L. H. HARTMANN.

JOURNAL BEARING.

APPLICATION FILED APR. 6, 1908.

907,047.

Patented Dec. 15, 1908.

2 SHEETS—SHEET 1.

Fig. 4.

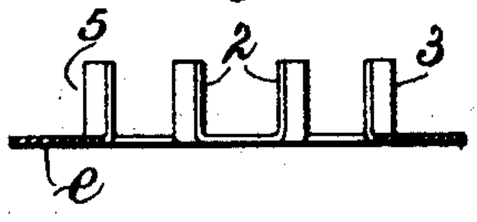


Fig. 1.

Fig. 3.

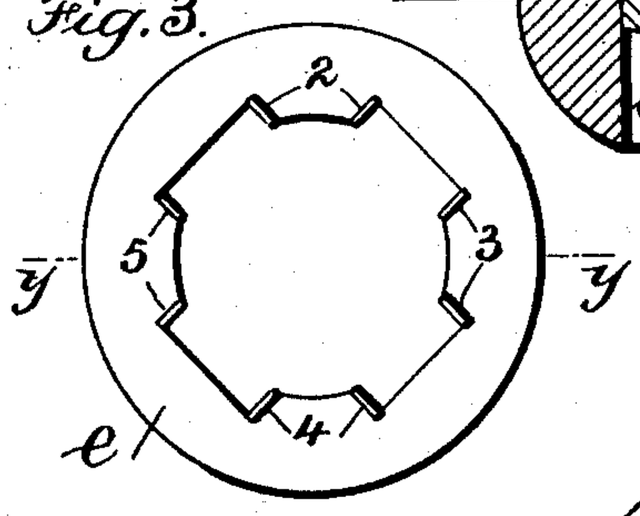


Fig. 5.

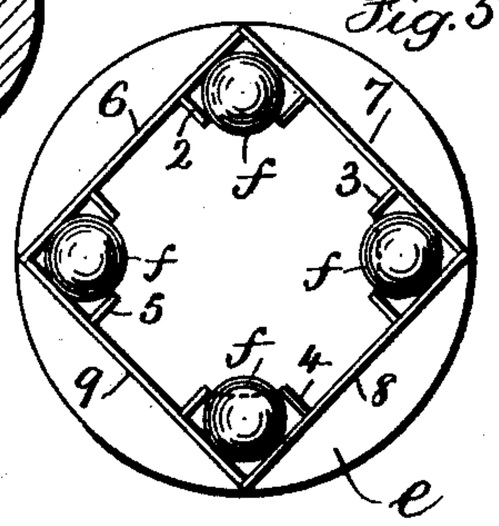
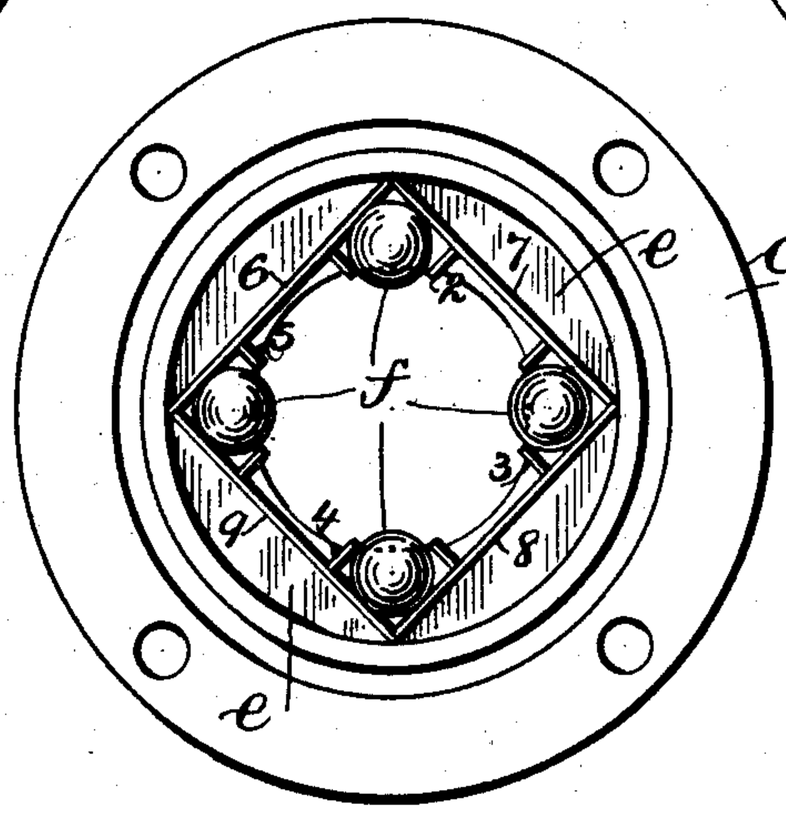


