(No Model.) 2 Sheets—Sheet 1.

C. F. PAIGE.

ANTIFRICTIONAL JOURNAL BEARING.

No. 490,867. Patented Jan. 31, 1893.

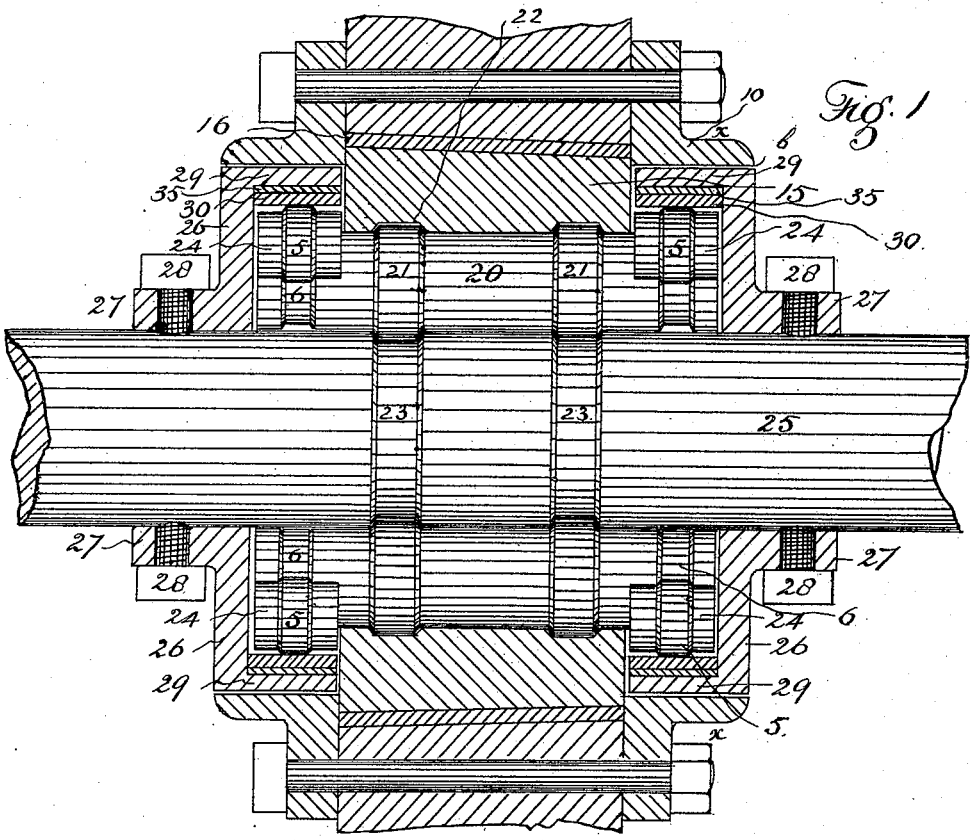

Fig. 1

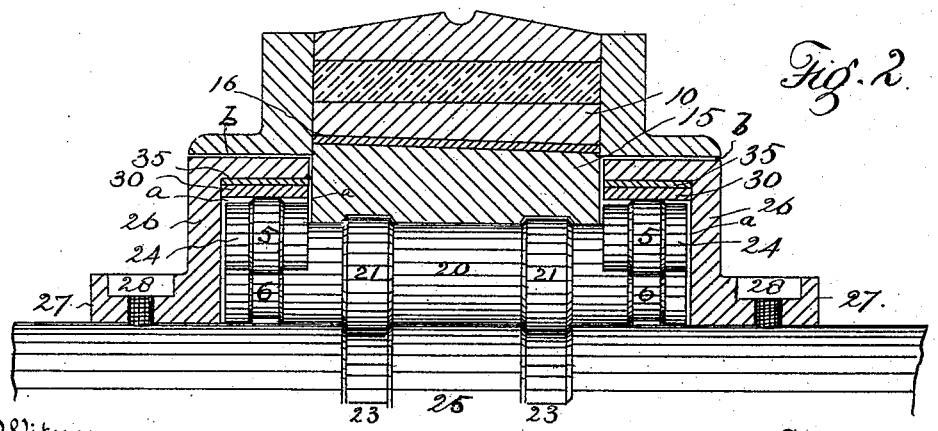

Fig. 2.

