No. 725,246. PATENTED APR. 14, 1903.

A. E. HENDERSON.

BALL BEARING.

APPLICATION FILED JULY 14, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

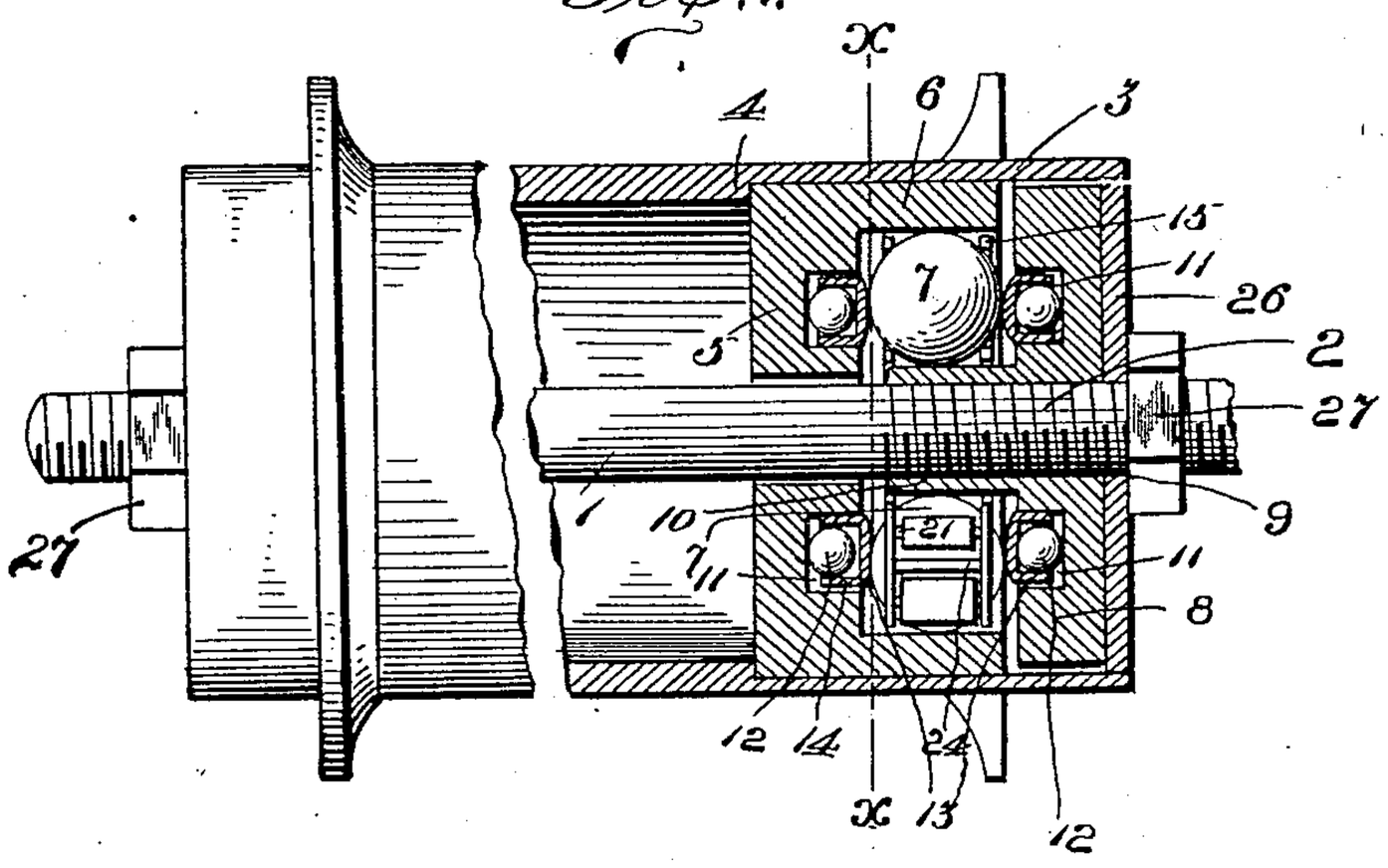
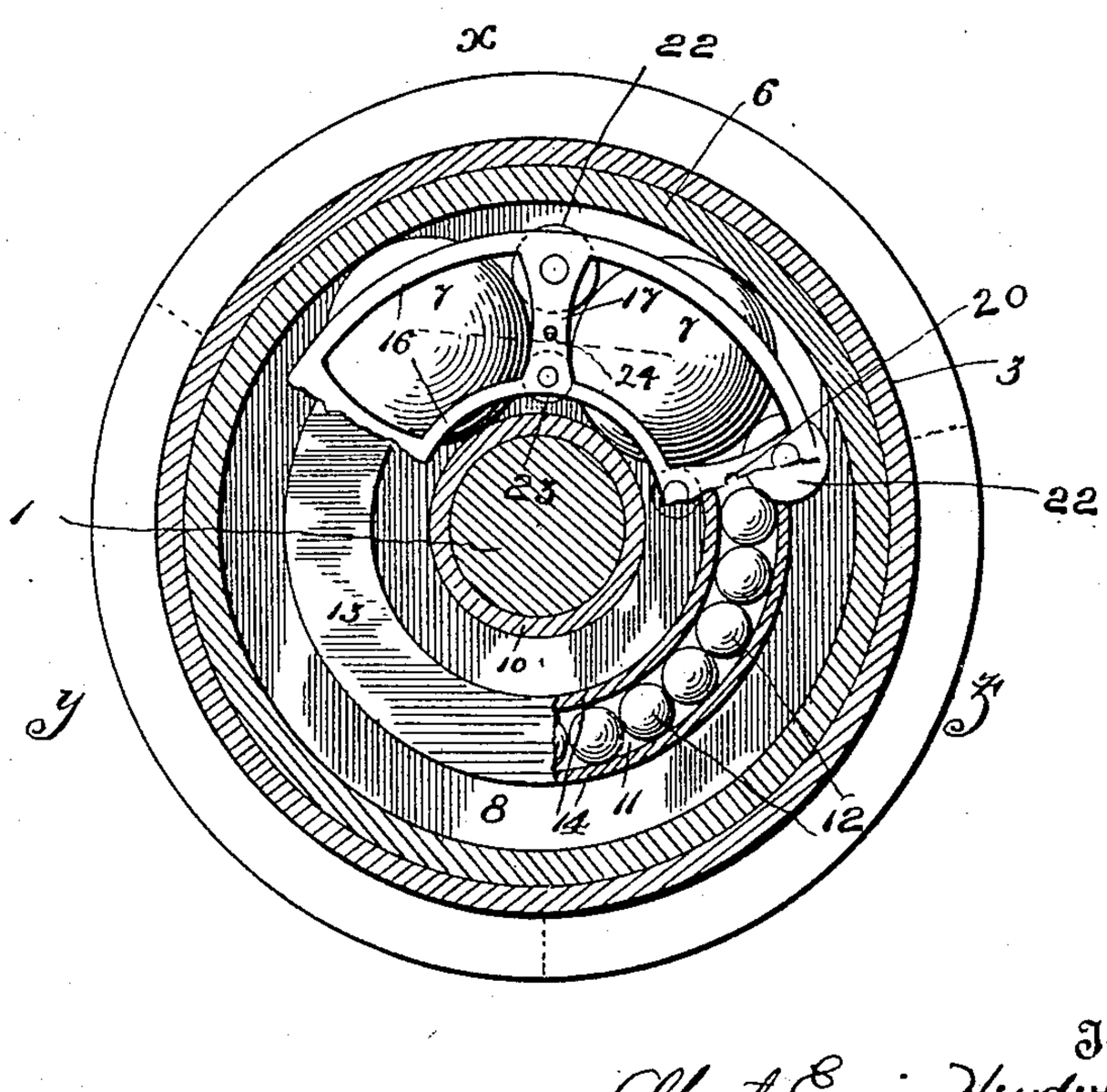


