No. 731,052. PATENTED JUNE 16, 1903.

H. HINCKLEY.

BEARING.

APPLICATION FILED APR. 21, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

FIG. 1.

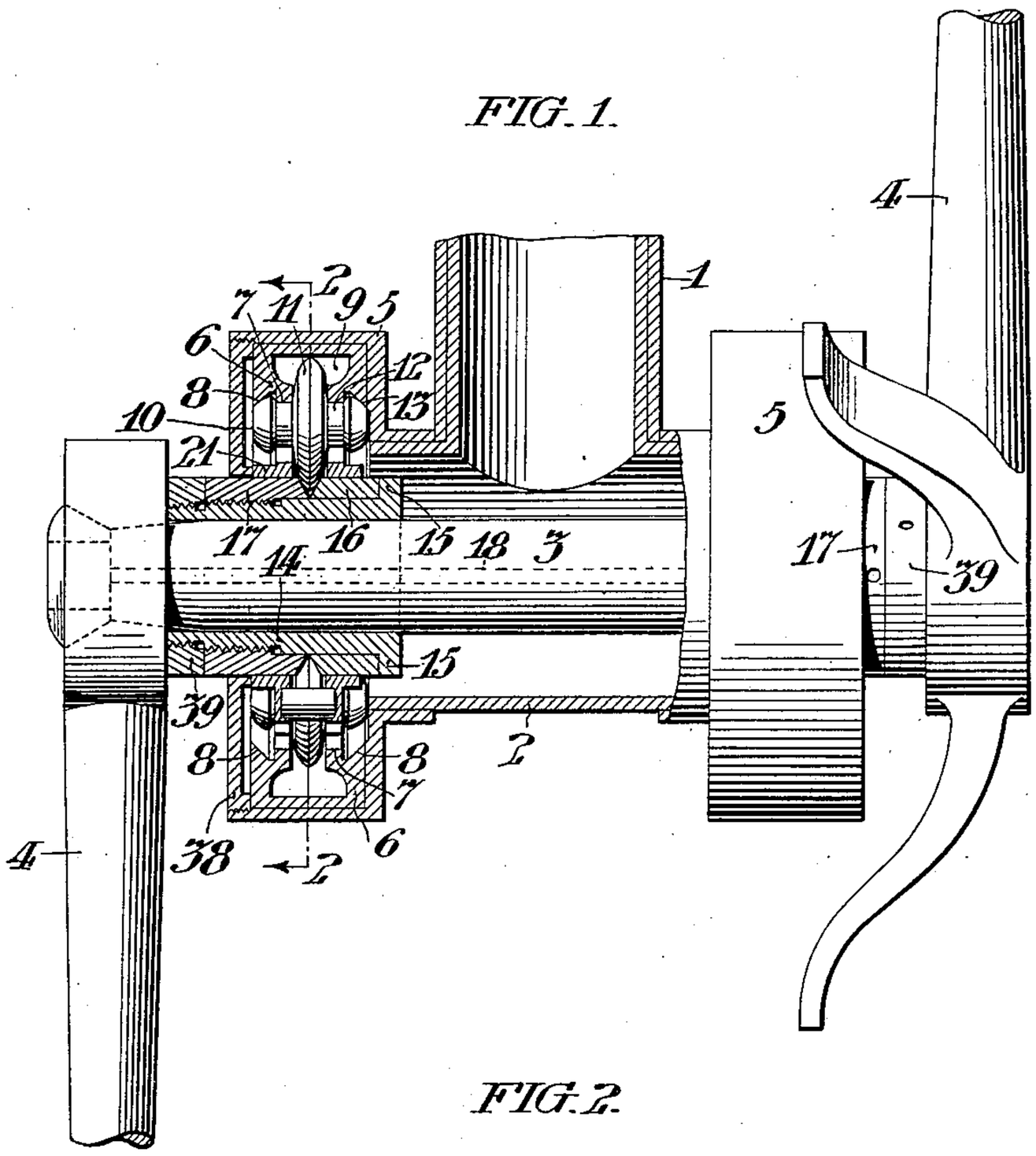
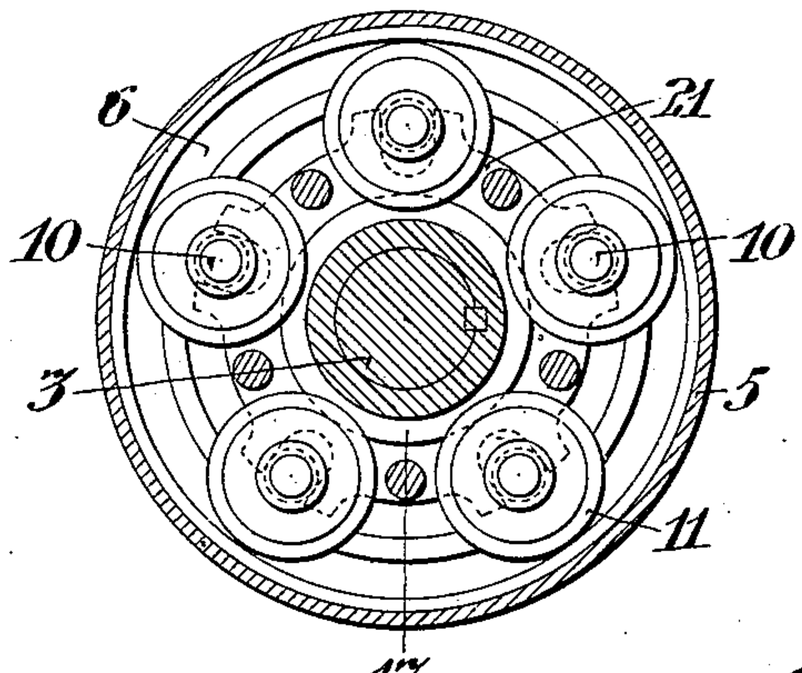