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Wm. McConnell

Inventor
Charles F. Paige
By his Attorney
A. J. O'Brien

(No Model.) 2 Sheets—Sheet 2.

C. F. PAIGE.

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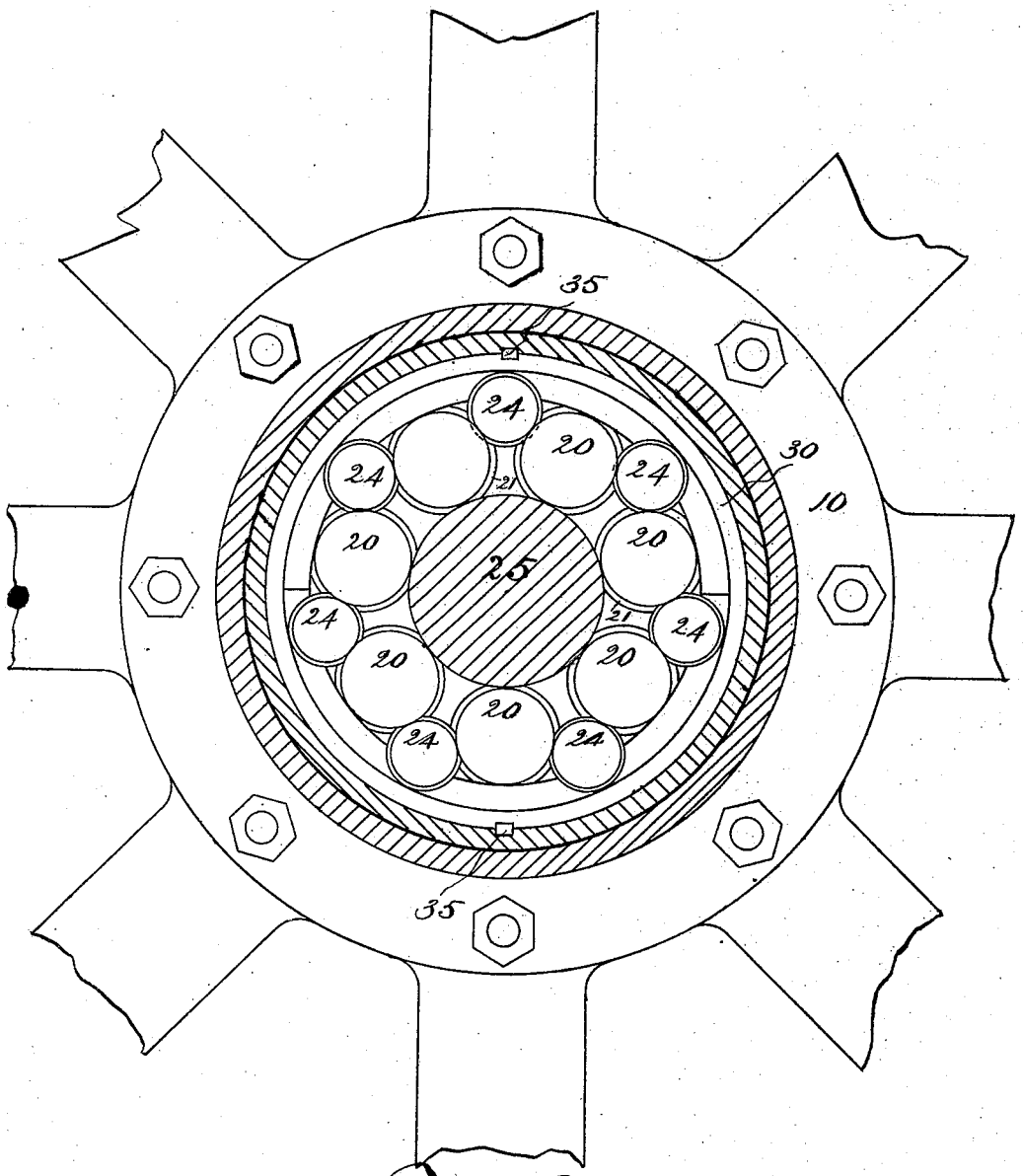

Fig. 3.