Fig. 2.



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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

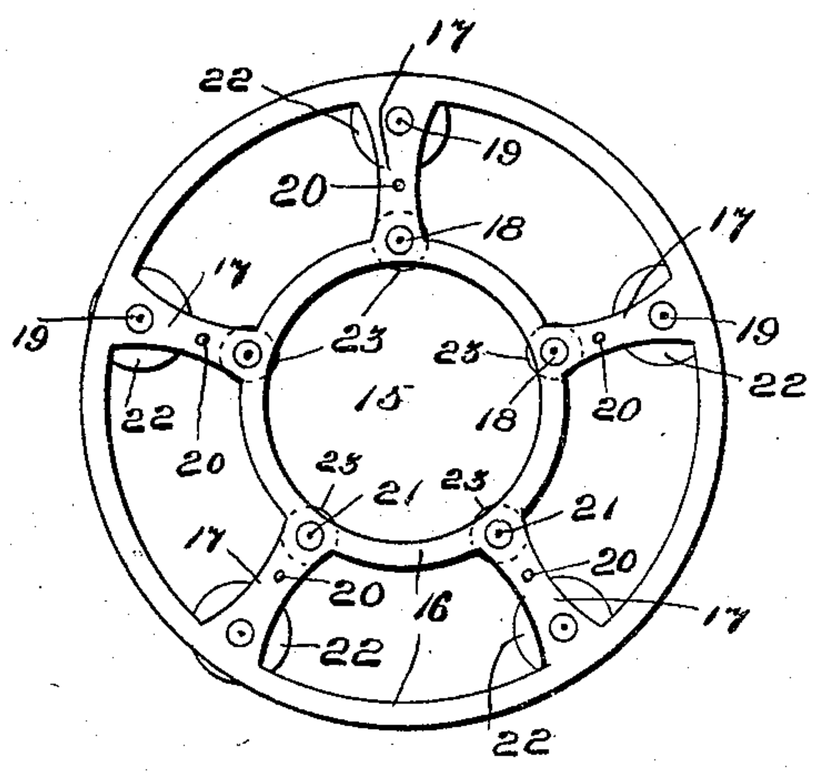


Fig. 4.

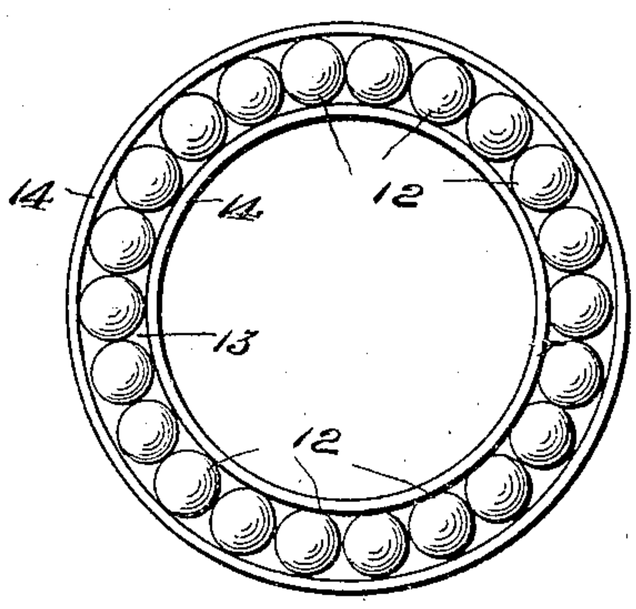


Fig. 5.

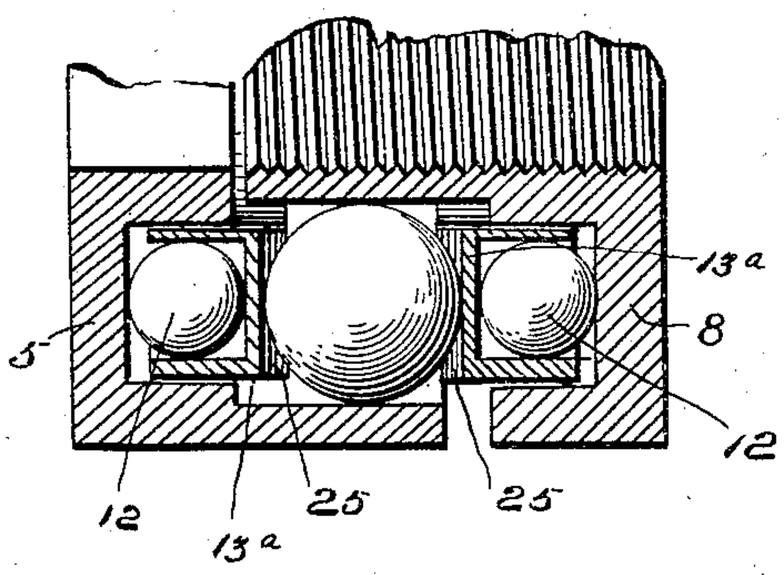
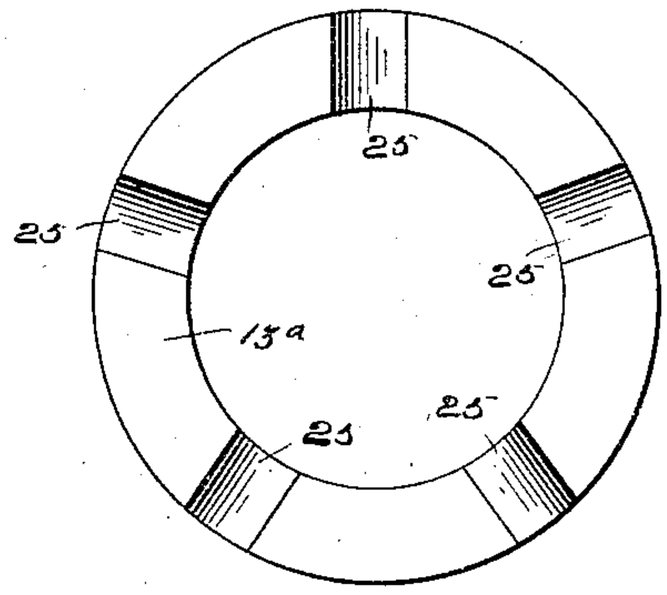


