

No. 608,854.

Patented Aug. 9, 1898.

L. E. HARPER & C. L. GROHMANN.
BALL BEARING.

(Application filed Oct. 28, 1897.)

(No Model.)

Fig. 1.

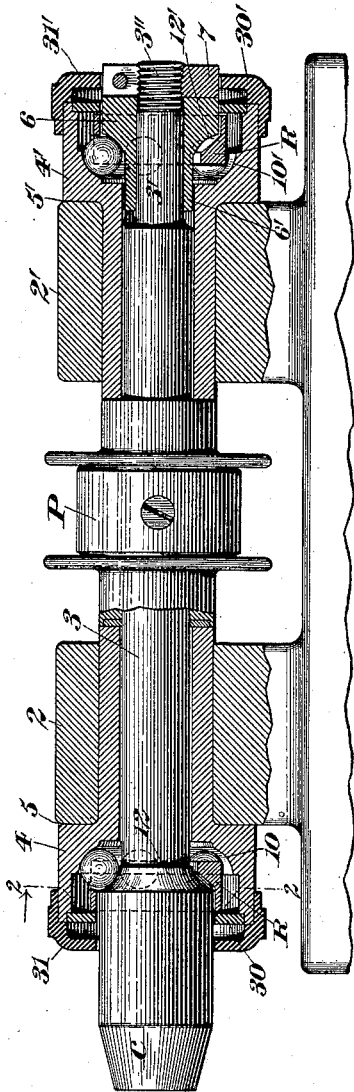


Fig. 2.

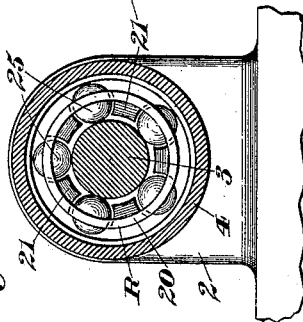


Fig. 3.

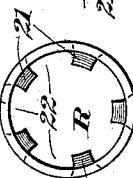


Fig. 4.

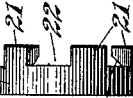


Fig. 5.



Fig. 6.

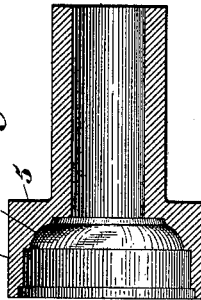


Fig. 7.



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UNITED STATES PATENT OFFICE.

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BALL-BEARING.

SPECIFICATION forming part of Letters Patent No. 608,854, dated August 9, 1898.

Application filed October 28, 1897. Serial No. 656,677. (No model.)

To all whom it may concern:

Be it known that we, LEWIS E. HARPER and CARL L. GROHMANN, citizens of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, 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 main object the provision of an improved device of this class in which the balls will be separated from one another in the bearing by means of a ball-separating retaining-ring having a circuit of ball-separating fingers projecting outwardly from one face thereof and inwardly toward the center of the ring in such a manner as to form between them ball-sockets which will have a number of points of contact sufficient to hold the balls properly in position without undue friction.

Another feature of the invention which we consider of special importance is the provision, in connection with a driving shaft or spindle, of a pair of bushings mounted in fixed bearings and forming, with the shaft and with an adjusting-cone thereon, races for two ball-bearings, the adjustment of which and the positioning of the bushings relatively to the shaft will be controlled by the adjusting bearing-cone.

In the drawings accompanying and forming part of this specification, Figure 1 is a sectional side elevation of the live-spindle and adjacent parts of a lathe or similar machine having our improvements applied thereto. Fig. 2 is a transverse section of the same, the section being taken in line 2 2, Fig. 1. Fig. 3 is a side view of the ball-separating retaining-ring. Fig. 4 is an edge view of the same. Fig. 5 is a cross-section of the same. Fig. 6 is a longitudinal section of one of the bushings for the shaft, and Fig. 7 is a detail of the working end of the live-spindle with the usual chuck thereon.

Similar characters designate like parts in all the figures of the drawings.

In the drawings of this application our invention is shown in connection with the live-spindle mounted on the head-stock of a lathe, which may be of the usual construction; but while the improved ball-bearing which forms

one of the main features of this invention is especially applicable to machines of this class it may of course be used in connection with the journal-surfaces of other rotary devices or parts.

