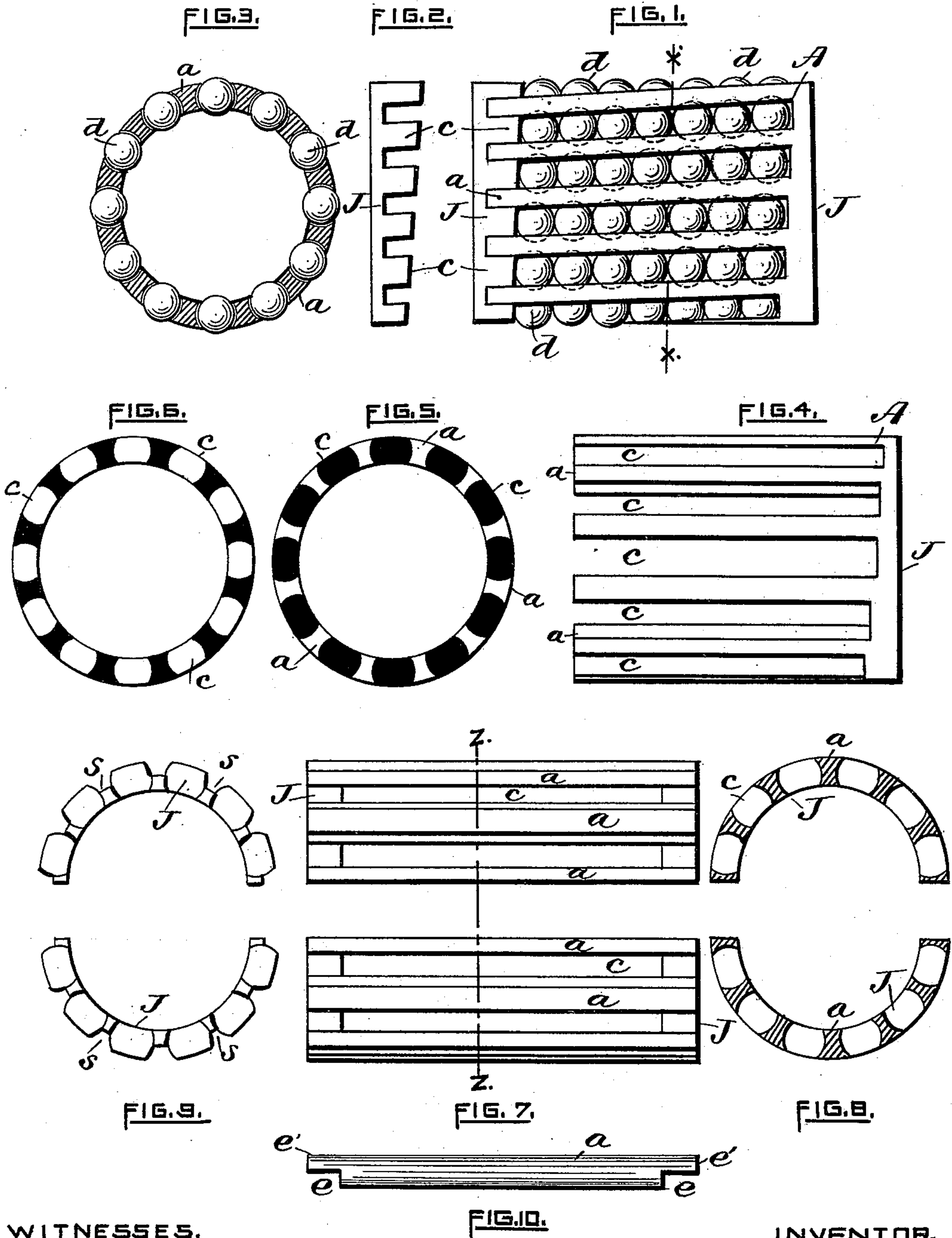


(No Model.)

H. HOWARD.
BALL BEARING.

No. 463,834.

Patented Nov. 24, 1891.



WITNESSES,

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UNITED STATES PATENT OFFICE.

HENRY HOWARD, OF PHENIX, RHODE ISLAND.

BALL-BEARING.

SPECIFICATION forming part of Letters Patent No. 463,834, dated November 24, 1891.

Application filed September 29, 1891. Serial No. 407,149. (No model.)

To all whom it may concern:

Be it known that I, HENRY HOWARD, of Phenix, in the county of Kent and State of Rhode Island, have invented certain new and useful
5 Improvements in Ball-Bearings; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon,
10 which form a part of this specification.

This invention relates to ball-bearings for shafts, axles, &c.; and it consists in an improved construction and arrangement of the shells or cases used for the purpose of controlling the balls in the bearing, and also as
15 a means of confining them and keeping them in position to be readily applied to a bearing. It is illustrated in the accompanying drawings.

