(No Model.)

R. W. HENT.

ROLLER BEARING.

No. 401,884. Patented Apr. 23, 1889.

Fig. 1.

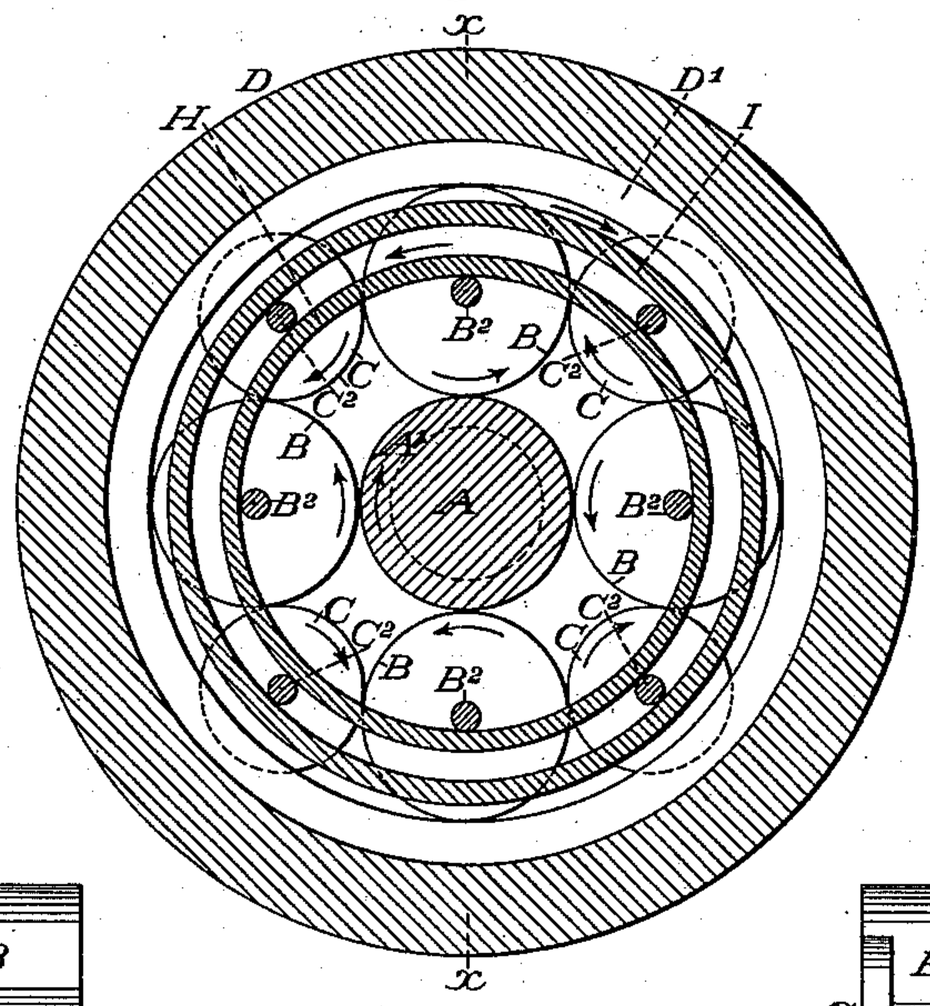

Fig. 5.

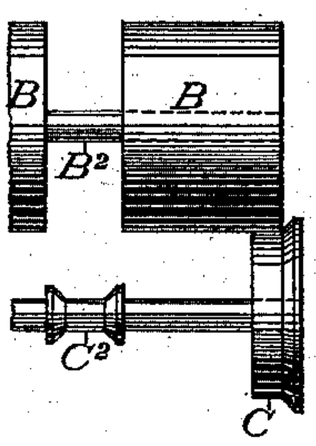

Fig. 6.

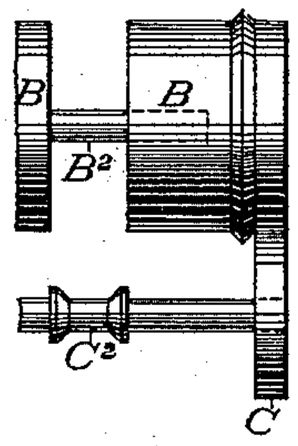

Fig. 3.