Fig. 2.



Witnesses

Chas. H. Smith

A. D. Serrell

Inventor

Louis Henry Hartmann

by Harold L. Serrell

his Atty.

L. H. HARTMANN.

JOURNAL BEARING.

APPLICATION FILED APR. 6, 1908.

907,047.

Patented Dec. 15, 1908.

2 SHEETS—SHEET 2.

Fig. 8.

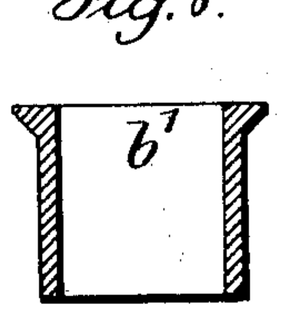


Fig. 9.

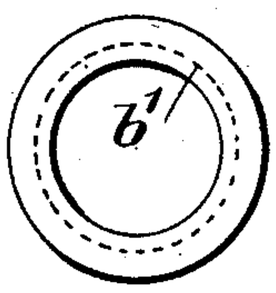


Fig. 10.

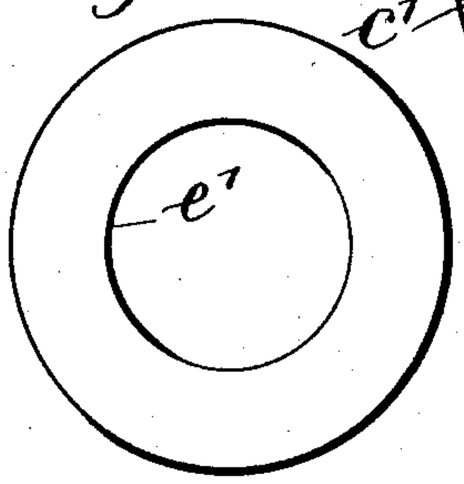


Fig. 11.

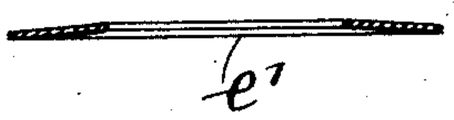


Fig. 6.

