(No Model.)

C. H. CHAPMAN.

BALL BEARING.

No. 567,849. Patented Sept. 15, 1896.

Fig. 1

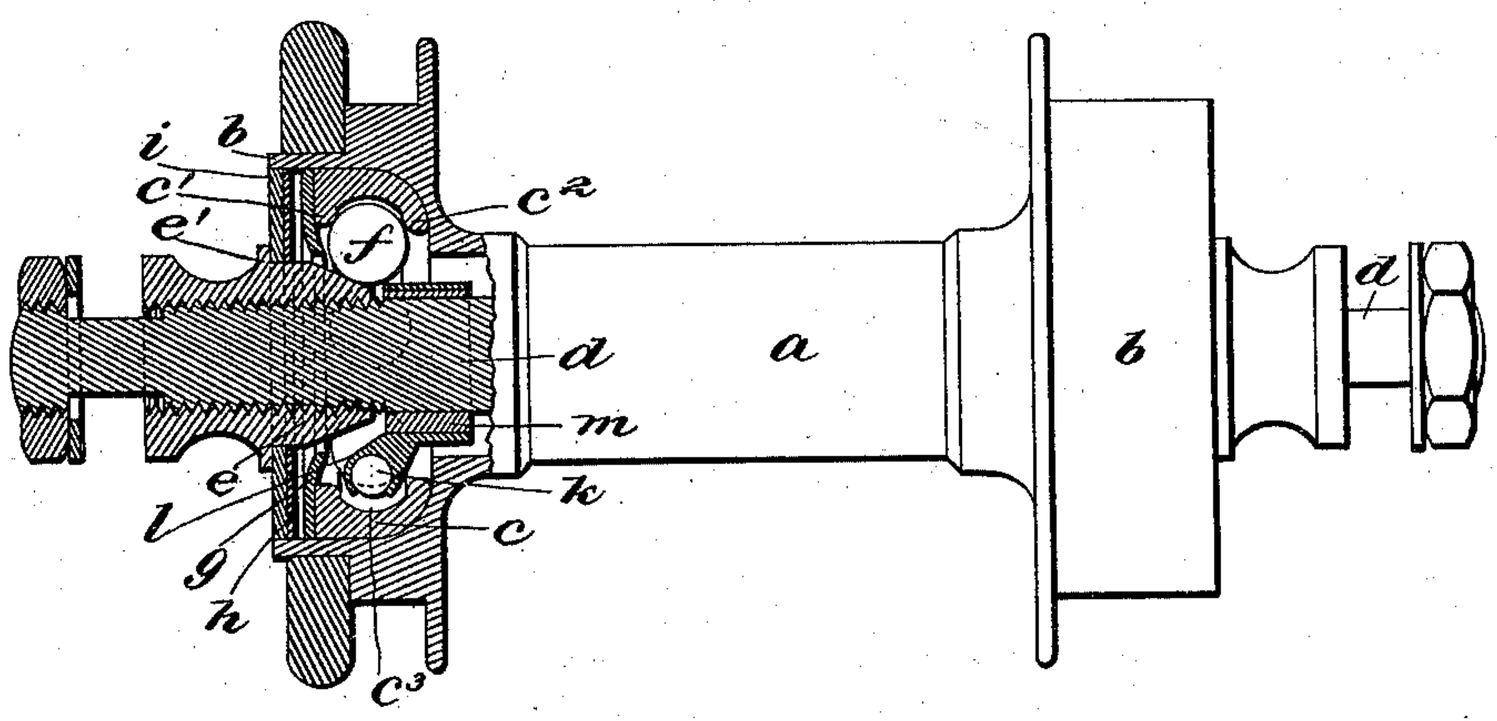


Fig. 2

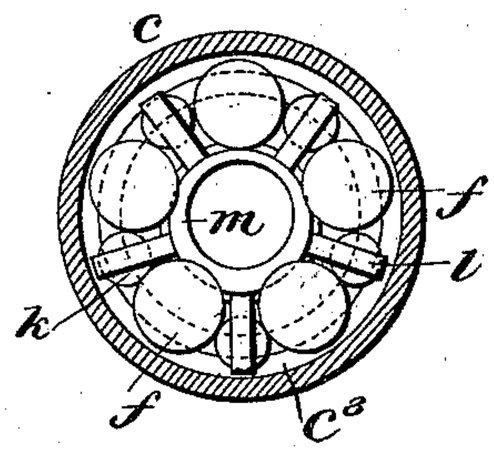


Fig. 3

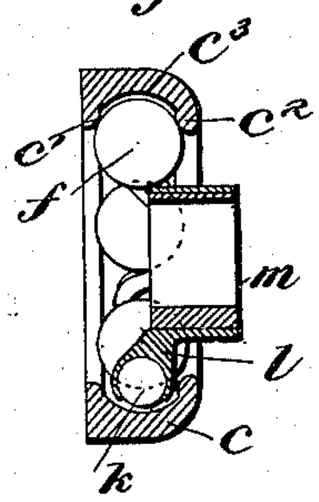


Fig. 4

Fig. 5

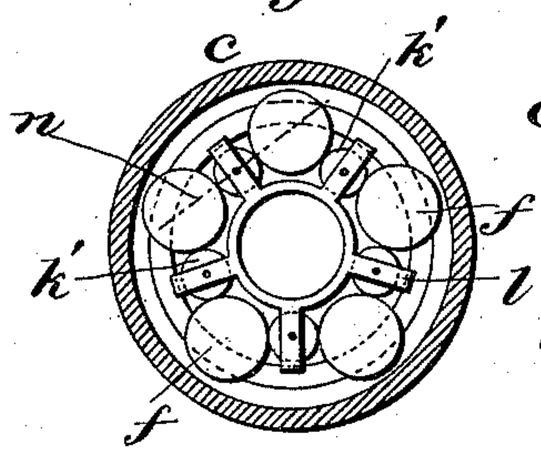
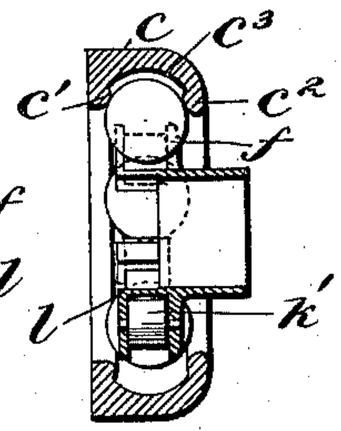


Fig. 6



Witnesses:
J. F. Coleman
Nellie Callahan.

Inventor:
Charles H. Chapman,
by Wm. H. Fuckel.
Attty.

UNITED STATES PATENT OFFICE.

CHARLES H. CHAPMAN, OF GROTON, MASSACHUSETTS.

BALL-BEARING.

SPECIFICATION forming part of Letters Patent No. 567,849, dated September 15, 1896.

Application filed November 16, 1895. Serial No. 569,125. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. CHAPMAN, a citizen of the United States, residing at Groton, in the county of Middlesex and State of Massachusetts, have invented a certain new and useful Improvement in Ball-Bearings, of which the following is a full, clear, and exact description.

This invention relates to ball-bearings, such, for instance, as those used for the wheels and the pedals of bicycles, it being understood, however, that my invention is not restricted in its use to any particular kind or c ass of machines or vehicles.

The object of the invention is to provide a construction in which there is no grinding of the balls one upon another, thus economizing in the power necessary to run the machine or apparatus in which the bearing is used.

Illustrating the principle of my invention as applied to a wheel of a bicycle, the invention comprises a raceway, preferably having raised tracks, a series of bearing-balls arranged in said raceway, and an alternating series of antifriction devices, which may be either balls or rollers, interposed between the bearing-balls and serving to separate them and to prevent their grinding together, the antifriction devices following in the wake of the bearing-balls, and a support for such antifriction devices, all as I will proceed now more particularly to set forth and finally claim.

In the accompanying drawings, illustrating my invention, in the several figures of which like parts are similarly designated, Figure 1 is an elevation of a hub and axle with one side in vertical section. Fig. 2 is a vertical section showing the raceway and balls. Fig. 3 is a vertical cross-section of Fig. 2, and Fig. 4 is an elevation of an eccentric employed in this form of my invention. Fig. 5 is a section, similar to Fig. 2, of a modification; and Fig. 6 is a cross-section of this modification.