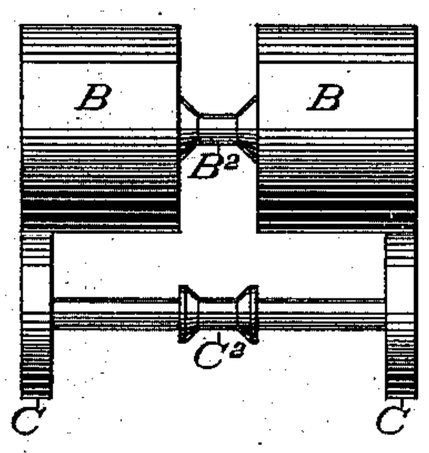

Fig. 4.

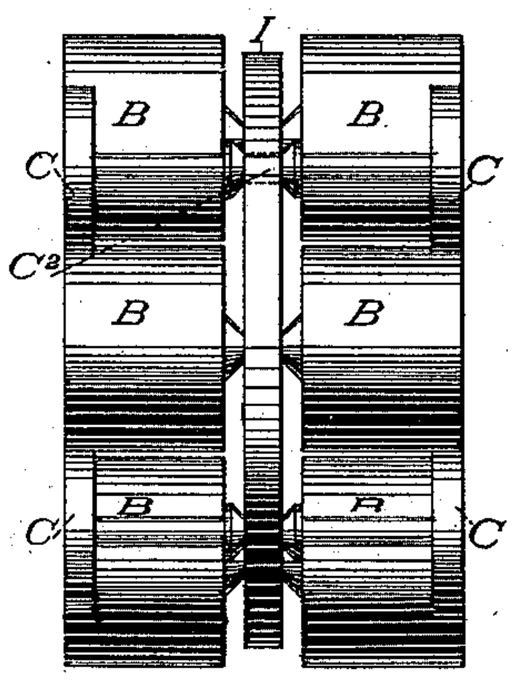

Fig. 7.

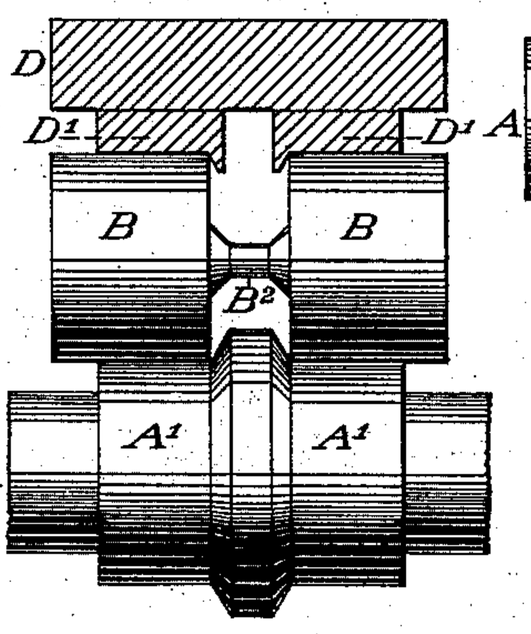

Fig. 2.

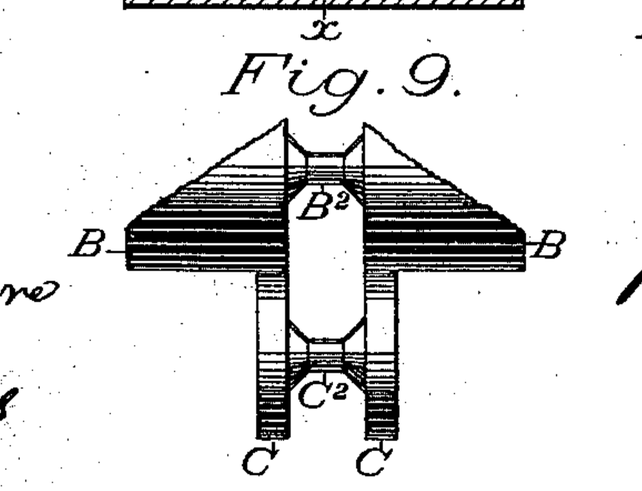

Fig. 8.

