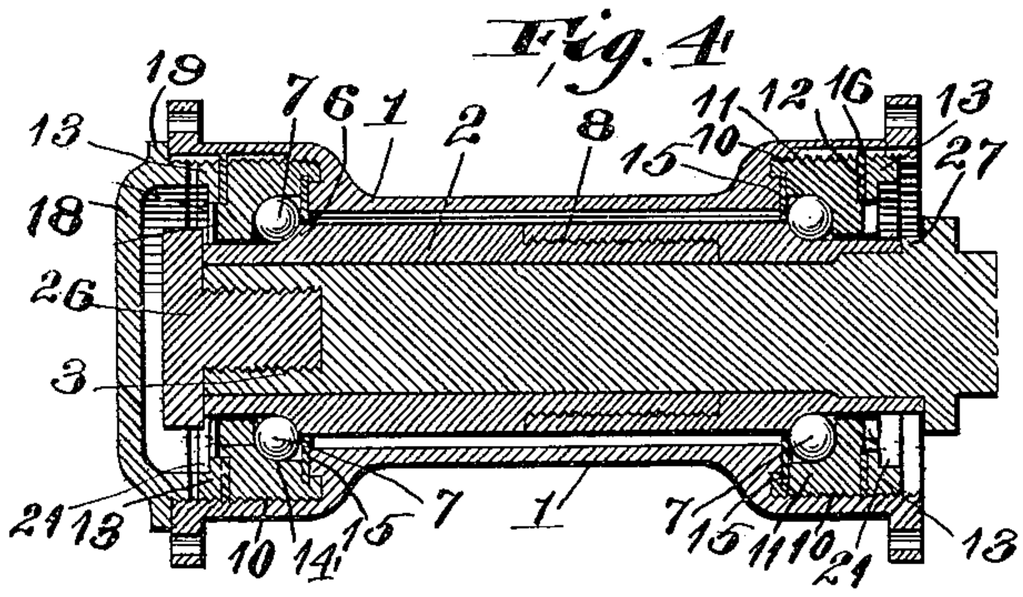


Fig. 5.

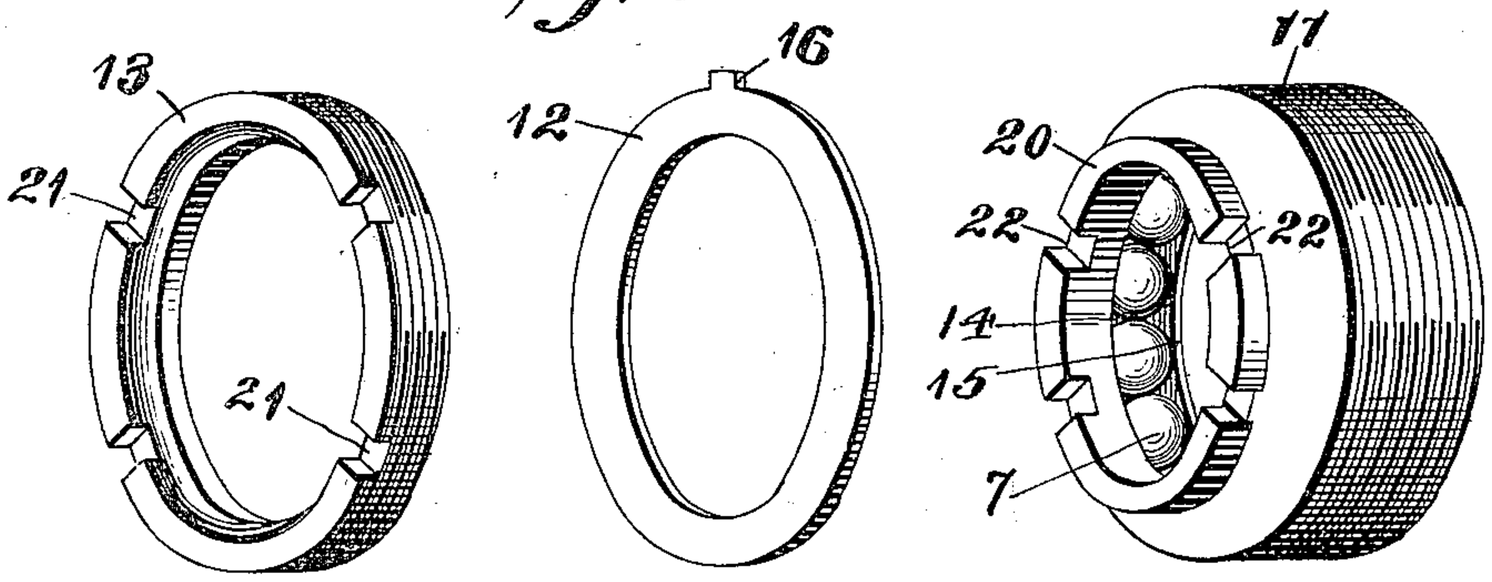


Fig. 6.

