No. 645,714. Patented Mar. 20, 1900.

E. F. CREAGER.

RETAINER FOR BALL BEARINGS.

(Application filed May 1, 1899.)

(No Model.)

Fig.1.

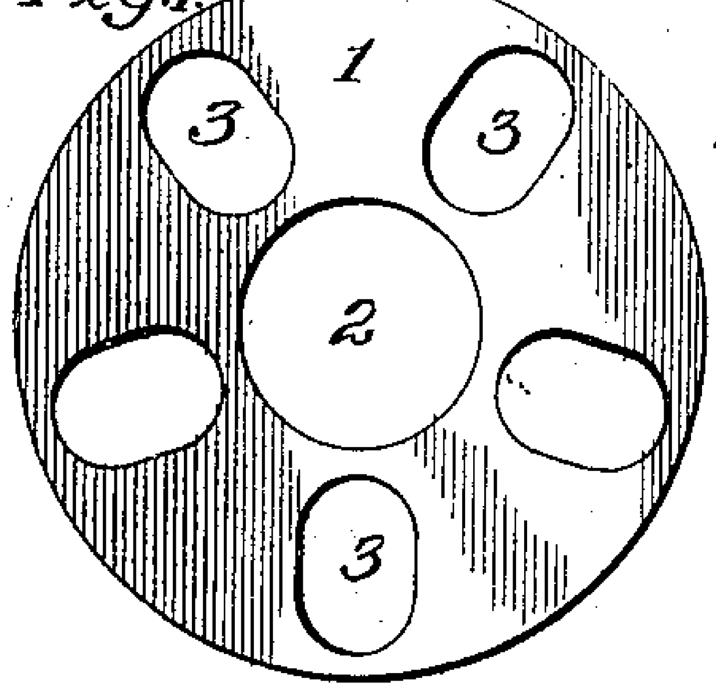


Fig.2.

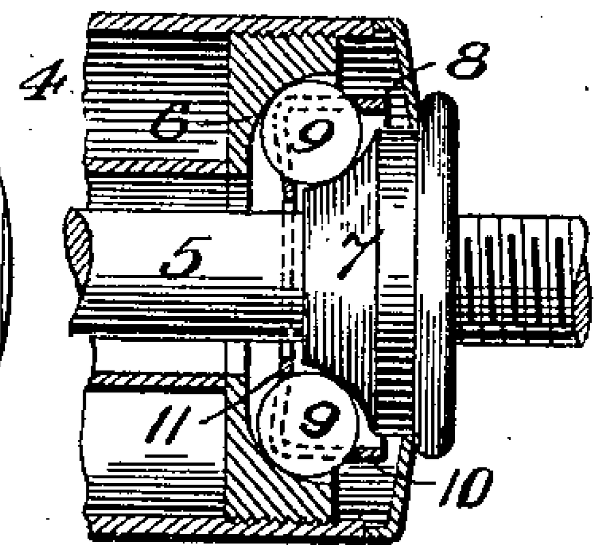


Fig.6.

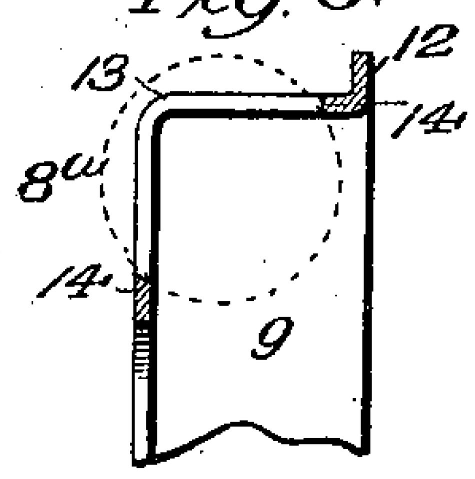


Fig.11.