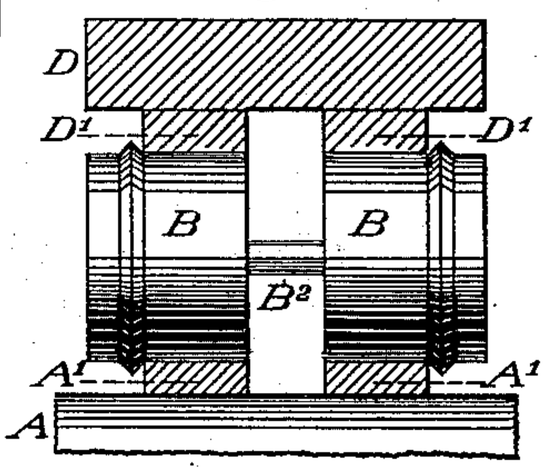

Fig. 9.

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UNITED STATES PATENT OFFICE.

REUBEN W. HENT, OF SAN FRANCISCO, CALIFORNIA.

ROLLER-BEARING.

SPECIFICATION forming part of Letters Patent No. 401,884, dated April 23, 1889.

Original application filed April 16, 1887, Serial No. 235,040. Divided and this application filed August 3, 1888. Serial No. 281,880. (No model.)

To all whom it may concern:

Be it known that I, REUBEN W. HENT, a citizen of the United States, residing in the city and county of San Francisco, and State of California, have invented a certain new and useful Improvement in Roller-Bearings, of which the following is a specification.

My invention relates to that class of roller-bearings in which are employed a series of bearing-rollers bearing directly on the shaft and casing, and a series of separating-rollers bearing neither on the shaft nor casing, but on the bearing-rollers, to keep the latter separate from each other, and in which the separating-rollers are kept from contact with the shaft by their bearing on the bearing-rollers, and from contact with the casing by an encircling ring bearing on the separating-rollers only. The axis of this ring is liable to shift from the axis of the shaft to a detrimental extent. Such shifting is prevented in my roller-bearing, (shown and described in my application for patent filed April 16, 1887, Serial No. 235,040,) in which the ring is interposed between journals of the bearing-rollers on its periphery and journals of the separating-rollers on its inner side; but although such interposed ring and said journals are exempt from pressure of the load, yet there is a limit to the number of bearing-rollers that can safely be employed in such construction, on account of the rapid diminution, as the number of rollers is increased, of the radial difference between the orbits of the two series of rollers, which is necessary to afford space for adequate journals and an adequate ring, and that limit is practically the number three—the smallest possible in any construction.

The object of my invention is to prevent such shifting in roller-bearings having four or more, as well as in those having only three, bearing-rollers. This object is attained by the employment, in addition to the said encircling ring in said class of roller-bearings, of a ring interposed between journals of the separating-rollers on its periphery and journals of the bearing-rollers on its inner side, the two series of rollers being so arranged relatively to each other and their journals made of such small but adequate dimensions that an adequate ring may be interposed, as last aforesaid, between adequate journals. In such ring bearing at its periphery on journals of the separating-rollers and at its inner side on journals of the bearing-rollers, in said arrangement and journals of the rollers to permit the employment of such ring, and in the peculiar construction and combinations of the parts hereinafter set forth, consists, essentially, my invention.

It is illustrated in the accompanying drawings, in which—

Figure 1 is a transverse section through the center or on the line *x x*, Fig. 2, of a roller-bearing embodying my invention. Fig. 2 is a longitudinal section through the center or on the line *x x*, Fig. 1. Fig. 3 is a side view of a bearing-roller and a separating-roller, showing the relative positions of the rollers, as seen along the plane tangent to both. Fig. 4 is a side view of said roller-bearing as it appears after the removal of the central journal and the casing. Figs. 5, 6, 7, and 8 are views showing means of retaining the several parts in their proper longitudinal positions. Fig. 9 is a view of a short separating-roller and its longitudinal position relative to a bearing-roller.