The hub *a* may be of usual construction, with its ends *b* recessed. So far as the following parts are concerned, each end of the hub is constructed and equipped alike, and therefore a description of one end will be sufficient. Within the recessed end of the hub is arranged an annular raceway *c*, having the parallel tracks c' c^2, which are described on arcs of circles of different radii. The axle *d* may be of usual construction, with its nib screw-threaded and having applied thereto the cone *e*, which cone has its inner end beveled as usual in order to furnish the outer bearing for the balls *f*. The cone is adjustable upon the nib of the axle to compensate for wear, as usual. The front washer *g* is applied around the cone and bears against the front edge of the raceway.

h is a washer, of felt or other suitable material, and *i* is a metal washer applied outside of and against the felt washer, and the two washers *h* and *i* are held in place by contact with the shoulder e' of the cone to close the end of the hub in a dust-tight manner.

The balls *f*, of which four are used, instead of nine, as is usual, are arranged in the raceway to roll upon the tracks as the hub revolves, and these balls are kept separated, and thereby their grinding together prevented, by means of interposed antifriction devices *k*, which, as shown in Figs. 1, 2, and 3, may themselves be balls or spheres of considerably less diameter than the balls *f*, and these antifriction devices follow in the wake of the balls *f*. It should be observed that the balls *f*, which I herein refer to as "bearing-balls," have three points of contact in the bearing, namely, two upon the respective tracks c' c^2 and a third upon the cone, and by this construction I conceive that the balls are less liable to be worn in grooves than by constructions heretofore common. I do not, however, wish it to be understood that my separating devices are limited in use to a raceway having the raised tracks c' c^2, since they are equally applicable to a ball-raceway such as is now in common use. The raceway is hollowed out at c^3 between its tracks, in order to furnish a receptacle for the accumulation of detritus, and thus remove such detritus from immediate contact with the balls and their bearings.