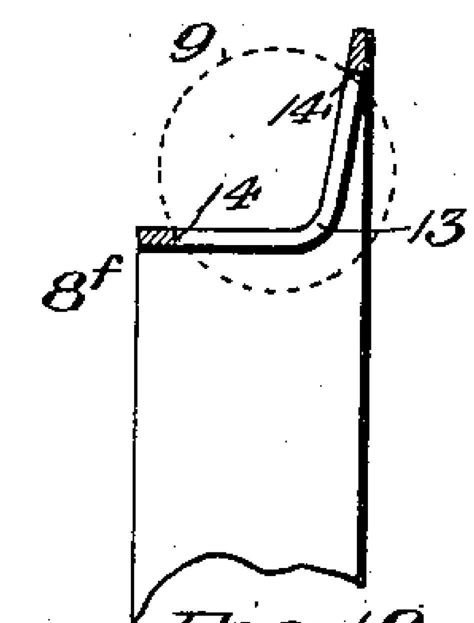


Fig.5.

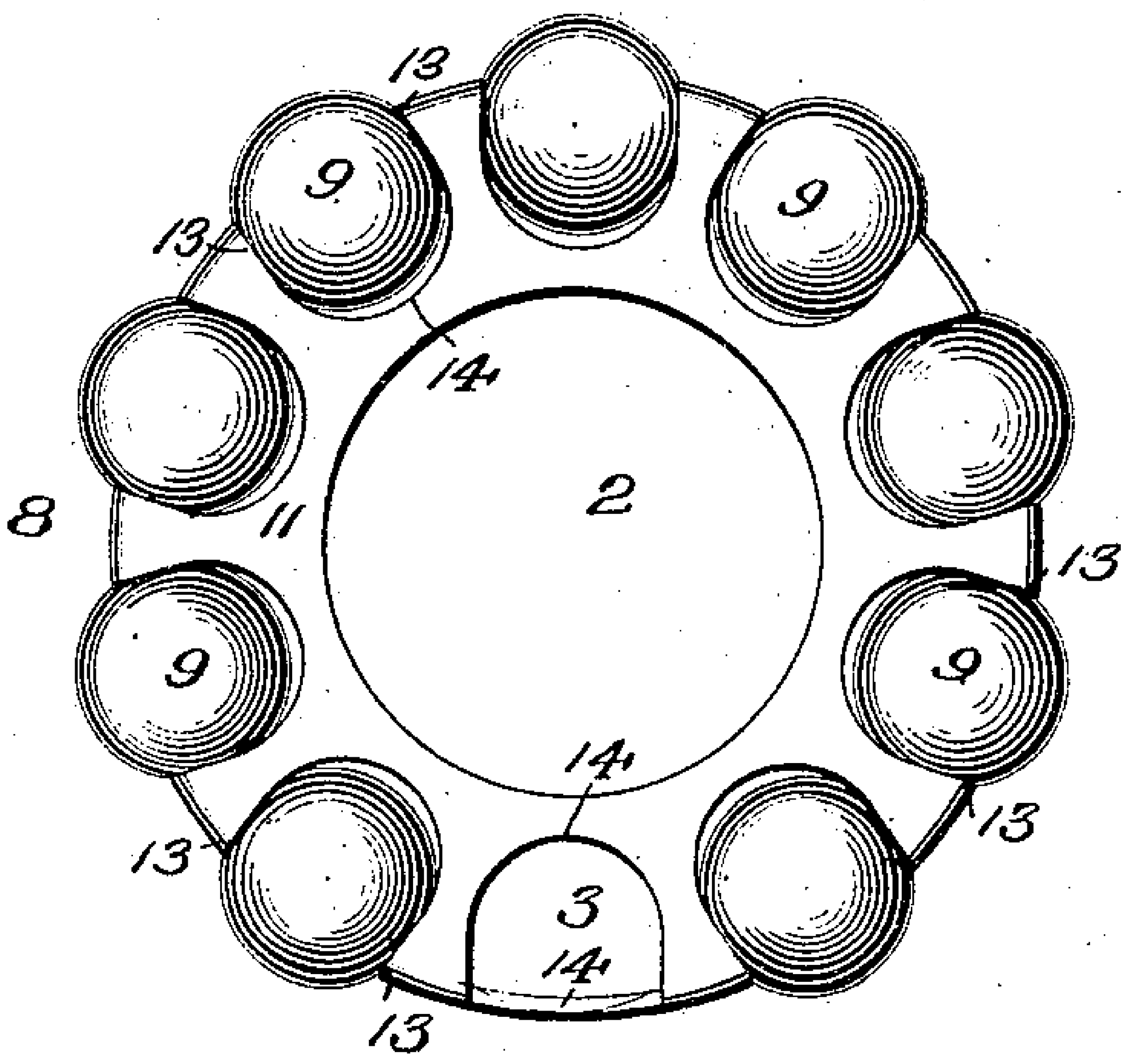


Fig.7.