Fig. 6.



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UNITED STATES PATENT OFFICE.

ALBERT ENNIS HENDERSON, OF TORONTO, CANADA.

BALL-BEARING.

SPECIFICATION forming part of Letters Patent No. 725,246, dated April 14, 1903.

Application filed July 14, 1902. Serial No. 115,513. (No model.)

To all whom it may concern:

Be it known that I, ALBERT ENNIS HENDERSON, a subject of the King of Great Britain, residing at Toronto, in the county of York, Province of Ontario, and Dominion of Canada, have invented certain new and useful Improvements in Ball-Bearings, of which the following is a specification.

This invention relates to improvements in ball-bearings; and it has for its object the production of a ball-bearing which is provided with means to produce frictionless end thrust to the balls and with an antifriction means for separating the balls. I attain these objects by employing two-point contacts for the balls, an antifriction thrust-bearing mounted in the sides of the ball-cups at substantially right angles to the contact-bearings, and also a separating means carrying antifriction devices mounted loosely between the cups and supported in the proper position by the balls or by providing means upon the antifriction thrust-bearings for holding the balls separated.

In the accompanying drawings, Figure 1 represents a cycle-wheel axle and hub, partly in section, with my improved ball-bearing in section and in operative position therein. Fig. 2 is a sectional view of the bearing on line *x x* of Fig. 1, with a portion of one cup removed, the entire circle being divided into three segments *x*, *y*, and *z*, in which are shown in detail the bearing-balls and separating device in segment *x*, one of the thrust-bearings in *y*, and a view showing the top of the thrust-bearing plate removed, as in *z*. Fig. 3 is a detailed view of the ball-separating device. Fig. 4 is an end view of one of the thrust-bearing rings and balls. Fig. 5 is a sectional view showing a modified form of thrust-bearing and separating means. Fig. 6 is a detailed plan view of one of these means.

Referring to the drawings, the numeral 1 designates the axle, which is provided with the threaded end 2, and 3 is the hub-shell, which is provided with the interior shoulder 4. Fitting within the hub-shell and adapted to loosely surround the axle is the inner cup or bearing-ring 5, whose inner face, near the circumference, abuts against the shoulder 4 of the hub-shell. This cup is provided with the outer peripheral cylindrical flange 6, whose inner face forms one of the bearing surfaces or raceways for the gearing-balls 7. The other ball cup or ring 8 is provided with the internal threaded portion 9, which is adapted to engage the threads of the axle and revolve therewith, its outer circumference being out of contact with the interior of the hub-shell. This cup is provided with the centrally-arranged cylindrical flange or sleeve 10, whose outer surface provides the inner bearing-surface or raceway for the bearing-balls. It will thus be seen from this construction that the bearing is provided with a two-point contact for the balls, and in order that the end thrust may be taken up and the sliding or twirling motion generally caused thereby prevented I form the oppositely-arranged annular recesses or journals 11, in which are arranged the series of balls 12, which are held in place and form the ball-bearing for the thrust rings or plates 13, which are provided with the substantially parallel flanges 14, the inner flange of these rings loosely contacting the inner wall of the channels 11. It will thus be seen that should the bearing-balls at any time contact either one of the rings 13, instead of the balls having to slide upon a stationary surface these rings, by reason of the balls, will revolve in unison with the axes of rotation of the respective bearing-balls proper. In order that these bearing-balls be properly separated, and thereby reduce the friction between same, I provide the two open rings or frames 15, which are provided with the upper and lower narrow bands 16, secured together by means of the intermediate straps or strips 17, which are provided with adjacent openings 18 and 19 and a central opening 20. Mounted between the rings 15 and having their mandrels or pintles 21 journaled in the openings 18 and 19, respectively, are the separating-rollers 22 and 23. The roller 22 is of a greater diameter than the roller 23 and is so journaled as to have its lower bearing-surface above the line between the axes of adjacent bearing-balls, while the lower roller, which is of a smaller size, is below said line. It will thus be seen that the rollers 22 and 23 keep the bearing-balls properly separated and so contact the bearing-balls as to cause said balls to support the cage and rollers. In order to