Referring to Figs. 2, 3, and 4, it will be observed that five bearing-balls are used, and the antifriction devices, therein shown as balls, are supported in the arms of a spider *l*, and this spider is mounted upon an eccentric *m*, which eccentric is fast to the stationary axle

d. As the wheel revolves the spider is carried with the bearing-balls, and the eccentric *m* causes the antifriction devices that are above to move down between the bearing-balls which are then uppermost in the hub and insure their positive separation, while the antifriction devices in the lowermost arms are projected beyond the bite of the bearing-balls—that is to say, as the holder revolves it nears the center of the axle (upon which the eccentric is fastened) as it passes the uppermost part of the bearing, and it moves away from the center of the axle as it passes the lowermost part of the bearing, thereby causing the antifriction devices to move in and out from between the bearing-balls.

In the modification shown in Figs. 5 and 6 the antifriction devices *k'* are in the form of cylindrical rollers mounted in a spider, which spider is free to turn upon the axle, and I prefer in this construction to have the axes of the bearing-balls and of the antifriction devices so arranged that a straight line drawn through the center of the bearing-balls will pass through the center of the antifriction devices, whether they be balls or cylinders, as shown by dotted line *n* in Fig. 5. This is what I term the "dead-center" line. When the antifriction devices are placed on the dead-center line, there is little, if any, tendency for them to fly out from between the bearing-balls, and thereby is greatly lessened the friction upon the spider which holds them in place. It will be observed that the antifriction devices are of smaller diameter than the bearing-balls and lie loosely, so far as the bite of the bearings is concerned, in the raceway, none of the weight being supported by these antifriction devices.

In my invention it will be observed that the antifriction devices drop in between the bearing-balls as the latter pass over the upper side of the bearing, and thereby prevent such bearing-balls from coming together as they roll around into the bite of the bearing, and as such bearing-balls roll to the under side of the bearing the antifriction devices drop out from between them, thus permitting the bearing-balls to roll freely round without grinding together. By this arrangement of the bearing-balls and antifriction devices following in the wake of one another I am enabled to dispense with a number of bearing-balls, in one case five and in another case four, thereby reducing the friction of running by that number of balls in each of the six bearings of a bicycle.

In one of the modifications employing spiders to sustain the antifriction devices, these antifriction devices retain their place on the dead-center line of the bearing-balls at all times, and act as a ball-bearing between the bearing-balls. When the bearing-balls tighten against the antifriction devices, the latter will roll with the surface of the bearing-balls and prevent the friction otherwise caused where the bearing-balls are allowed to grind together.

It is obvious that my invention is applicable alike to the wheels and the pedal-axle of bicycles.

It will be understood that in the use of the terms "following in the wake," or words of like import, as descriptive of the arrangement of the bearing-balls and antifriction devices, I mean the arrangement of these elements in the same plane, as opposed to parallel planes, as they have heretofore been arranged.

In the common form of ball-bearing the balls have a spinning action as they revolve, which is wasteful of energy, and this spinning I reduce to a minimum by the provisions of the tracks in the raceway.

What I claim is—

1. A ball-bearing comprising a raceway having raised tracks of different radii, bearing-balls arranged thereupon, antifriction devices arranged between such bearing-balls, and a supporting device adapted to sustain such antifriction devices with their axes at or near the dead-center line of the axes of the bearing-balls which they separate, substantially as described.

2. A ball-bearing comprising a raceway, bearing-balls arranged thereupon, antifriction devices arranged between such bearing-balls, and a supporting device adapted to sustain such antifriction devices with their axes at or near the dead-center line of the axes of the bearing-balls which they separate, substantially as described.

3. A ball-bearing comprising a raceway, having raised tracks, bearing-balls thereon, rotary antifriction devices, and a spider or holder in which said devices are arranged, substantially as described.

4. A ball-bearing comprising a raceway, having raised tracks, bearing-balls thereon, rotary antifriction devices arranged in the wake of and in alternation with the balls, a spider or holder for such antifriction devices and an eccentric adapted to move such spider or holder so as to throw some of the antifriction devices in between the load-bearing balls and throw the others away from the remainder, substantially as described.

5. A ball-bearing comprising a raceway, raised tracks thereon, bearing-balls, antifriction devices arranged between such balls, and a supporting device for such antifriction devices adapted to sustain such devices in a dead-center line with the balls, substantially as described.

In testimony whereof I have hereunto set my hand this 14th day of November, A. D. 1895.

CHARLES H. CHAPMAN.

Witnesses:
JAMES W. GILDAY,
JOHN E. HARTZMAN.