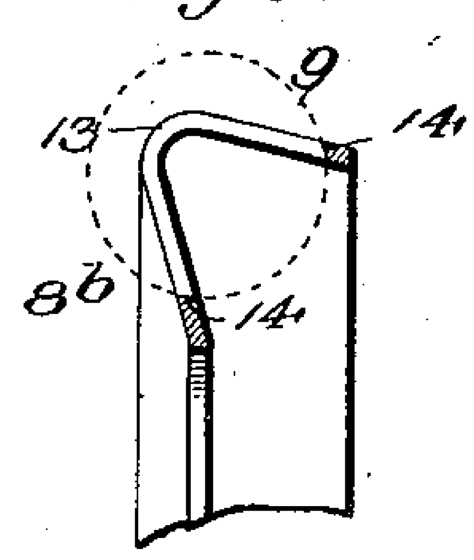


Fig.12.

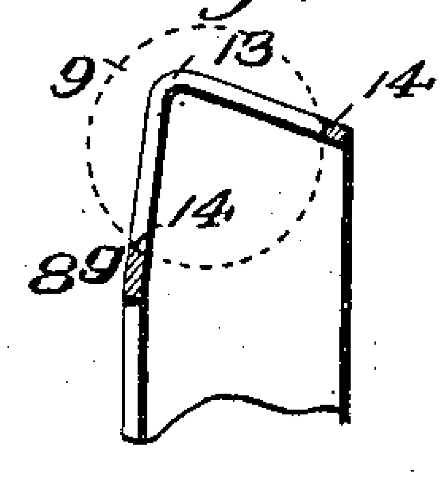


Fig.8.

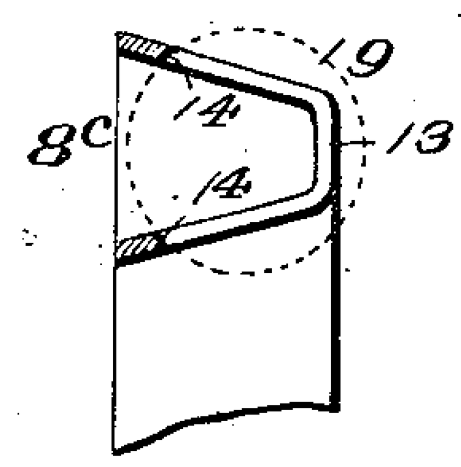


Fig.13.

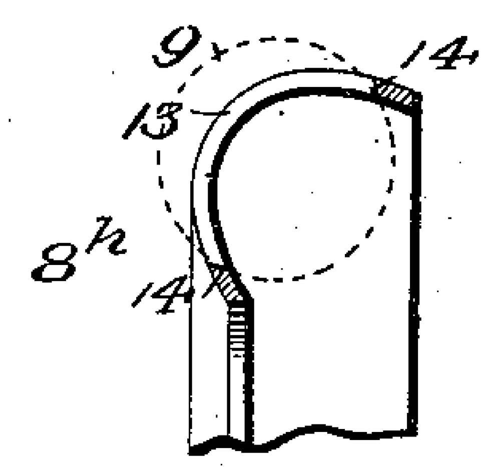


Fig.4.