FIG. 2.



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NO MODEL. 3 SHEETS—SHEET 2.

FIG. 3.

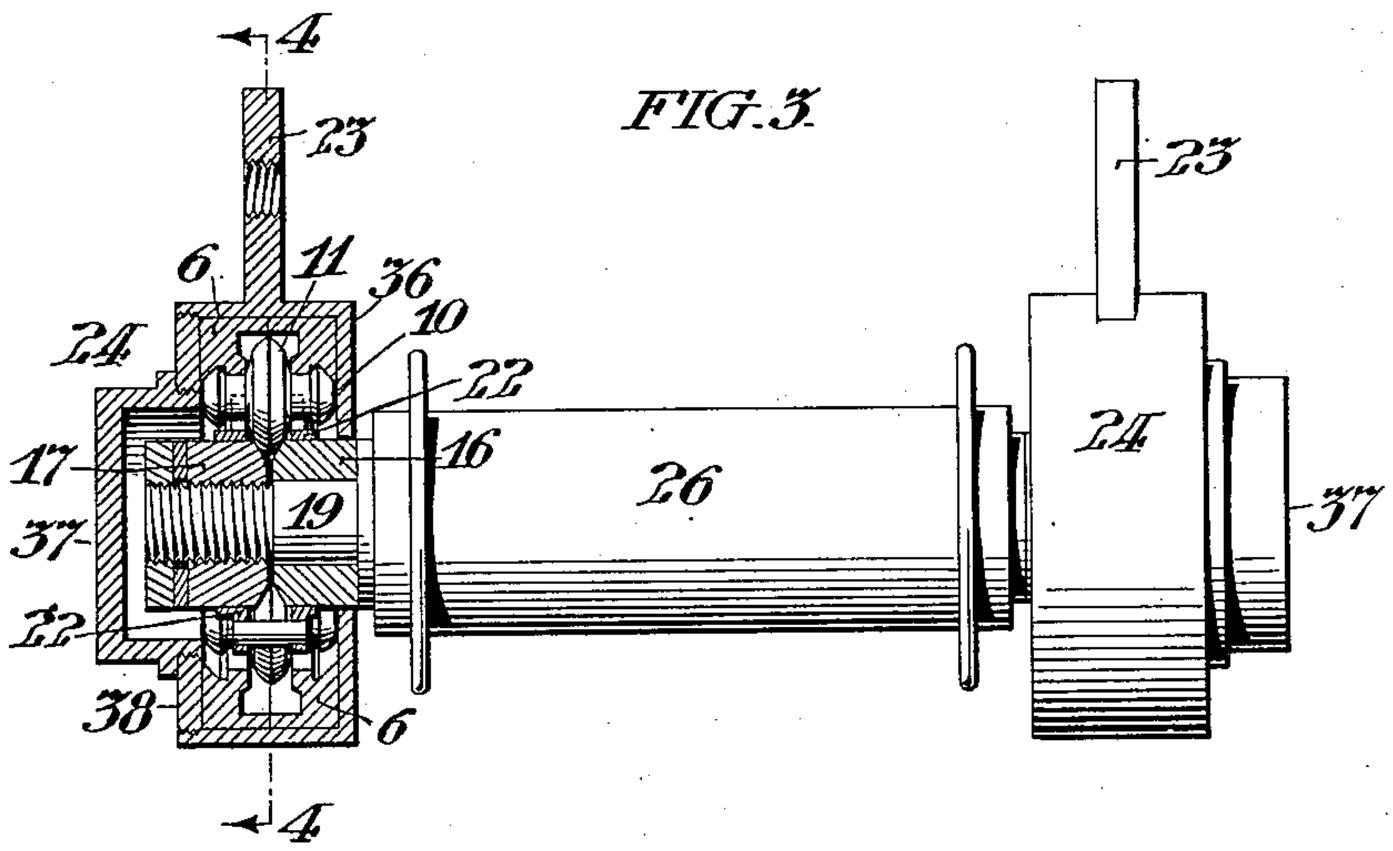
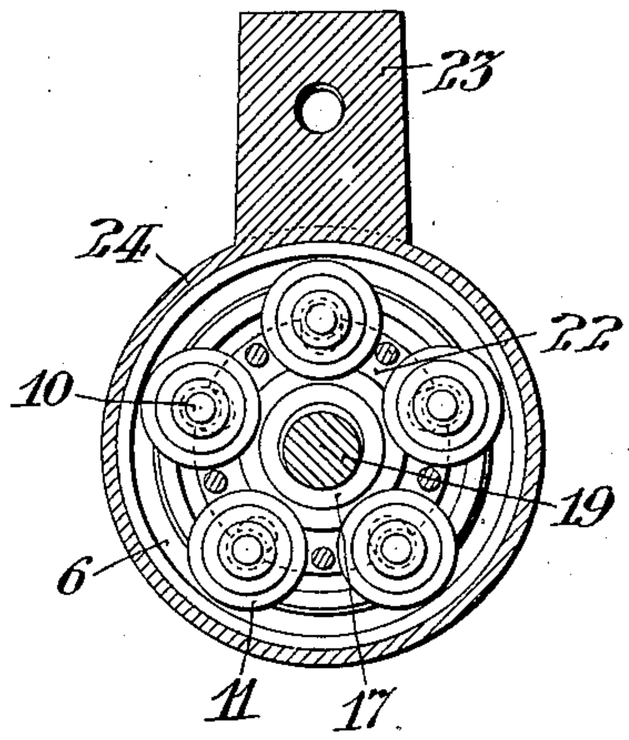