A represents the shaft; A′, a sleeve upon the shaft; B, the bearing-rollers; B^2, the journals of the bearing-rollers; C, the separating-rollers; C^2, the journals of the separating-rollers; D, the casing; D′, sleeves within the casing, and H and I the rings.

The rings are of different diameters, the ring H being the smaller. The sleeve A′ is shorter than the rollers B, and with that portion of the shaft A upon which it is fitted constitutes the central journal. The sleeves D′ have their outer ends in the planes of the ends of the sleeve A′, and with those portions of the casing within which they are fitted constitute the bearing-casing. The rollers B bear on the central journal and bearing-casing, but, being longer than the sleeves, bear only portions of their lengths on said journal and casing, (bearing directly on and projecting beyond the sleeves,) and at their projections beyond the sleeves bear on the rollers C, each roller B on and between two rollers, C. The rollers C bear on the rollers B only, and

are so reduced in diameter portions of their lengths that they bear only on those portions of the rollers B not bearing on the central journal and the bearing-casing, (bearing only on the rollers B at their projections beyond the sleeves,) each roller C on and between two rollers, B. The journals B^2 are formed at the longitudinal centers of the rollers B and bear on the inner side of the ring H. The journals C^2 are formed at the longitudinal centers of the rollers C and bear on the inner side of the ring I and the periphery of the ring H. The ring H is interposed between and bears on the journals C^2 at its periphery and the journals B^2 at its inner side. The ring I bears at its inner side on the journals C^2. The arrow-heads indicate the relative directions, when the casing is stationary, of the axial rotations of the shaft and rollers and of the rings caused by the axial rotations of the journals B^2 and C^2.

The rollers B are kept separate from each other by the rollers C. The rollers C are kept from contact with the shaft by the rollers B, assisted by the bearing of the journals C^2 on the ring H, and from contact with the casing by the bearing of the journals C^2 on the ring I, and the shifting of the axis of the ring H from the axis of the shaft is limited by the journals B^2. The sleeves and the portions of the rollers B bearing on the sleeves sustaining all the pressure of the load, (provided no more than four rollers, B, are employed,) and the pressure which the other parts are required to sustain being too slight to cause substantial wear, if all sliding friction be avoided, it follows that, the journals B^2 and C^2, the rings H and I, the rollers C, and said projections of the rollers B retaining substantially their original dimensions, whatever the changes in the dimensions of the parts liable to substantial wear, the ring I will be kept coaxial with the ring H by the journals C^2, the said shifting of its axis will be limited, as is that of the axis of the ring H, the orbit of the rollers C will be kept circular and its diameter constant, and if, as shown in Figs. 1, 2, and 4, the axes of the rollers B are without the square formed by the planes of the axes of the rollers C the orbit of the rollers B will also be kept circular and its diameter constant, (the rollers C forming bearings for the rollers B independent of the central journal,) the two orbits will remain concentric, each roller C will be in constant contact with the two rollers B, between which it is placed, the axes of all the rollers will be kept parallel and equidistant, and the rollers B and C will be held and kept compactly and exactly in their proper relative positions by parts exempt from all substantial wear.

All sliding friction may be avoided by the observance of the following proportions: If the diameters of the journals B^2 and C^2 are equal, as shown in the drawings, and as is preferable, then the diameter of the rollers B is to the diameter of the rollers C as the outer diameter of the ring H is to its inner diameter. If the diameters of the rollers B and C are equal, then the diameter of the journals C^2 is to the diameter of the journals B^2 as the outer diameter of the ring H is to its inner diameter; and if neither the diameters of the journals nor the diameters of the rollers are equal, then the outer diameter of the ring H, divided by the diameter of a journal, C^2, (equaling the number of its revolutions,) multiplied by the circumference of a roller, C, equals the inner diameter of the ring H, divided by the diameter of a journal, B^2, (equaling the number of its revolutions,) multiplied by the circumference of a roller, B—an equation to which all the anti-friction proportions are reducible.