secure the rings 15 together, and thereby hold the rollers in their proper places, I employ the screws or tie-rods 24, which are mounted in the openings 20 of the rings. It will be seen that by constructing the separating device as herein set forth the bearing-balls do not contact with the cage, but only with the rollers 22 and 23, and thereby sustain the cage.

In Figs. 5 and 6 I have illustrated the separating device which dispenses with the rings and rollers, and in lieu thereof I form concavities 25 in adjacent faces of the rings 13^a to such a depth that the concavities guide the bearing-balls, so that they cannot ride upon the plane surfaces between the concavities, thus always holding the bearing-balls between two opposed concavities and keeping the same separated as they revolve upon the raceways.

My method of relieving the sliding or twirling motion of the axes of the bearing-balls by means of the ball-bearing plates or rings mounted upon opposed faces of the cups or bearing-rings is not only applicable to ball-bearings which are provided with separating means, but may be used upon any form of ball-bearing, as it is always applicable and will prevent the twirling motion to which balls are commonly subject, and thereby reduce the friction and tendency to break. In order that the bearing ring or cup 8 may be adjusted readily and held at the proper adjustment, I provide the lock-disk 26, which is provided with threads to engage the axle and revolve therewith, a nut 27 being used to hold the parts more securely in adjusted position.

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

1. In a ball-bearing, the combination of two bearing-rings, antifriction thrust means carried by the bearing-rings, bearing-balls arranged therebetween, and a spacing device for the bearing-balls supported by said bearing-balls, said spacing device having pairs of rollers engaging the bearing-balls one above and one below the line joining the centers of the two adjacent bearing-balls.

2. In a ball-bearing, the combination of two bearing-rings, antifriction thrust means carried by the bearing-rings opposed to the axes of rotation of the bearing-balls, bearing-balls arranged therebetween and a spacing device for the bearing-balls supported by said bearing-balls, said spacing device having rollers of different sizes, the larger ones engaging the bearing-balls above the line joining the centers of two adjacent bearing-balls, and the smaller rollers engaging the bearing-balls below said center line.

3. In a ball-bearing, the combination of bearing-rings, bearing-balls arranged therebetween, antifriction thrust means carried by the bearing-rings opposed to the axes of rotation of the bearing-balls, and antifriction separating means contacting and supported by the bearing-balls, said separating means comprising a pair of open rings, rollers arranged in pairs of different sizes carried by the open rings and adapted to rest in the space between adjacent bearing-balls, and means to hold the open rings together.

4. In a ball-bearing, the combination of bearing-rings, having raceways, bearing-balls arranged therebetween, antifriction thrust means for the bearing mounted in opposed sides of the rings and adapted to revolve with the bearing-balls only when contacted therewith, and antifriction separating means supported by the bearing-balls.

5. In a ball-bearing, the combination of bearing-rings, having raceways, bearing-balls arranged therebetween, antifriction thrust means for the bearing independently mounted in opposed sides of the rings and adapted to revolve with the bearing-balls only when in contact therewith.

6. In a ball-bearing, the combination of bearing-rings, having raceways, bearing-balls arranged therebetween, and antifriction thrust-rings mounted in opposed sides of the bearing-rings and adapted to revolve with the bearing-balls only when in contact therewith.

7. In a ball-bearing, the combination of bearing-rings, having raceways, bearing-balls arranged therebetween, and antifriction thrust means for the bearing mounted in the bearing-rings opposed to the axes of rotation of the bearing-balls and adapted to revolve only when in contact with the bearing-balls.