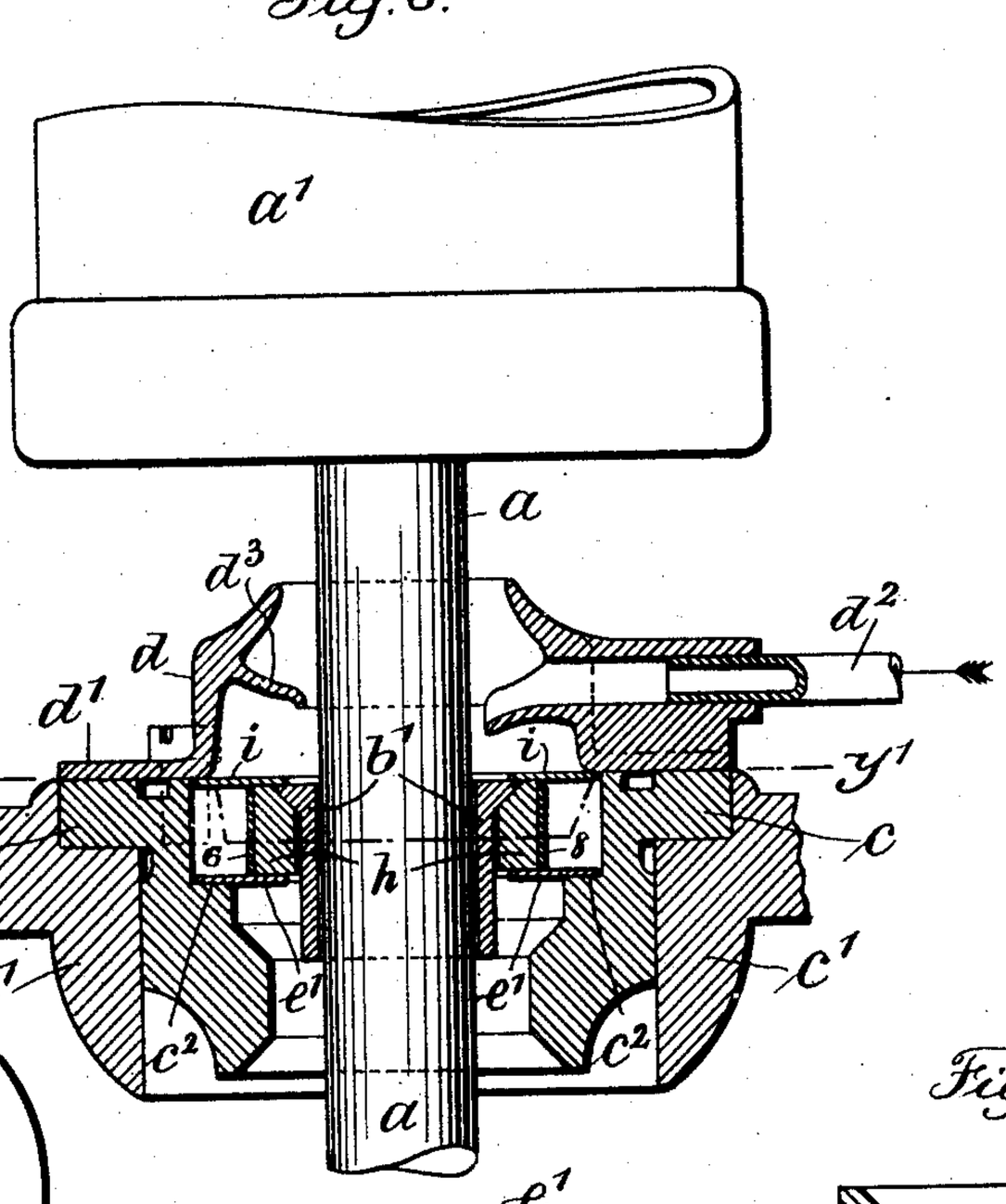


Fig. 12.

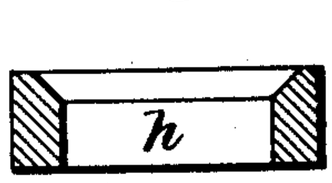
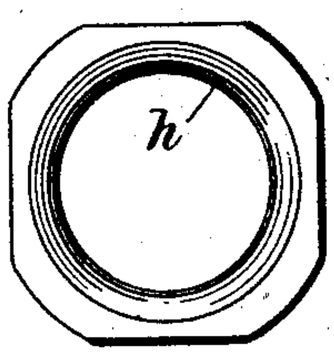


Fig. 13.