20 Figure 1 is a side elevation of the shell or case for holding the balls, filled with them in readiness to be put onto a shaft or axle or into the box in which the shaft or axle runs. Fig. 2 represents an edge view of the removable end collar of the case separate therefrom. Fig. 3
25 shows a vertical cross-section of the case with the balls, taken through line *xx*, Fig. 1. Fig. 4 represents the bar portion of the case with one end to which the bars are attached. Fig. 5 is an end view of the open end of the case shown in Fig. 4. Fig. 6 represents the inner
30 side of the removable end collar, showing the projections that enter between the bars when the case is put together. Fig. 7 represents the case made in two parts, the division being made lengthwise through the middle of the case. Fig. 8 shows a cross-section of the two halves of the case on line *zz*, Fig. 7. Fig. 9 is an outside view of the ends of the divided
40 case shown in Fig. 7. Fig. 10 is a side view of one of the bars of the case as shown in Fig. 7.

The case with balls, as represented in Fig. 1, embodies the two great essential features of the best arrangement of balls in a ball-
45 bearing. The first of these features is that whereby the balls in their progress around the bearing are compelled to pass over as much as possible of its surface to prevent them from following each other in the same
50 track, and thereby making grooves in the surface of the bearing. This is accomplished by starting each successive row of balls a little

farther in from the end until the circuit of the case is made. The other feature is keeping the rows of balls out of line with the center line of the bearing, thereby insuring at all times the presence of balls directly under the center of the shaft or axle to take the weight of the load, for with straight rows of balls in line with the center line of the bearing the bearing sinks a little between the rows and has to rise over each succeeding row of balls. This is a great disadvantage in bearings carrying very heavy burdens, as street-car axles; but in light-weight quick-
60 running bearings it is of less account.

The case A is made in a hollow cylindrical form, with recesses or slots *c* made through its sides, extending nearly its whole length and dividing it up into bars *s* of equal or varying
70 lengths, as will hereinafter be explained. The bars *a* have their sides made concave, as seen in Fig. 3, to form circular slots to hold the balls *d*, which play loosely in them. The edges of the concave sides project over, both
75 at the outer and the inner surfaces of the bars, to prevent the balls from falling out or in toward the center when the case is not on the bearing.

The main portion of the case, as seen in
80 Fig. 4, may be cast of bronze or other metal by molding it upright and drawing it endwise from the mold; or it may be made of a piece of tubing and the parts between the bars *a* cut out by means of a drill or milling
85 tool; or it may be made by casting the end collars, supports, or walls *J* separate from the bars *a*, as shown in Figs. 7 to 10. In this last-mentioned method of construction the bars are preferably rolled or drawn to the
90 proper shape in section, with concave sides and inner surface and outer surface agreeing with the outside circle of the case. They are then cut off to the proper length and rabbeted at *e e*, leaving a portion *e' e'* to fit into the
95 notches *s s* in the end collars. In putting the cases made in this way together the ends of the bars *a* are first placed in the notches *s* in one end collar and made fast by soldering, pinning, or other way, if preferred, and then the
100 slots between the bars are filled with the balls *d* and the other end collar placed in between the ends of the bars and secured there in like manner as with the first end collar.

In some instances, as in shafts having shoulders at each end of the bearing, or with collars shrunk on, and under some other conditions it is not convenient, even if it is possible, to put the case as a whole on the bearing. To provide for this the end collars J may be cast in halves by dividing across their centers, as shown in Fig. 8. In this case the division should be made through the center of a bar, leaving one-half of it on each part to retain the balls in place. These halves may be made identical in shape and size and the same form or pattern answer for both parts of a bearing. Other divisions of the case than halves may be made, if necessary, as thirds, &c. As before mentioned, each successive row of balls is started from the end a little farther than the preceding row to prevent grooving. This is accomplished by varying the thickness of the end collars at the ends of the slots, as seen in Figs. 1 and 2, or by putting in blocks of different thicknesses at those places, if preferred. As it is much easier to make the bars α straight, the incline to the center line of the bearing may be given to them by twisting the case with sufficient force to set it as desired before the balls are put in the slots.

Having thus described my improvements,
I claim as my invention—

1. A case for holding balls in a ball-bearing, comprising a series of bars having concave sides extending lengthwise of the bearing at a slight angle to the center line or axis thereof to bring the balls in each row successively under the center of the bearing instead of simultaneously.

2. A case for holding balls in a ball-bearing, comprising a series of bars having concave sides extending lengthwise of the bearing at a slight angle to the center line or axis thereof to bring the balls in each row successively under the center of the bearing instead of simultaneously and held together at their end by end walls or supports of variable thickness to cause the balls to follow in different paths.

3. A case for holding balls in a ball-bearing, comprising a series of bars extending lengthwise of the bearing at a slight angle to the center line or axis thereof and held together by end walls or supports A at their ends, said case being divided lengthwise into parts to admit of its being applied to a bearing where it cannot conveniently be slipped over the end, substantially as set forth.

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Witnesses:

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