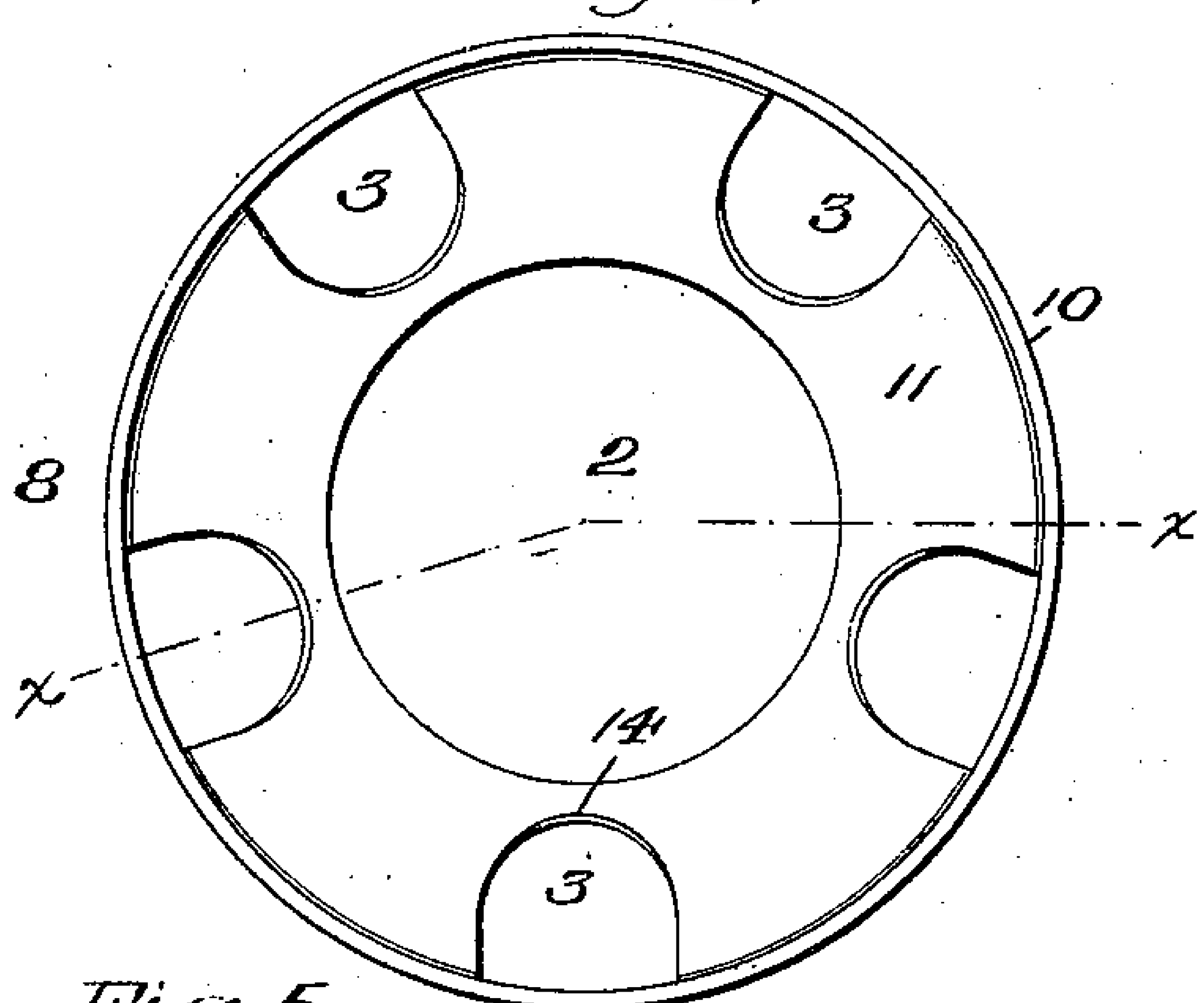


Fig.9.

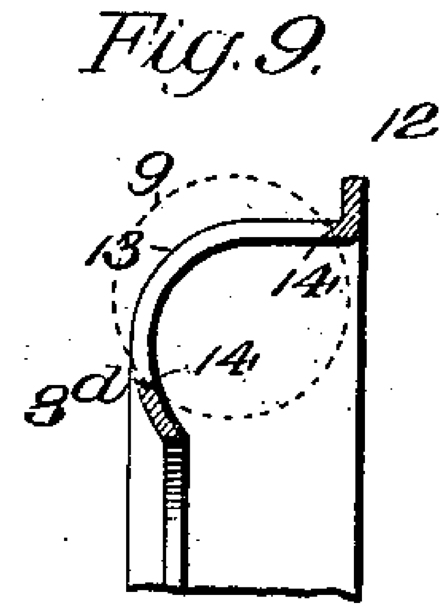


Fig.14.