Preferably the radial difference between the two orbits is divided into four equal parts, and one of the parts taken for the radius of a journal, B^2, one for the radius of a journal, C^2, and the remaining two parts for the thickness of the ring H, necessitating, if said proportions are observed, rollers C of smaller diameter than the rollers B. If the rollers C are of the same length as the rollers B, this radial difference may be nearly equal to the radius of the rollers B, less the radius of a journal, C^2, being only limited by the inner sides of the sleeves D′. If the rollers C are shortened, as they may be, as shown in Fig. 9, and space between the sleeves D′ is left sufficient to prevent contact of these rollers with these sleeves, this radial difference will be limited by the casing only, and therefore may be increased to any extent by increasing the thickness of the sleeves.

It is the observance of proportions to reduce or avoid sliding friction that renders the sleeves D′ necessary to provide room for the operation of the rollers C, and it is the employment of these sleeves that renders the sleeve A′ necessary to secure evenness of wear of the rollers B. If more than four bearing-rollers are employed, some of the pressure of the load, after the commencement of wear of the sleeves and of the rollers B, will be sustained by the journals and the rings, to their great detriment. Therefore the number of bearing-rollers is preferably limited to four.

The rollers C may be kept in their proper longitudinal position either by the ring H and flanges at the ends of the journals C^2, as shown in Figs. 2, 3, and 4, or by flanges on the rollers, as shown in Figs. 5 and 6, or by any equivalent means.

The rollers B may be kept in their longitudinal position upon the shaft and within the bearing-casing by flanges and collars, as shown in Figs. 7 and 8, or by any equivalent means.

To facilitate the insertion between the central journal and the bearing-casing of the rollers and rings in their proper relative positions, each roller C is preferably made with one end removable from the journal C^2; but the journals B^2 and C^2 may all be made sepa-

rately from, and after insertion in their proper places be securely and rigidly attached to, the rollers B and C, respectively, by slipping the rollers tightly, as sleeves, over extensions of the journals, as shown in Figs. 5 and 6, or by any equivalent means. Preferably, however, the journals not necessarily removable are formed integral with the respective rollers. The sleeve A′ and the sleeves D′ may be formed either integral with or separate from and fastened to the shaft A and the casing D, respectively.

I claim as my invention—

1. In a roller-bearing, the combination, with a series of bearing-rollers and a series of separating-rollers bearing only on the bearing-rollers, of a ring bearing at its periphery on journals of the separating-rollers and at its inner side on journals of the bearing-rollers, substantially as set forth.

2. In a roller-bearing, the combination, with the series of bearing-rollers B, having journals B^2, and the series of rollers C, bearing only on the rollers B and having journals C^2, of the ring H, bearing at its periphery on the journals C^2 and at its inner side on the journals B^2, substantially as shown and described, and for the purposes set forth.

3. In a roller-bearing, the combination, with a series of bearing-rollers, a series of separating-rollers bearing on the bearing-rollers only, and a ring bearing at its inner side on journals of the separating-rollers, of a smaller ring bearing at its periphery on said journals and at its inner side on journals of the bearing-rollers, substantially as set forth.

4. In a roller-bearing, the combination, with the series of rollers B, bearing on and projecting beyond the sleeve A′ and the sleeves D′, and having journals B^2, the series of rollers C, bearing only on the rollers B at their projections and having journals C^2, and the ring I, bearing at its inner side on the journals C^2, of the ring H, bearing at its periphery on the journals C^2 and at its inner side on the journals B^2, substantially as shown and described, and for the purposes set forth.

5. In a roller-bearing, the combination of a series of bearing-rollers bearing on the central journal and the bearing-casing, and having journals bearing on the inner side of a ring, and a series of separating-rollers bearing on the bearing-rollers only and having journals bearing on the periphery of said ring and on the inner side of a larger ring, all constructed and arranged substantially as set forth.