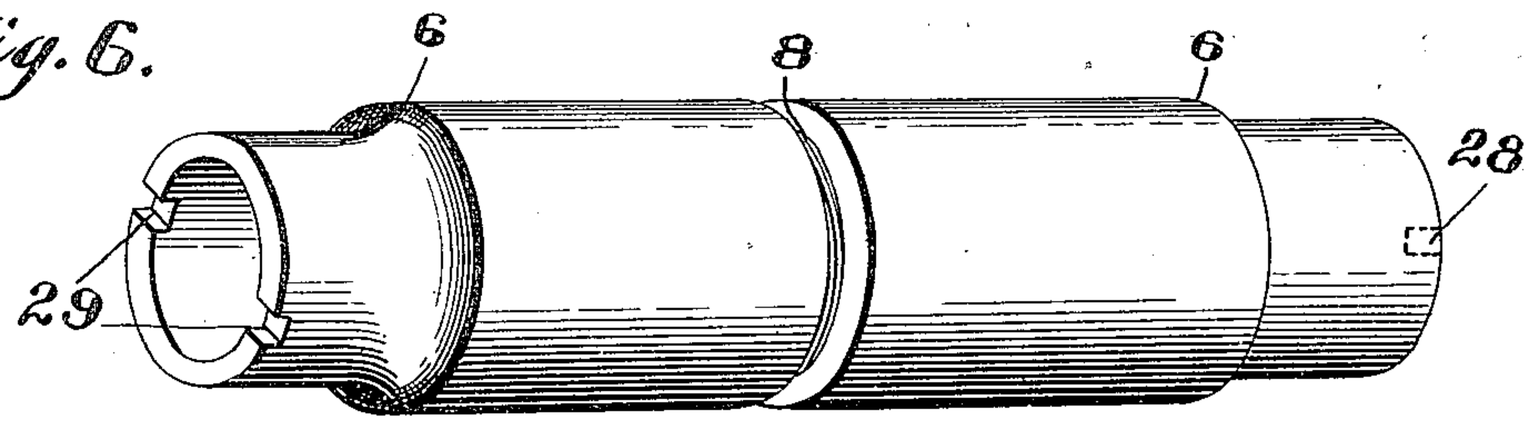
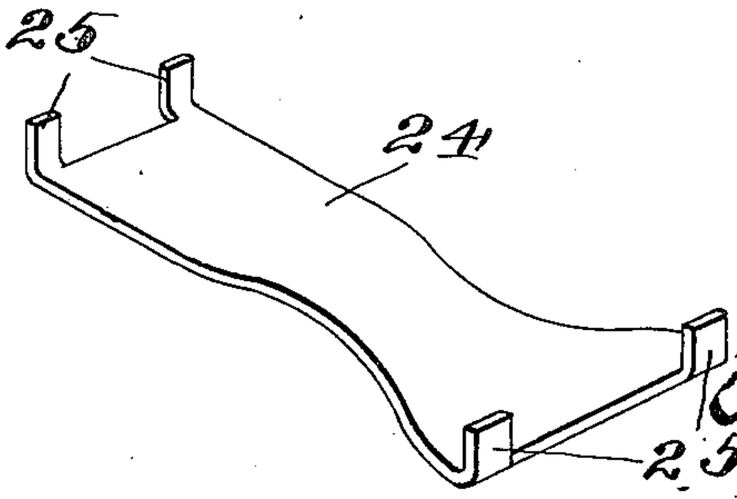


Fig. 7.



Witnesses
G. H. Walmsley,
Clarence Shaw.

Inventor
J. W. Dickinson, Jr.
by Munn & Co.
Attorneys

UNITED STATES PATENT OFFICE.

JOHN W. DICKINSON, JR., OF LITTLE ROCK, ARKANSAS.

BALL-BEARING.

SPECIFICATION forming part of Letters Patent No. 670,313, dated March 19, 1901.

Application filed September 15, 1900. Serial No. 30,161. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. DICKINSON, Jr., a citizen of the United States, residing at Little Rock, in the county of Pulaski and State of Arkansas, have invented a new and useful Ball-Bearing Boxing, of which the following is a specification.

My invention relates to antifriction-bearings, and has for one of its objects to produce a device of this kind which can be applied to vehicle-wheels, pulleys, car-wheels, and shafting and can be quickly and easily adjusted by any person having control or charge of the same.