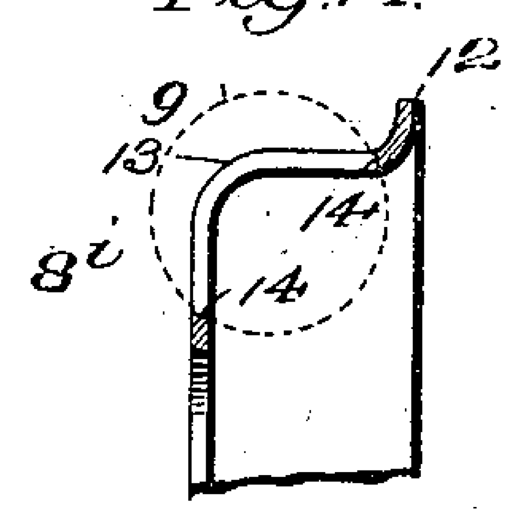


Fig.10.

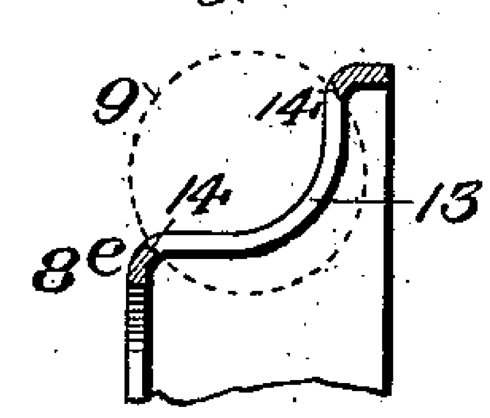


Fig.15.

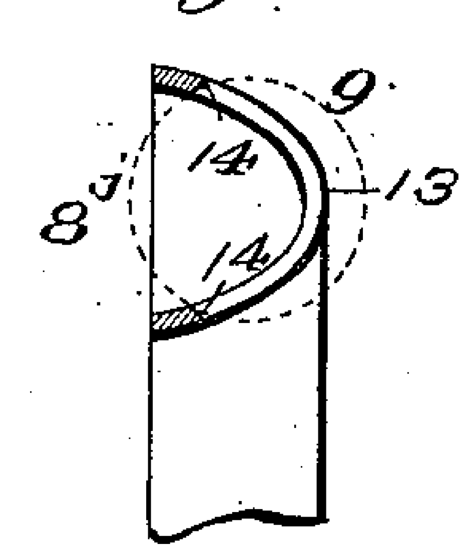
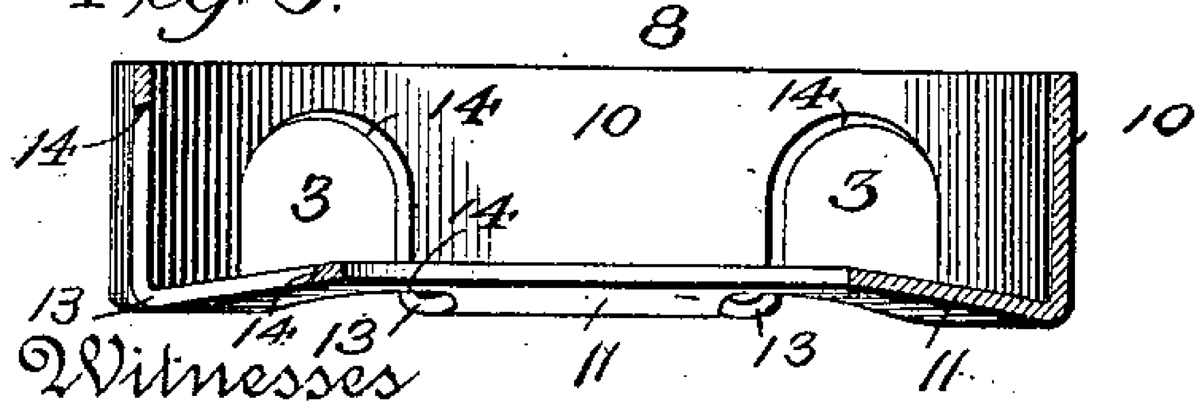


Fig.5.