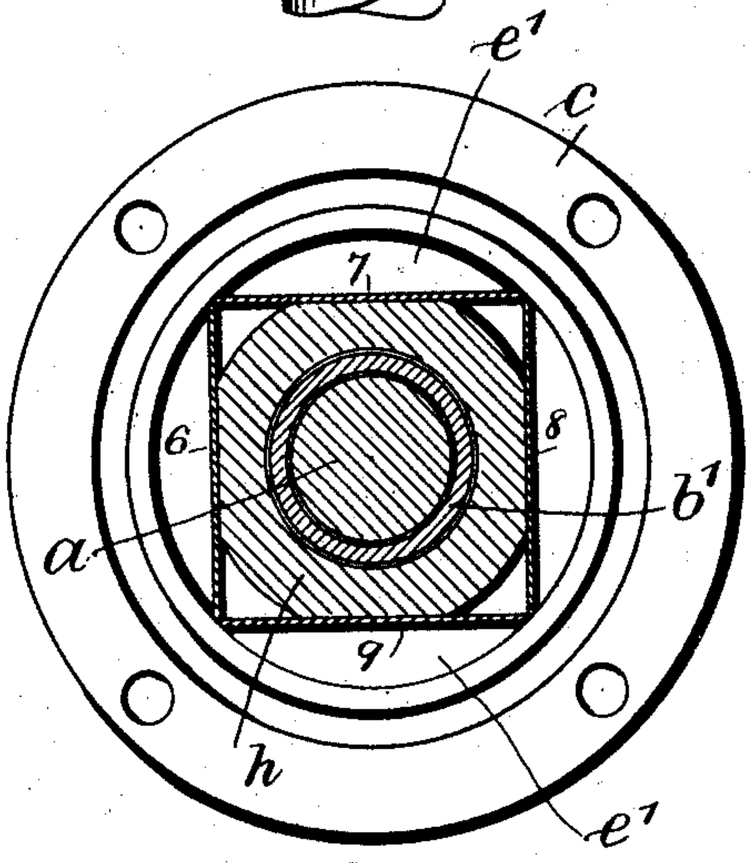


Fig. 7.

Witnesses

Chas. A. Smith

A. Lafferrell

Inventor

Louis Henry Hartmann.

by Harold Serrell

his Atty

UNITED STATES PATENT OFFICE.

LOUIS HENRY HARTMANN, OF BAINBRIDGE, NEW YORK, ASSIGNOR TO AMERICAN SEPARATOR CO., OF BAINBRIDGE, NEW YORK, A CORPORATION OF NEW YORK.

JOURNAL-BEARING.

No. 907,047. Specification of Letters Patent. Patented Dec. 15, 1908.

Application filed April 6, 1908. Serial No. 425,528.

To all whom it may concern:

Be it known that I, LOUIS HENRY HARTMANN, a citizen of the United States, residing at Bainbridge, in the county of Chenango and State of New York, have invented an Improvement in Journal-Bearings, of which the following is a specification.

My invention relates to anti-friction journaled bearings adapted for vertically positioned shafts and particularly adapted for the top bearing of such high speed vertical shafts as are employed with centrifugal cream separators. With shafts of this character a certain amount of flexibility is desirable in order that a shaft driven at exceptionally high speed may as it were find its own center of rotation, and this flexibility is desirable without the reaction which is found in rubber or springs. More than a predetermined amount of flexibility is distinctly disadvantageous as it causes an oscillatory motion of the shaft and parts carried by and rotated therewith.

In the device of my invention and in combination with a vertical shaft and revoluble device supported thereby, I provide a bearing sleeve freely surrounding the shaft, a support and a spring actuated device interposed between the support and the bearing sleeve which device acts also to hold up the collar. More particularly stated I provide an annulus adapted to be suitably supported and to receive through it the shaft and its sleeve and having within the same a flat horizontally disposed seat; within this annulus and upon this seat fits a centrally apertured circular disk of metal, above which and within the annulus are plates of spring metal to fit the annulus and which converge against the walls thereof. Between these spring plates and the sleeve and according to one form of my invention, I employ pairs of turned-up prongs to form recesses for several anti-friction balls against which the sleeve upon the said shaft bears, while according to the other form of my invention I employ an intervening collar,—all of which is hereinafter more particularly described.