Another object is to adapt it for use upon vehicle-wheels in such a manner that it will be impossible to lock the wheel against rotation, one member of the attachment being adapted to be secured upon the axle against rotation under ordinary conditions, but rotatable under abnormal conditions.

Another object is to adapt the bearing to axles of different sizes or special construction by simply changing one element of the bearing.

Another object is to adjust the bearing by changing the relative position of the antifriction devices relatively to the hub of the wheel and the inner sleeve or by varying the length of the inner sleeve, or both.

Another object is to provide means for locking the parts in their adjusted positions without removing either of said parts from the wheel; and a still further object is to construct the parts in such a manner that it will be impossible for the rotation of the wheel to lock the parts in an inoperative position.

With these objects in view my invention consists in the improved construction and novel arrangement of parts of a ball-bearing, as will be hereinafter more fully set forth.

In the accompanying drawings, in which the same reference-numerals indicate corresponding parts in each of the views in which they occur, Figure 1 is a perspective view of one form of my improved ball-bearing as applied to the hub of a vehicle. Fig. 2 is a longitudinal sectional view of the same. Fig. 3 is a similar view showing it applied to a hub in a different manner. Fig. 4 is a similar view showing it applied to a metal hub. Fig. 4^a is a transverse sectional view. Fig. 5 shows a perspective view of the ball-cup, dial-washer, and nut-lock separated. Fig. 6 is a perspective view of one form of the inner sleeve, and Fig. 7 is a perspective view of a wrench.

In practicing my invention I provide two sleeves 1 and 2, the inner one of which is adapted to fit upon the axle 3, and the outer one forms the hub of the wheel or is adapted to be secured thereto either internally or externally in any well-known manner. The inner sleeve is adapted to fit upon the spindle portion of the axle and to be rotated thereon, although I prefer to lock it against rotation by means of a yielding washer 4, as leather or cork, which is adapted to fit between the ends of the sleeve and the retaining-nut 5 or between the sleeve and the shoulder at the inner end of the spindle. Adjacent to each end the sleeve is provided with a shoulder 6, which forms a cone for the engagement therewith of the balls 7. The portion beyond the shoulder is preferably formed cylindrical and of the same external diameter throughout its length, which will afford a support for the balls at any point. If desired, the inner sleeve may be constructed of two parts arranged to telescope each other, as shown at 8, the parts being preferably screw-threaded for adjusting the length of the sleeve longitudinally. The outer sleeve 1 may be formed from one or two portions, one being shown in the drawings, and it may be placed upon the exterior of the hub, as in the ordinary shell-hub shown in Figs. 1 and 2, or it may be placed upon the interior of the hub, as shown at 9 in Fig. 3. Each end of the outer sleeve is interiorly screw-threaded, as shown at 10, for the reception of the ball-cups 11, dial-washers 12, and lock-nuts 13. The race 14 for the balls is cut upon the inner surface of the ball-cups, and a retainer 15 is secured at the inner end of each cup for holding the balls in position, the inner diameter of the retainer being preferably just large enough to fit over the end of the inner sleeve adjacent to the shoulder, the parts being of such relative size that the balls will be retained within the cup when removed from the hub, and the cup may be adjusted relatively to the sleeve without the retainer engaging

therewith. The dial-washer is preferably provided with a projection 16, which is adapted to fit into a longitudinal recess 17, cut across the screw-threads at each end of the outer sleeve.

As above described, a ball-cup is inserted in one end of the hub or outer sleeve, with the dial-washer and lock-nut following it. The inner sleeve is then inserted with one end projecting through the cup and the other end extending substantially to the opposite end of the hub. The remaining ball-cup is then inserted and screwed down until the balls engage with the opposite ends of the inner sleeve with the necessary amount of play and the dial-washer is inserted. The wheel is then placed upon the axle and secured in position by means of the nut 5, and the outer lock-nut, which is preferably made in the form of a dust-cap 18, is screwed into the outer end of the outer sleeve when the wheel is in condition for use, the dust-cap being preferably formed with a shoulder 19, which is adapted to fit against the outer end of the sleeve and presents a neat and attractive appearance. With a wheel constructed in this manner the inner sleeve is preferably held against rotation by the friction of the yielding washer placed at its end and clamped therein by means of the retaining-nut at the outer end of the spindle. As the wheel revolves the ball-cups are carried around and the balls or other antifriction devices caused to travel between the shoulders of the inner sleeve and the ball-cups. So long as the antifriction devices operate in their normal condition the inner sleeve will remain stationary upon the axle; but should one of the balls be crushed or the balls become locked against rotation from any cause the excessive friction caused by such abnormal arrangement will lock the inner sleeve to the ball-cups in such a manner as to cause it to overcome the slight resistance of the yielding washer and revolve upon the spindle in the same manner as the ordinary boxing. In this manner it is impossible to lock the wheel against rotation, as frequently happens with the antifriction devices in common use, and as soon as the journey is completed the wheel may be removed and the trouble remedied by replacing the broken ball or removing whatever obstruction that had caused the trouble.