In the construction shown, 2 and 2' designate a pair of fixed bearings on the head-stock of a lathe, and 3 indicates the usual live spindle supported by these bearings. The spindle is not carried directly by the bearings 2 and 2', however, but in this instance is mounted for rotation in a pair of bushings—such, for example, as are shown at 4' and 4—these bushings having suitable stop-shoulders, such as 5 and 5', adapted to bear against the outer cheeks of the bearings 2 and 2', so as to limit the movement of the bushings longitudinally toward each other. It will be obvious that as these bushings are disposed oppositely to each other they may be drawn toward each other by suitable adjusting means until their stop-faces 5 and 5' abut against the cheeks of the bearings, when further movement thereof will be prevented. As a means for obtaining this result we provide, in connection with the live spindle 3, suitable adjusting means, preferably in the form of an adjustable bearing-cone—such, for instance, as that illustrated at 6 at the rear end of the spindle 3—and we also prefer to make use of ball-bearings for the purpose of reducing the friction due to the rotation of the spindle and to the end thrust thereof.

At its rear end the spindle may be screw-threaded at 3'' and reduced, as shown at 3', for the reception of the bearing-cone 6, which will be mounted thereon for the purpose of permitting it to be adjusted along the spindle 3, and should have a somewhat long sleeve 6' mounted on the reduced end 3' of the spindle.

A check-nut—such, for example, as that shown at 7—may be employed for preventing the working loose of the bearing-cone 6. The usual driving-pulley P may be mounted on the spindle 3 between the inner ends of the bushings 4 and 4', so as to fill the space between such bushings, this pulley being keyed to the spindle in any suitable manner.

For the purpose of properly supporting the parts and reducing the friction, as before stated, we have shown herein ball-bearings at opposite ends of the live spindle, these be-

ing formed in this case by ball-races, two of which are shown at 10 and 10' in the bushings 4 and 4', while the other two are formed, respectively, at 12 and 12'. The ball-race 12 may be obviously on any suitable part of the spindle 3 or member rotating in unison with such spindle; but in the present case it is formed on the rear end of the chuck-body c. The bearing 12' should obviously be on the adjusting bearing-cone in order that the bearings at opposite ends of the spindle may be tightened or loosened, as desired, to take up wear or to permit the spindle to run freely.

As it is generally recognized at the present day that the balls of a ball-bearing turn with less friction when separated from one another in the ball-races, we employ in the present case a novel form of bearing of this type in which the ball-separating retaining-ring has a circuit of ball-separating fingers projecting in two directions from the edge of the ring—viz., outwardly from one face of the retaining-ring and inwardly toward the center thereof. The ball-separating ring that we employ is clearly shown in Figs. 3, 4, and 5 and is designated in a general way by R. It comprises as its essential features a relatively thin and preferably flat ring, such as 20, having a circuit of equidistant ball-separating fingers or lugs, such as 21. These ball-separating members are of considerable thickness as compared with the thickness of the ring 20 and form between them a plurality of parti-spherical ball-sockets 22, in which the balls 25 are carried. Each ball-separating finger is in the form of a lug substantially triangular diametrically of the retaining-ring and having an inner oblique face 21' intersecting the inner end wall 21'' of such finger.

It will be obvious by referring to Figs. 3, 4, and 5 that the ball-sockets and the separating-fingers may be formed by removing portions of a relatively thick internal flange, the oblique faces 21' being, before the ball-sockets are cut in the blank, portions of a continuous beveled annular face forming the inner wall of such internal flange. It will be noticed also that the ball-separating fingers are disposed substantially at right angles to the relatively flat ring and that the ring and each finger form together a member substantially L-shaped in cross-section.

When the tools are placed in position in

the retaining-ring and the parts of the bearing are assembled, it will be evident that the retaining-ring will be entirely clear of the walls of the ball-races and that viewed edgewise, as in Fig. 2, the flat ring portion 20 of the retaining-ring R will encircle substantially the central flatwise zones of the balls of the bearing. As the bearings at both ends of the live spindle 3 are practically identical in construction, the above description will of course apply equally to both ball-bearings illustrated herein.

In order to close the bearings at both ends of the spindle, we make use of the usual washers or rings 30 and 30', and we may also employ suitable caps—such, for instance, as those shown at 31 and 31'—for covering the bearings at the ends of the live spindle.

Having described our invention, we claim—

1. In a ball-bearing, the combination with a bearing member and with a rotary member, of a ball-separating retaining-ring having ball-separating fingers projecting outwardly from one end thereof and inwardly relatively to the inner face of said ring, and having ball-sockets between said ball-separating fingers, and a plurality of balls seated in said sockets.

2. A ball-separating retaining-ring having a plurality of ball-separating fingers projecting outwardly from one end thereof and inwardly relatively to the inner face of said ring, and having ball-sockets between said ball-separating fingers.

3. The combination, with a pair of fixed bearings, forming at their outer ends stops for bushings of oppositely-disposed bushings in said bearings, said bushings having stop-shoulders for limiting their movements toward each other, and also having ball-races; a shaft journaled in said bushings and having a ball-race coöperative with the ball-race of one of said bushings; an adjustable bearing-cone on the shaft and coöperative with the ball-race of the other bushing and controlling the positions of the shaft and the bushings; and balls for said ball-races.

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