In the drawing, Figure 1 is a vertical section of my improved journal bearing and elevation of the shaft. Fig. 2 is a plan at the dotted line x, x, of Fig. 1, with the shaft and its collar removed. Fig. 3 is a plan of the centrally apertured circular disk of metal having pairs of up-turned prongs cut from the disk. Fig. 4 is a cross section at the dotted line y, y, of Fig. 3 of the same part. Fig. 5 shows the part illustrated in Figs. 3 and 4, with the plates of spring metal and the series of anti-friction balls in position; the illustration Fig. 5 really representing the ball cage and the balls therein.

The foregoing figures of the drawing represent one form of my invention, while the following figures represent the other form of my invention, in which—

Fig. 6 is a vertical section and elevation of the shaft and part of the device carried thereby. Fig. 7 is a sectional plan at the dotted line y', y', of Fig. 6. Fig. 8 is a vertical section and Fig. 9 a plan of the bearing sleeve shown in Figs. 6 and 7. Fig. 10 is a plan and Fig. 11 a cross section of the centrally apertured circular disk. Fig. 12 is a cross section and Fig. 13 a plan of the bearing collar or seat also shown in Figs. 6 and 7.

Similar letters of reference in the respective figures stand for similar parts.

Referring particularly to Figs. 1, 2, 6 and 7, a represents the vertically disposed revoluble shaft and b b^1 the bearing sleeves freely surrounding the same. There is a slight difference in these sleeves in their outline and in the upper spread or overhanging portions which will be particularly described hereinafter.

c represents an annulus member supported in a frame member c^1, which frame member may form any part of a suitable supporting frame of a machine in which the structure is employed; the machine to which my device has special reference being a centrifugal cream separator. Within this annulus there is provided a flat horizontally disposed seat or surface c^2.

d represents an apertured cover adapted to surround the shaft and to set over and cover the annulus. This cover is provided with a flange d^1 adapted to fit down upon the periphery of the annulus c and to be suitably secured thereto by bolts or screws, one of which is shown in Figs. 1 to 6, entering one of the holes shown in Figs. 2 and 7. The cover d is preferably provided with an oil supply pipe d^2 and with an internal oil

distributing flange d^3 but this forms no essential part of my invention.

The essential features of my invention consist of the bearing sleeve freely surrounding the shaft and a spring actuated device interposed between the same and said annulus and supported from the seat of the annulus. For the purpose of this support upon the seat c^2 I provide a centrally apertured circular disk e according to Figs. 1 to 5 inclusive, or e^1 according to Figs. 6, 7, 10 and 11.

With particular reference to Figs. 1 to 5 inclusive, this centrally apertured circular disk e is constructed with pairs of up-turned prongs 2 3 4 and 5 cut from the material of the disk and turned into an upright position at right angles to the surface or plane of the disk.

According to Figs. 6, 7, 10 and 11, the circular disk instead of being flat is slightly raised at the inner edge so as to have a spring function. I provide plates of spring metal 6 7 8 and 9 which are alike in both forms of my invention. These are adapted to rest respectively upon the upper surface of the centrally apertured circular disk and to fit within the recess in the annulus and to form a square configuration; the respective ends of said spring metal plates touching the inner surface of the annulus so that any pressure on the same between the respective ends tends to deflect the plates, providing a yielding function, the plates returning to their normal position when the pressure is removed.

In Figs. 1 to 5 inclusive, these plates converge back of the pairs of prongs 2 3 4 and 5 so as to form receptacles between their adjacent faces and the inner faces of the prongs for several anti-friction balls f, the prongs being a means for preventing the escape or disarrangement of the balls of the bearings as between the adjacent faces of the spring plates where they converge back of the balls and the ball-way or groove of the bearing sleve b; said bearing sleeve only contacting with the nearest surface of each ball. From Fig. 1 it will be noticed that the sleeve b is preferably made with a depressed center around the shaft a and oil delivered through the pipe d^2 will fall into this depression and onto the upper surface of the sleeve b and by centrifugal action the oil will work over and around the edge of the sleeve down to the circumferential groove or ball-way so as to lubricate the bearing and will also work down between the sleeve and the shaft for lubrication at this place. The form given in the drawing for the frame member c^1 is simply illustration and not necessarily the construction of the support for the bearing.