Witnesses
Jos. C. Stack.
Rufus H. Thayer

Inventor
E.F. Creager
by Walter F. Rogers
his Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EDWIN FRANCIS CREAGER, OF LANCASTER, PENNSYLVANIA.

RETAINER FOR BALL-BEARINGS.

SPECIFICATION forming part of Letters Patent No. 645,714, dated March 20, 1900.

Application filed May 1, 1899. Serial No. 715,225. (No model.)

To all whom it may concern:

Be it known that I, EDWIN FRANCIS CREAGER, a citizen of the United States, residing at Lancaster, in the county of Lancaster and State of Pennsylvania, have invented certain new and useful Improvements in Retainers for Ball-Bearings; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in ball-bearings, and particularly to retainers and separators to be used with ball-bearings. Its object is to provide a retainer which may be easily manufactured, shall be applicable to ball-bearings generally, and shall give the greatest freedom to the balls in action.

It consists, essentially, of a ring perforated to receive the balls and bent to convert the walls of the perforations into guards for the balls.

In the accompanying drawings, Figure 1 is a plan view of a templet from which the retainer may be formed. Fig. 2 is a longitudinal section of an approved form of hub with my retainer and separator applied. Fig. 3 is relatively to the following figures a top plan view. Fig. 4 is a bottom plan view, and Fig. 5 is a section on the line $x\,x$ of Fig. 4. Figs. 6 to 15 are sections of modifications of the form illustrated by Figs. 3, 4, and 5.

In the drawings, 1 designates a templet having an axial perforation 2 and a series of perforations 3.

4 designates a hub; 5, a shaft or axle; 6, a cup or ball-chamber; 7, a cone; 8, a retainer, and 9 antifriction-balls.

In Figs. 3, 4, and 5 10 designates the outer wall, and 11 the inner wall, of the retainer—that is, inner and outer with respect to the location of the retainer in place, as shown in Fig. 2.

The retainer may be formed of metal cast, spun, or stamped in any approved manner. The templet 1 is shown as cut in the form of a flat ring having a circular axial perforation and a series of perforations which are substantially circular or preferably oblong or elliptical in outline. The short axis 13 of each perforation 3 is less than the diameter of the ball it is to receive. The templet may vary in dimensions and in conformation, but the one shown may be bent to produce many forms, as indicated in the drawings. The bend is on the line or includes the line of the short axis 13 of each perforation 3, and there is always therefore a fixed guard for the balls in one direction. The space included within the circumference of any of the perforations 3 is greater than the area included within the equator or circumference of any ball to be used in the retainer, a provision which insures the greatest freedom of movement of the balls when in place in the finished retainer. The line of bending lies between the circumference of the templet 1 and the circumference which defines the axial perforation 2. The perforations 3 are intermediate these circumferences, and the metal on each side of the line of bending may be considered as forming distinct walls of the ring or retainer, each perforation being divided between the walls or a part of each perforation extending beyond the line of bending or division into each wall. These walls diverge, but the effect of the bending is to bring nearer together the ends of the long diameter of each of the ball-receiving perforations, with the result that any point of contact between a ball and the wall of a perforation is a less distance from any other point in the wall of the perforation than the length of the diameter of the ball, so that while a large space is provided for the play of the ball it will be secured or retained at all times. In other words, I bend or curve the ring to form a cylindrical side wall and an end wall, so that the ball-receiving openings are so related to the size of the balls to be used that a ball may be sprung into an opening from the inner side of the ring and held from accidental displacement by the contact-points at the opposite ends of the transverse diameter, or, briefly, by what may be termed the "side" walls of the openings, and held from displacement in the opposite direction by what may be termed the "end" walls of the openings. The ball-receiving perforations or openings may be said to be inclosed—that is, in the specific illustrations they are distinguished from mere notches or recesses in the side of a cup or ring, and considering the real size of the openings they may be rudely but fairly described as of greater length than width. I may, especially in case of unusually large perforations or to even further reduce the necessity of carefully measuring the perforations, depress one of the walls, as in Fig. 5, to bring nearer together the ends of the long diameter of each perforation.