6. In a roller-bearing, the combination of the series of rollers B, bearing on and projecting beyond the sleeve A′ and the sleeves D′, and having journals B^2, bearing on the inner side of the ring H, and the series of rollers C, bearing only on the rollers B at their projections, and having journals C^2, bearing on the periphery of the ring H and on the inner side of the ring I, all constructed and arranged substantially as shown and described, and for the purposes set forth.

7. In a roller-bearing, the combination, with two rings of different diameters, of a series of bearing-rollers bearing on the central journal and the bearing-casing, and having journals bearing on the inner side of the smaller ring, and a series of separating-rollers keeping the bearing-rollers separate from each other and bearing on the bearing-rollers only, and having journals bearing on the periphery of said smaller ring and on the inner side of the larger ring, all constructed and arranged substantially as and for the purposes set forth.

8. In a roller-bearing, the combination, with the rings H and I, of the series of rollers B, bearing on and projecting beyond the sleeve A′ and the sleeves D′, and having journals B^2, bearing on the inner side of the ring H, and the series of rollers C, bearing only on the rollers B at their projections, and keeping the latter rollers separate from each other, and having journals C^2, bearing on the periphery of the ring H and on the inner side of the ring I, all constructed and arranged substantially as shown and described, and for the purposes set forth.

9. In a roller-bearing, the combination, between the shaft and casing, of a sleeve upon the shaft and sleeves within the casing, two rings of different diameters, a series of bearing-rollers bearing on and projecting beyond said sleeves and having journals bearing on the inner side of the smaller ring, and a series of separating-rollers bearing only on the bearing-rollers at their projections, each separating-roller on and between two bearing-rollers to keep the latter rollers separate from each other, and having journals bearing on the periphery of said smaller ring and on the inner side of the larger ring, keeping the separating-rollers from contact with the casing, all constructed, arranged, and operating substantially as and for the purposes set forth.

10. In a roller-bearing, the combination, between the shaft A and casing D, of the sleeve A′ and the sleeves D′, having their outer ends in the planes of the ends of the sleeve A′, the rings H and I, the series of rollers B, bearing on and projecting beyond the sleeves and having journals B^2, bearing on the inner side of the ring H, and the series of rollers C, bearing only on the rollers B at their projections, each roller C on and between two rollers, B, to keep the latter rollers separate from each other, and having journals C^2, bearing on the periphery of the ring H and on the inner side of the ring I, keeping the rollers C from contact with the casing, all constructed, arranged, and operating substantially as and for the purposes set forth.

11. A roller-bearing comprising the central journal, the bearing-casing, two rings of different diameters, a series of bearing-rollers bearing only portions of their lengths on the central journal and the bearing-casing and having journals bearing on the inner side of the smaller ring, a series of separating-rollers keeping the bearing-rollers separate from each

other and bearing only on the portions of the bearing-rollers not bearing on the central journal and bearing-casing, each separating-roller on and between two bearing-rollers, and having journals bearing on the periphery of said smaller ring and on the inner side of the larger ring, keeping the separating-rollers from contact with the casing, all constructed, arranged, combined, and adapted to operate substantially as shown and described, and for the purposes set forth.

12. A roller-bearing comprising the shaft A, the sleeve A′, the casing D, the sleeves D′, having their outer ends in the planes of the ends of the sleeve A′, the series of rollers B, bearing on and projecting beyond the sleeves and having journals B^2, bearing on the inner side of the ring H, the series of rollers C, keeping the rollers B separate from each other, and bearing only on the rollers B at their projections beyond the sleeves, each roller C on and between two rollers, B, and having journals C^2, bearing on the periphery of the ring H and on the inner side of the ring I, the said ring H interposed between and bearing on the journals C^2 at its periphery and the journals B^2 at its inner side, and the said ring I bearing at its inner side on the journals C^2 and keeping the rollers C from contact with the casing, all constructed, arranged, combined, and adapted to operate substantially as shown and described, and for the purposes set forth.

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