Referring particularly to Figs. 6 to 13 inclusive, I provide a bearing collar h having a circular aperture to freely surround the bearing sleeve b^1, the outer surface of which is provided with flat bearing faces in parallel opposite pairs so as to fit within the square configuration produced by the plates of spring metal 6 7 8 9. It will therefore be apparent that this bearing collar h rests upon the circular disk e^1 and fits within the frame of spring plates. I also provide a ring disk collar i, the inner edge of which rests upon the upper surface of the bearing collar h and fits within the recess in the annulus c and the periphery of this ring disk collar comes beneath the inner under surface of the flange d^1 of the cover and when the cover is on, the same presses upon the ring disk collar i and the said pressure tends to flatten the centrally apertured circular disk e^1, thus producing as it were a tension between which the bearing collar h is held. The inner edge of the ring disk i fits slightly over the upper flanged edge of the bearing sleeve b^1 tending to hold the same down so that its inclined under edge bears tightly and smoothly upon the inclined upper surface of the said bearing collar h.

In the operation of the forms of my invention, the vertically placed high speed shaft such as the shaft carrying the bowl of a centrifugal cream separator, take their own center because the tendency of the high speed is to cause said parts to find their own center of rotation and this is best assisted when there is no violent reaction by springs.

It will be seen in both forms of my invention that the loose bearing sleeve around the shaft is supported and maintained in place in the one instance mainly by the ball bearings and the cage in which they move, and in the other case by the bearing collar h supported upon the disk e^1. As the sleeves b b^1 are loose around the shaft and are also loose in their support, there is the utmost freedom of action, which permits the shaft to rotate at its speed and the bearing sleeve to follow in its proportional speed.

Any possible lateral or sidewise movement will in the first form of my invention be effective against the balls and be transmitted by the series of balls to the spring plates and by them be taken up, while in the second form of my invention any such motion will be transmitted to the bearing collar h and be taken up by the similar spring plates of metal and with the looseness provided a certain amount of freedom is possible, so that there is no question but that the rapidly revolving parts will find their own vertical center of rotation.

Any swaying motion of the shaft or even of the bearing sleeves b b^1 is quickly arrested because of the yielding action of the interposed device between the same and the springs. The looseness provided between

the respective parts reduces the friction to a minimum and the machine runs with great ease and freedom.

From the foregoing description it will be apparent that in the first form of my invention there is a possibility of rotation to the disk, the spring plates and the balls collectively around the axis of the shaft as well as the rotation of the balls on their own axes, while according to the second form of my invention, it is possible for the collar *h* and the disk e^1 with the spring plates also to have a perceptible amount of rotation within the annulus and upon the seat thereof; these rotary movements being in the same direction but at a greatly reduced ratio to that of the vertical shaft. Should the shaft incline in its rotation the force or pressure exerted radially as transmitted to the spring plates is checked and with a slight rebound the shaft is brought back to its vertical center and the swaying stopped by the construction shown in either form of my invention.

I claim as my invention:—

1. In a journal bearing the combination with a shaft, of a revoluble bearing sleeve freely surrounding the shaft, a fixed support, a spring actuated device acting upon the sleeve and interposed between the support and the said bearing sleeve, and means similarly interposed and acting to hold up the sleeve.

2. In a journal bearing the combination with a shaft, of a revoluble bearing sleeve freely surrounding the shaft, a fixed support, a spring actuated device acting upon the sleeve and interposed between the support and the said bearing sleeve and freely surrounding the latter, and means carried by the support and acting to hold up the sleeve.

3. In a journal bearing the combination with a shaft, of a revoluble bearing sleeve freely surrounding the shaft, a fixed support, a series of spring plates arranged within said support, a device interposed between the said series of springs and the said bearing sleeve to receive the lateral thrust of the shaft, and means similarly interposed and acting to hold up the sleeve.