In Figs. 6 to 15 I have illustrated several modifications 8^a 8^b 8^c 8^d 8^e 8^f 8^g 8^h 8^i 8^j. 8^a, Fig. 6, is practically a right-angle form. 8^b, Fig. 7, shows both sides bent in. 8^c, Fig. 8, has a double bend, a form adapted for certain special bearings. 8^g, Fig. 12, is practically the form of Figs. 3 to 5, with a depression of the opposite wall. 8^f, Fig. 11, is an obtuse-angle form.

In Figs. 9, 10, 13, 14, and 15, 8^d, 8^e, 8^h, 8^i, and 8^j, I have illustrated the same principle applied to curved forms, a distinct specific form, that of a tubular annulus, forming the subject-matter of a separate application of even date with this.

In Figs. 6, 9, and 14 I have also illustrated a generally applicable feature of invention in an extension-flange 12, which enables me to strengthen the ring by using additional metal in the wall 10 without requiring additional space in the line of action, a feature more fully explained in a separate application of even date with this.

In all of the forms all of the balls may be readily applied and any ball may be easily removed by pressure upon the outer or projecting surface of the ball. The balls are thus securely held, and yet through the elasticity of the metal easily replaced in case of necessity.

In action a ball lies between the cone and the walls of the cup, pressed in from the short axis of its perforation, barely touching the retainer, generally lightly at a single point and never at more than two distinct and opposite points, the retainer traveling with the balls.

Throughout the invention I have had in mind a low cost, ease of manufacture, a minimizing of friction, adaptability to fit substantially all forms of hubs, accompanied by strength and wearing qualities.

I have used the word "retainer" throughout the specification as a convenient term to designate a device having the functions of both a retainer and a separator—that is, a cage for holding all the balls in place when removed from the hub and preventing contact of the balls in action.

Having fully described my invention, what I desire to secure by Letters Patent is—

1. In a ball-bearing, the combination of a ball-retainer and balls, the ball-retainer comprising a ring having perforations to receive the balls, the space included within the circumference of a perforation being greater than the area included within the equator or circumference of a ball, and any point of contact between a ball and the wall of a perforation being a less distance from any other point of contact than the diameter of a ball.

2. In a ball-bearing, the combination of a ball-retainer and balls, the ball-retainer comprising a ring having openings to receive the balls, the circumference of an opening including a space of larger area than that included within the equator or circumference of a ball, the ring being bent so that all opposite points of contact of a ball in an opening are a less distance apart than the length of the diameter of a ball.

3. In a ball-bearing, the combination of a ball-retainer and balls, the ball-retainer comprising a ring bent to retain balls by diverging walls, and having perforations to receive the balls, the circumference of a perforation being greater than the equator or circumference of a ball, but the distance between the axial points being less than the diameter of a ball.

4. A ball-retainer comprising a ring having substantially-elliptical perforations to receive balls, the transverse diameter of a perforation being less than the diameter of a ball, the ring being bent substantially on the line of the transverse diameter of each perforation, so that the perforation may retain and yet permit a free movement of the balls.

5. The combination in a ball-bearing, of a cup, a cone, balls and a ball-retainer comprising a ring having walls in different planes constructed to fit between the cup and cone and having perforations to receive the balls, all the relative points of contact upon the wall of a perforation being a less distance apart than the length of the diameter of a ball.

6. A ball-retainer comprising a ring having ball-receiving perforations, each perforation to receive a ball, the walls of each perforation serving to retain in all directions and yet permit a free movement of a ball.

7. A ball-retainer, comprising a ring with a side wall which is cylindrical and an end wall and having perforations to receive and retain the balls, each perforation being divided between the walls of the retainer.

8. A ball-retainer, comprising a ring bent or curved to form a cylindrical side wall and an end wall and provided with inclosed ball-receiving openings in its bend, each of greater length than width, the relative areas of the openings and the balls to be used being such that the balls may be sprung into the openings and held from accidental displacement in one direction by the side walls of said openings, and from displacement in the opposite direction by the end walls of the openings.

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

EDWIN FRANCIS CREAGER.

Witnesses:
JAS. F. ERISMAN,
CHAS. H. FLICK.