If desired, the screw-threads in the ends of the outer sleeve may be cut in opposite directions—that is, right and left—and so arranged that any tendency of the ball-cups to rotate within the sleeve will cause them to be screwed outward as the wheel moves forward, thereby preventing the possibility of the cups being screwed in toward the shoulders of the inner sleeve, which might create undue friction or damage to the bearing.

To permit of a convenient adjustment of the ball-cups and of the locking-nuts, I prefer to form the outer surface of each of the ball-cups with an annular projection 20, which is adapted to extend outwardly until it is substantially even with the outer surface of the lock-nut, the interior diameter of the lock-nut and dial-washer being large enough to fit loosely over the projection of the ball-cup. The outer face of the lock-nut may be recessed or cut away, as shown at 21, and the outer edge of the projection and also of the lock-nut may be provided with depressions or notches 22 for the reception of an ordinary spanner-wrench, one form of such wrench being shown in Fig. 7, in which a flat plate 24 is provided with a set of projections 25 at each end, the distance between the projections at one end being equal to the diameter of the projection of the ball-cups and the distance between the others being equal to the diameter of the locking-nut. By constructing the ball-cups and lock-nut in this manner the ball-cups may be easily adjusted by screwing them back and forth in the outer sleeve without having to remove any of the parts from the wheel, as the cup and the nut can be rotated independently of each other. By placing the dial-washer between the nut and the ball-cup, with its projection fitting within the longitudinal recess of the outer sleeve, the rotation of the lock-nut will not be transmitted to the ball-cup, and therefore the liability of changing the position of the ball-cup by tightening the lock-nut is entirely prevented.

As above described, my improved ball-bearing is adapted for use upon any ordinary standard axle, as all that is necessary to change it from one size to another is to remove the inner sleeve and replace it with a sleeve having an interior diameter adapted to fit upon the diameter of the spindle to which the wheel is to be applied. The internal diameter of the bearings formed by the balls is large enough to receive a sleeve having an internal diameter sufficient for the larger axles and also for the smaller axles, the wall of the sleeve for the smaller axle being thicker under the ball-race than for the larger axle.

Owing to the efforts being made to utilize the ball-bearing upon the different kinds of vehicles in use, the different manufacturers have adopted different styles of what are called "special" axles, one form of which is shown in Fig. 4. The spindles in the special axles are generally shorter than the standard axles, and the sleeve or bearing which is adapted for the one will not fit the other. To adapt my improved bearing for either one of said constructions, I provide means for making the inner sleeve adjustable—as, for instance, by making the parts so that they may be telescoped upon each other and preferably screw-threading them, whereby they can be adjusted with any degree of nicety. I preferably make the sleeve of such a length that when the shoulders formed at the inner ends of the two parts of the sleeve are screwed up against each other the sleeve will be the proper length to fit upon the special axle, the screw-

threaded portion of the outer sleeve extending in far enough to permit of screwing in the ball-cups and lock-nuts far enough to have the balls engage with the shoulders formed on the outer ends of the inner sleeve. If it should be desired to use the same wheel upon a standard axle, the ball-cups are screwed outward and the inner sleeve is then lengthened by unscrewing its parts until it will fit between the retaining-nut and the shoulder of the standard axle in the same manner as though the sleeve were formed from a single piece of material and was originally intended for the standard axle. The ball-cups are then adjusted to the shoulders of the inner sleeve and locked in the same manner as heretofore described for the standard axle. If the special axle should be provided with a socket-nut 26, said nut will engage with the outer end of my adjustable sleeve and hold it in position in the same manner as it would retain the special sleeve which was originally intended to fit thereon. Many of these special axles are provided with a projection 27 upon the inner end of the spindle, which fits within a notch of the sleeve to prevent its rotation. To provide for this construction, I form a notch 28 upon the inner end of my improved sleeve, and I also prefer to provide the outer end of the sleeve with two notches 29, by means of which the outer part can be screwed outward for the purpose of adjustment with or without removing the wheel from the spindle.