Witnesses
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Inventor
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By his Attorney
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UNITED STATES PATENT OFFICE.

CHARLES F. PAIGE, OF DENVER, COLORADO, ASSIGNOR OF TWO-THIRDS TO JOHN C. RICE AND JOSEPH P. RILEY, OF SAME PLACE.

ANTIFRICTIONAL JOURNAL-BEARING.

SPECIFICATION forming part of Letters Patent No. 490,867, dated January 31, 1893.

Application filed July 24, 1891. Renewed June 15, 1892. Serial No. 436,764. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. PAIGE, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Antifrictional Journal-Bearings; and I do 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to an improved antifrictional journal bearing of the class in which a cluster of rolls surrounds the shaft and is held in place by an outer shell or case which it also engages, the rolls being capable of rotation.

The chief object of this invention is the same as of all inventions of this type, namely to reduce the friction to a minimum, and at the same time provide a device of the class stated which shall be simple in construction, economical in cost, and reliable, durable and thoroughly practicable in use. It is believed that I attain these objects by the use of the mechanism illustrated in the accompanying drawings in which is shown an embodiment of the invention.

In the drawings, Figure 1 is a section taken through the casing without cutting the rolls, some of which are however removed to expose the shaft. In this view the mechanism is illustrated as an intermediate bearing—as where a wheel is mounted upon a stationary shaft at any point between its extremities. Fig. 2 illustrates another application of the invention, namely, its use as an end bearing on vehicle or car axles. Fig. 3 is a section taken through the mechanism on the line *x*—*x*, Fig. 1. In this view the casing and shaft are cut while the rollers are shown in end elevation.

In the views, similar reference characters designating corresponding parts of the mechanism, let the numeral 10 designate the casing of a box or the hub of a wheel laterally inclined on its inner face to receive the bushing 15 which is secured in place within the casing or hub by a key, feather or spline, 16. This bushing is formed in sections which is necessary to permit of its being placed in position, since it is interiorly grooved to receive corresponding circumferential beads formed on the engaging rolls 20.

To the shaft 25 are rigidly secured the double flanged collars 26. One flange 27 of each collar extends outward, the collar being made fast to the shaft by screw bolts 28 passing through apertures formed in the flange and entering recesses or openings formed in the shaft. The other flange 29 of each collar 26 extends inwardly and overlaps a ring 30 to which the flange is secured by a feather or spline 35. It will thus be observed that collar 26 and ring 30 rotate with the shaft.

It must be understood that collars 26 and rings 30 may be formed integral, or that flanges 29 may constitute rings 30. It is preferred, however, to make the rings separate from the collars in order that they may be properly tempered or chilled, since their function requires a different quality of material from that necessary for the flanged collars proper.

Between the shaft 25 and bushing 15 are located the rollers 20 which are provided with peripheral beads 21 engaging corresponding circumferential grooves 22 and 23 formed in the bushing and shaft respectively, interiorly on the one, exteriorly on the other. Any suitable number of these rollers 20 may be employed. Seven are shown in the drawings and are supplemented by the smaller spacing rollers 24 upon each of which is formed a peripheral bead 5 engaging a counter part groove 6 formed near each extremity of the rollers 20. Beads 5 engage ring 30 interiorly. There is a pair of short rollers 24 for each larger roller 20. It will be observed that rollers 24 engage only rings 30 and rollers 20. They lie between collar 26 and bushing 15 but must not engage either, there being a narrow intermediate space *a* left between the parts 26 and 15 and also between the collar and the end of roller 24 to avoid friction with the rollers which are held in place by the engagement

of their beads with the grooves of roller 20 in conjunction with the external contact of rings 30. A similar space *b* is left between collar 26 and the surrounding casing or hub. It will be observed that whether the shaft and its collar 26 remain stationary and the hub turns, or whether the casing is stationary and the shaft and collar rotate the relation between the intermediate rollers and the shaft and external engaging parts must be such that there will be no friction between the engaging parts unless it be between the beveled edges of the corresponding beads and grooves heretofore described.