FIG. 4.



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No. 731,052. PATENTED JUNE 16, 1903.

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BEARING.

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NO MODEL. 3 SHEETS—SHEET 3.

FIG. 5.

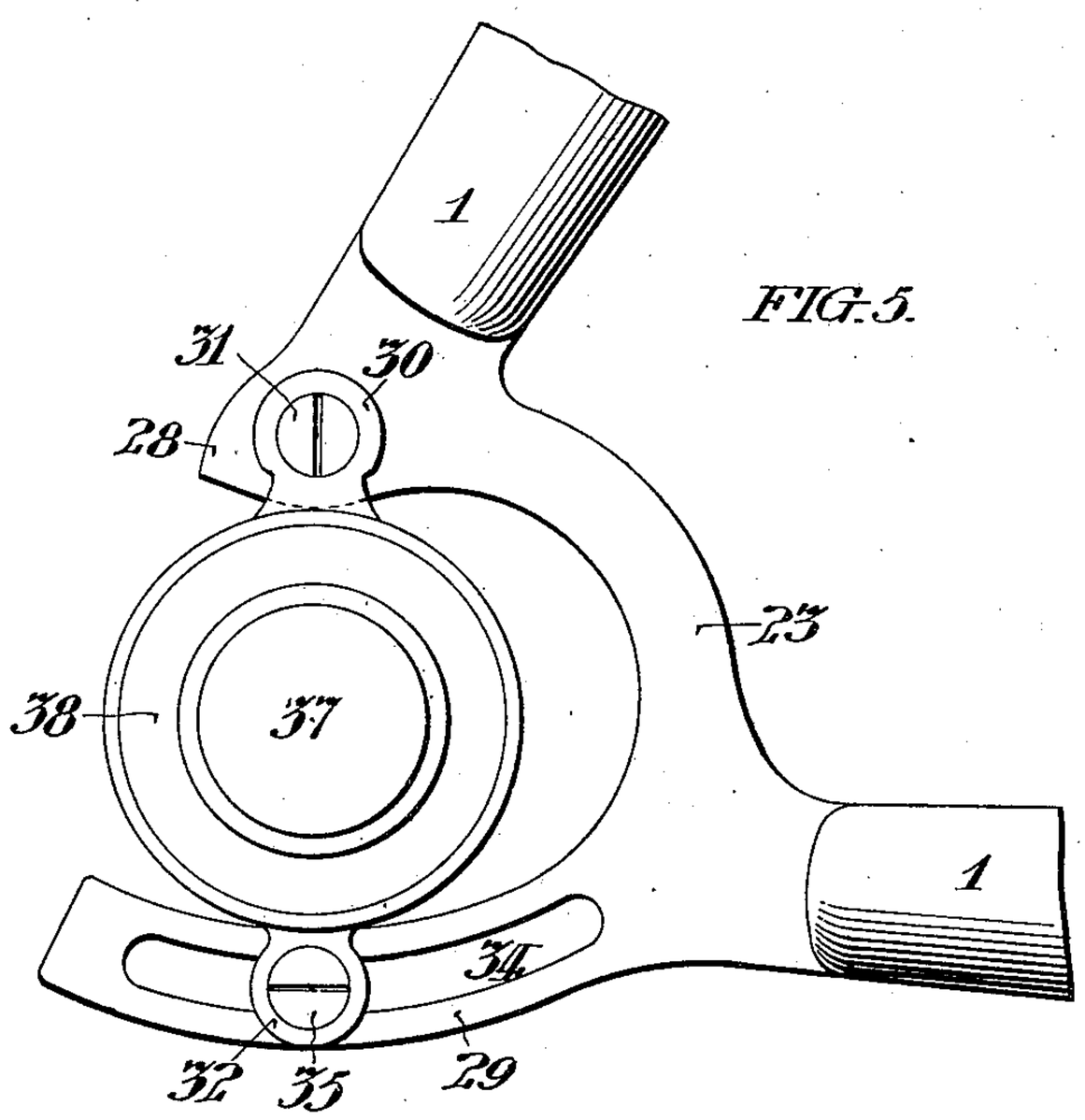
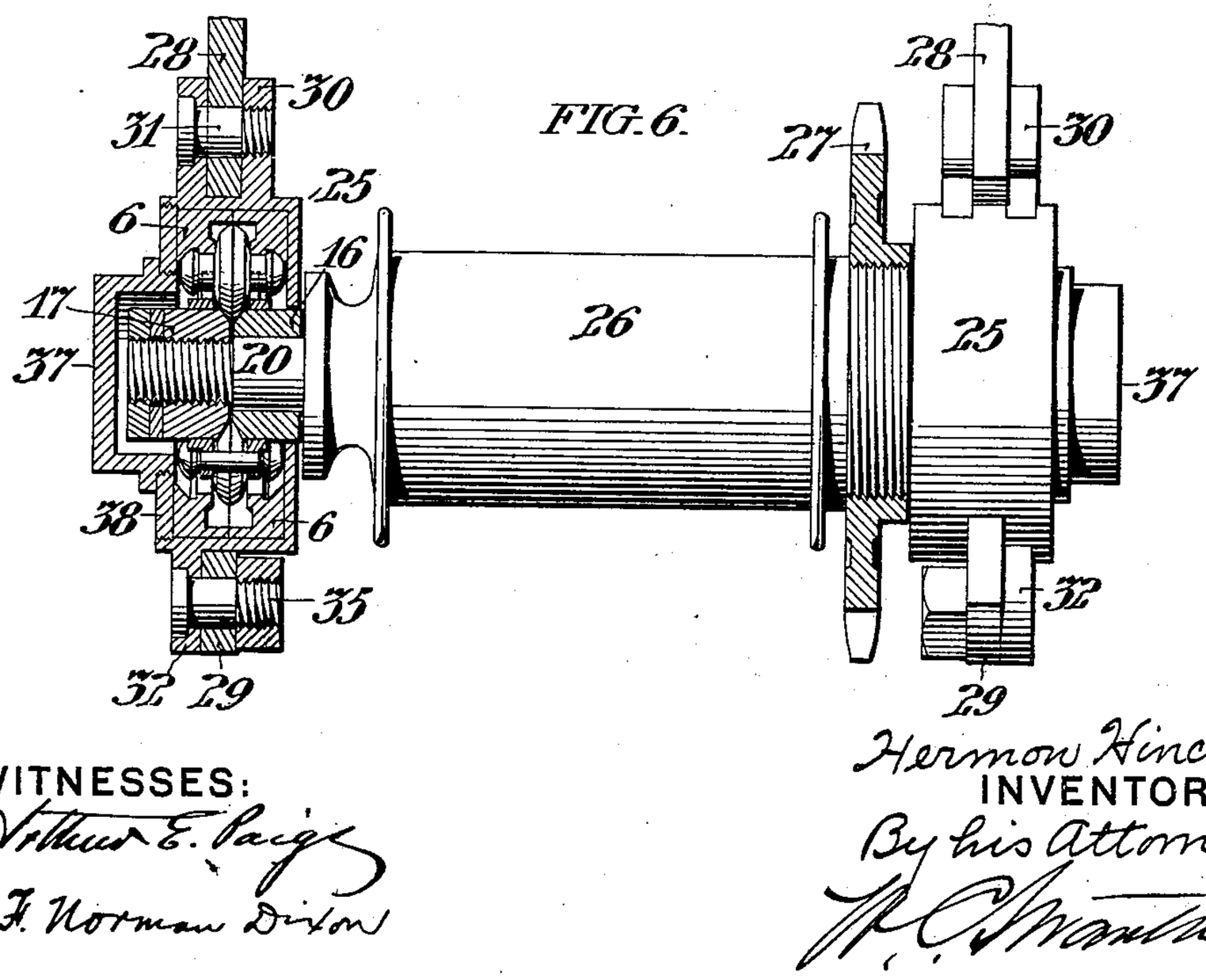