8. In a ball-bearing, the combination of an axle, a hub-shell, a bearing-ring contacting and revoluble with the hub-shell, another bearing-ring carried by the axle, bearing-balls supported between the bearing-rings, antifriction thrust means mounted in opposed sides of the bearing-rings and adapted to revolve only when in contact with the bearing-balls, and antifriction separating means for the bearing-balls supported by the bearing-balls and having rollers of different sizes one above and the other below the line joining the center of two adjacent bearing-balls.

9. In a ball-bearing, the combination of bearing-rings having each a raceway and further provided with opposed annular recesses, bearing-balls mounted between the raceways, and antifriction thrust means arranged in the recesses of the rings.

10. In a ball-bearing, the combination of bearing-rings provided with opposed bearing-surfaces, and opposed recesses, bearing-balls mounted between the bearing-surfaces and antifriction thrust-rings mounted in said recesses.

11. In a ball-bearing, the combination of bearing-rings, provided with opposed bearing-surfaces, bearing-balls mounted between the bearing-surfaces of the rings and antifriction means independently mounted in opposed sides of the bearing-rings adapted to contact the bearing-balls at substantially right angles to the lines of contact with the bearing-surfaces.

12. In a ball-bearing, the combination of bearing-rings provided with flanges having opposed bearing-surfaces and with opposed annular recesses, bearing-balls mounted between the bearing-surfaces, and antifriction means mounted in said recesses opposed to the axes of rotation of the respective bearing-balls and adapted to contact the bearing-balls at such point.

13. In a ball-bearing, the combination of the bearing-rings, said bearing-rings each being provided with a bearing-surface and an annular recess, bearing-balls mounted between the bearing-surfaces of the rings, flanged rings mounted in said recesses of the bearing-rings and free to rotate therein, and bearing-rollers mounted in the recesses to support said flanged rings.

14. In a ball-bearing, the combination of a hub-shell, a bearing-ring mounted within the hub-shell and revoluble therewith, an axle, a bearing-ring mounted upon the axle, said bearing-rings being provided upon opposed faces each with an annular recess, a thrust-ring mounted in each of said recesses, bearing-balls mounted between the bearing-rings and adapted to have their axes of rotation opposed to the said thrust-rings to cause the thrust-rings when contacted by said bearing-balls to rotate with the bearing-balls, and bearing-rollers for the thrust-rings mounted in the recesses.

15. In a ball-bearing, the combination with a hub-shell and an axle, of a bearing-ring having an annular recess and a peripheral flange whose inner face is a bearing-surface, said bearing-ring being mounted in the hub-shell and revoluble therewith, another bearing-ring revoluble with the axle and provided with a flange having a bearing-surface opposed to the first-mentioned bearing-surface and also with an annular recess opposed to the annular recess of the first-mentioned bearing-ring, bearing-balls mounted between the bearing-surfaces of the rings, bearing-rollers mounted in the recesses of the bearing-rings, and a ring mounted in each recess of the bearing-rings and contacting the bearing-rollers so that when said rings are contacted by the bearing-balls said rings rotate with the balls.

16. In a ball-bearing, the combination of an axle, a hub-shell, a bearing-ring carried near one end of the axle, another carried near one end of the hub-shell, said bearing-rings being provided with opposed recesses, and bearing-surfaces, bearing-balls mounted between said bearing-surfaces, antifrictional thrust means independently mounted in said recesses opposed to the axes of rotation of the respective bearing-balls and adapted to rotate only when in contact with the bearing-balls, and means mounted upon the axle to hold the parts assembled.

17. In a ball-bearing, the combination with a hub-shell and an axle, of bearing-rings carried by the hub-shell and axle respectively and provided each with a flange forming a bearing-surface and with an annular recess, bearing-balls mounted between the bearing-surfaces, a ring mounted in each recess of the bearing-rings opposed to the axes of rotation of the respective bearing-balls, and balls mounted in the recesses and contacted by said rings.

18. In a ball-bearing, the combination of a revolving part and a stationary part, bearing-balls arranged therebetween and independently-mounted antifriction thrust means for the bearing opposed to the axes of rotation of the respective bearing-balls.

In testimony whereof I affix my signature in presence of two witnesses.

ALBERT ENNIS HENDERSON.

Witnesses:
T. BLAIR SHOEMAKER,
DAVID P. MOORE.