4. In a journal bearing the combination with a shaft, of a revoluble bearing sleeve freely surrounding the shaft, a fixed support, a series of spring plates arranged within said support, a device interposed between the said series of springs and the said bearing sleeve freely surrounding the latter to receive the lateral thrust of the shaft, and means carried by said support and acting to hold up the sleeve.

5. In a journal bearing the combination with a shaft, of a bearing sleeve freely surrounding the shaft, an annulus having a seat in its open center and a suitable support for the annulus, means received within said annulus and resting upon the seat thereof and interposed between the inner walls and seat of said annulus and said bearing sleeve, to receive the lateral thrust of the said shaft, and means for holding up the bearing sleeve.

6. In a journal bearing the combination with a shaft, of a bearing sleeve freely surrounding the shaft, an annulus having a seat in its open center and a suitable support for the annulus, a centrally apertured circular disk fitting said annulus and resting upon the seat thereof, a series of spring plates also fitting the annulus, with their ends against the wall thereof and resting upon said disk, and a device interposed between the said springs and the said sleeve, which device receives the lateral thrust of the shaft and at the same time holds up the bearing sleeve.

7. In a journal bearing the combination with a shaft, of a bearing sleeve freely surrounding the shaft, an annulus having a seat in its open center and a suitable support for the annulus, a centrally apertured circular disk fitting said annulus and resting upon the seat thereof, a series of spring plates also fitting the annulus, with their ends against the wall thereof and resting upon said disk, and a device interposed between the said spring plates and the bearing sleeve, which freely surrounds the bearing sleeve and which device is adapted to receive the lateral thrust of the shaft and communicate the same to the springs and which acts also to hold up the said bearing sleeve.

8. In a journal bearing the combination with a shaft and its sleeve, of an annulus receiving the shaft and its sleeve, and having an internal seat, a centrally apertured circular disk within the annulus surrounding the sleeve and provided with up-turned prongs, plates of spring metal fitting within the annulus with the ends thereof converging back of the pairs of prongs and anti-friction balls received between the plates and the prongs and adapted to come closely adjacent to the sleeve of the shaft.

9. In a journal bearing the combination with a shaft and its bearing sleeve and an annulus receiving the same, of a series of anti-friction balls adapted to come closely adjacent to the sleeve, a support in the annulus for said series of balls, and spring plates having bearings at their respective ends, with their ends in juxtaposition, said plates forming supports and bearings near their ends for the balls at points substantially opposite to the bearing thereon of the sleeve.

10. In a journal bearing the combination with a vertically disposed shaft and a sleeve thereon having a circumferential groove, of an annulus and a suitable support therefor, the annulus receiving said shaft and sleeve and having an internal seat disposed horizontally or at right angles to the axis of the

shaft, a disk of sheet metal adapted to rest upon said seat provided with an aperture for said sleeve and with pairs of up-turned prongs cut from the metal of the disk, plates of spring metal adapted to bear upon the outer upright edges of said prongs, with their respective ends converging between the pairs of prongs and bearing on the inner surface of the annulus and between said ends and prongs, forming ball cages, and series of anti-friction balls received in said places retained in place by the prongs and bearing at opposite points in the groove of the sleeve and upon the faces of the spring plates near their ends.

11. In a journal bearing the combination with a series of anti-friction balls oppositely disposed in pairs, of a ball cage comprising an apertured circular disk with up-turned prongs in pairs, and plates of spring metal with their meeting ends and surfaces at right angles with the up-turned prongs and between which parts are formed ball spaces.

12. In a journal bearing the combination with a series of anti-friction balls oppositely disposed in pairs, of a ball cage comprising an apertured circular disk with up-turned prongs in pairs at right angles to one another, and plates of spring metal set vertically and edge-wise with reference to the plane of the disk and at right angles thereto, with their meeting ends and surfaces at right angles with the up-turned prongs and between which parts are formed ball spaces.

Signed by me this 27th day of March 1908.

LOUIS HENRY HARTMANN.

Witnesses:

LELAND VAN ETTEN,

EARL A. WESTCOTT.