By making the inner sleeve adjustable longitudinally and forming the screw-threads at the ends of the outer sleeve of sufficient length the bearing can be adjusted to fit spindles of different lengths, as the sleeve may be first adjusted and then the ball-cups adjusted relatively thereto. After the inner sleeve has been adjusted the engagement therewith of the retaining-nut will be sufficient to lock it against change or variation until after the pressure has been removed by the removal of the retaining-nut, thereby preventing the bearing from getting out of adjustment while being used.

As an instance of some of the advantages arising from the construction of my improved antifriction device the same wheels may be adapted for vehicles of different sizes—that is, those having larger or smaller spindles—by having a set of inner sleeves for each vehicle. For instance, if a man should have several vehicles he could use the same set of wheels upon each of the vehicles or he could have wheels of different makes—as, for instance, a set of wood-spoke wheels and another set of wire-spoke or pneumatic wheels—and he could use wheels interchangeably upon the vehicles by simply providing each wheel with the proper sleeve to fit the axle which it is desired to use. As the parts forming my improved bearing are of simple construction and can be removed and adjusted by simply screwing and unscrewing the different parts the changes from one to the other and the proper adjustment of each can be made by any person into whose hands the bearings should come. In case the proper adjustment was not made—that is, if the distance between the bearings at the two ends of the hub should be greater than the distance between the shoulders of the inner sleeve—the bearing would operate equally as well as though the balls fitted close against the shoulders of the inner sleeve, as the portion of the sleeve beyond the shoulders is made of the same diameter throughout its length and would support the balls at any point, the only difference being that the play of the sleeve back and forth through the bearing would cause a slight sound and jar when either shoulder would engage with the balls at that end.

If desired, the interior diameter of the sleeves at the inner end of the hub may be larger than at the outer end to accommodate the enlarged portion of the spindle at that point. It is also evident that my improved bearing could be applied to pulleys or roller-skates as readily as to vehicle-wheels, and it can also be applied to car-wheels, thereby rendering it adaptable for use for a wide variety of purposes and of variable adjustability in each of the uses to which it may be put.

If desired, the inner sleeve may be positively locked against rotation in any suitable manner, as by omitting the elastic washer, or the axle may be angular in cross-section, with the bearing of the sleeve made to correspond. Instead of providing the axle with the usual annularly-grooved collar it may be provided with a shoulder or stop of any kind, against which the inner end of the sleeve may engage, thus reducing the cost of manufacturing the axle, as all lathework could be dispensed with. As there is no possible chance for the ball-cups or any of the bearing to come in contact with the spindle or the shoulder of the axle at the inner end or the axle-nut at the outer end the friction is reduced to a minimum. The bearing-surface of the cup is preferably made substantially cylindrical upon its inner end and parallel with the bearing-surface upon the inner sleeve, thereby securing a direct bearing diametrically across the balls and at right angles to said surfaces, thereby avoiding any lateral pressure of the balls against the cup or the cone.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a ball-bearing, the combination, with two sleeves, one within the other, the inner sleeve being provided with a cone adjacent to each end and the outer sleeve being interiorly screw-threaded at each end and provided with a longitudinal groove cut across the screw-threads, an exteriorly-screw-threaded ball-cup in each end of the outer sleeve, antifriction devices in position to engage with said cups and cones, a washer upon each cup,

the periphery of which is provided with a projection to fit within said groove, and an exteriorly-screw-threaded lock-nut within the sleeve outside of said washer, the cup and the nut being adjustable independently of each other and without removing either of them or the washer from the end of the sleeve, substantially as described.

2. In a ball-bearing, the combination, with an inner and an outer sleeve, the inner sleeve being provided with a cone adjacent to each end, and each end of the outer sleeve being interiorly screw-threaded, a ball-cup in each end of the outer sleeve, the outer face of which is provided with an outwardly-extending notched projection adjacent to the inner sleeve, antifriction devices between the cups and cones, and a lock-nut for each cup, the interior diameter of which is large enough to fit over said projection and the outer face of the nut provided with recesses whereby the nut and the cup may be rotated independently of each other and without removing any of the parts from the outer sleeve, substantially as described.

3. In a ball-bearing, the combination, with an inner and an outer sleeve, the inner sleeve being formed from two screw-threaded telescopic portions, the outer ends of each of which is provided with a cone, and each end of the outer sleeve interiorly screw-threaded, of a ball-cup adjustably secured in each end of the outer sleeve, and a lock-nut for each sleeve, the two portions of the inner sleeve and of the ball-cups being adjustable independently of and relatively to each other and to the outer sleeve without removing any of the parts from the outer sleeve, substantially as described.

JOHN W. DICKINSON, JR.

Witnesses:
CHAS. E. BROCK,
CLARENCE SHAW.