Assuming that the diameters of the parts are as follows, that is to say, the shaft three inches, the seven engaging rollers each one and one half inches, the inner periphery of the bushing six inches, the smaller rollers one inch with an increase of one eighth when taken through the bead, and the inner periphery of the ring six and three fourths inches, the demonstration is as follows:—When the shaft has made one rotation each roller 20 has made two revolutions on its axis and traveled half way around the inner periphery of the bushing in its orbit, so to speak, and when the shaft has made two revolutions each roller 20 has made four turns on its axis and traveled around the entire inner periphery of the bushing or has made a complete circuit of its orbit. During this time the smaller rollers 24 have traveled around the inner periphery of the ring since they must move with the larger rollers. Hence while each roller 20 has made four revolutions on its axis each roller 24 has made six rotations on its axis and every point upon the periphery of its body has moved approximately 18.8496+ inches in traveling around its axis and upon the periphery of a larger roller, this distance being exactly four circumferences of the larger roller, which demonstrates that there has been no friction between the peripheries of these two sets of rollers.

In considering the relative movements of the two sets of rollers upon each other, the beads and grooves need not be considered since the one enters the other and the relation of the two sets of rollers is relatively the same as if their peripheries were of uniform diameter. However, with reference to the ring 30 the rule is different since its engaging face is plain and only in contact with the bead upon rollers 24. Hence while these rollers have been making six revolutions upon their axes, each point upon the periphery of the beads has moved 21.2058+ inches around the axis, which distance is the inner circumference of ring 30, and also once in its orbit around the shaft or the other rolls. Now the ring 30 being secured to the collar which is made fast to the shaft, must have moved two revolutions therewith, and during the action of the small engaging rollers just described. Hence the relation of the rollers and ring has been such that there has been no friction, since a given point upon the periphery of the bead of each roller has traveled 21.2058+ inches upon its axis and the same distance around the center of motion, said point having thus traveled the same distance as a point upon the inner periphery of the ring.

It will be seen that when the parts are properly arranged there is scarcely any friction while careful provision has been made to prevent disarrangement of the parts and to obviate as far as possible any change in the relative positions occupied by the shaft and the rollers. For instance, rollers 20 cannot move laterally upon the shaft, neither can rollers 24 have any lateral movement upon rollers 20, since the ring 30 maintains the bead and groove constantly in engagement with each other, the ring being in turn kept in position by the collar 26 made fast upon the shaft.

It will be observed that whenever beads are referred to in this specification as engaging grooves, the latter should be somewhat deeper than the former in order that the face of the one may not engage the bottom of the other. This is necessary in order to maintain the proper anti-frictional or rolling relation between the engaging parts.

Having thus described my invention what I claim is:—

1. The combination with the shaft of the engaging rolls 20, the surrounding bushing engaging said rolls, two sets of end spacing rolls 24 engaging rolls 20 and projecting beyond the face of the same, rolls 24 being provided with circumferential beads, corresponding grooves formed in rolls 20 for the reception of said beads, plain rings surrounding rolls 24 and engaging the beads thereon and collars formed integral with or attached to the rings and made fast to the shaft substantially as described.

2. In an anti-friction roller bearing the combination with the shaft, of the engaging rolls 20, a suitable surrounding bushing engaging the same, two distinct sets of end spacing rolls 24 engaging rolls 20, projecting beyond the face of the same and traveling around the shaft in a larger orbit than rolls 20, rolls 24 being provided with circumferential beads, corresponding grooves formed in rolls 20 for the reception of these beads, plain rings surrounding rolls 24 and engaging the face of the beads but not touching the adjacent parts of the roll, and collars secured to the shaft and made fast to the rings whereby the rings are made to rotate uniformly with the shaft, substantially as described.

3. In an antifrictional roller bearing the combination with the shaft, of rolls 20 surrounding and engaging the same, the shaft and rolls being connected by counter part beads and grooves, a surrounding casing or bushing engaging said rolls, two distinct sets of end

rolls 24 engaging rolls 20 and provided with circumferential beads, corresponding grooves formed on rolls 20 for the reception of said beads, plain rings surrounding rolls 24 and engaging the beads but free from the adjacent parts of the rolls' face, and collars made fast to the shaft at each end of the rolls and formed integral with or rigidly secured to the rings whereby the latter are made to rotate with the shaft, substantially as described.

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

CHARLES F. PAIGE.

Witnesses:
WM. MCCONNELL,
G. J. ROLLANDET.