FIG. 6.



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No. 731,052. Patented June 16, 1903.

UNITED STATES PATENT OFFICE.

HERMON HINCKLEY, OF WILLIAMSPORT, PENNSYLVANIA.

BEARING.

SPECIFICATION forming part of Letters Patent No. 731,052, dated June 16, 1903.

Application filed April 21, 1902. Serial No. 103,897. (No model.)

To all whom it may concern:

Be it known that I, HERMON HINCKLEY, a citizen of the United States, residing at Williamsport, in the county of Lycoming, in the State of Pennsylvania, have invented certain new and useful Improvements in Bearings, of which the following is a specification.

My invention relates especially, although not restrictively, to the bearings of the wheels of bicycles and kindred vehicles.

It is the object of my invention to provide a roller bearing, which may be termed a "composite bearing," of a simple and inexpensive character, which shall be compact in form, capable of very nice adjustments, and more efficient in facilitating the passage of the moving part of the structure over the relatively fixed part, than such devices as heretofore constructed.

In the accompanying drawings,

Figure 1 is a view partly in central vertical section and partly in side elevation of the crank shaft of a bicycle, its associated hub, and appliances constituting an embodiment of my improved roller bearing.

Figure 2 is a transverse section on the dotted line 2 2 of Figure 1, the rollers being shown in elevation.

Figure 3 is a view partly in central section and partly in elevation of the hub of the front wheel of a bicycle, illustrating the associated boxings and parts composing my improved roller bearing.

Figure 4 is a transverse section on the dotted line 4 4 of Figure 3, the rollers being in elevation.

Figure 5 is a view in side elevation of a portion of a bicycle frame illustrating the hub of the rear wheel in connection therewith, showing the arrangement by which the rear wheel is rendered adjustable with respect to the frame.

Figure 6 is a view partly in central section and partly in elevation of the hub of the rear wheel, its boxing, and the associated parts composing my improved roller bearing.

Similar numerals of reference indicate corresponding parts.

Referring first more particularly to Figure 1, 1 indicates a portion of a bicycle frame, 2 a casing supported thereon, and 3 a crank axle, arranged for rotation with respect to said casing, and having the usual cranks 4.

The respective ends of the casing 2 are provided with the boxings or boxes 5, within each of which is disposed a stationary annular roller way, as I term it, 6. Said roller way, which is conformed to provide a circumferential annular conduit 9, embodies, as to its inner face, the circumferential bearing faces 7, and the guide faces 8.

The bearing faces 7 are disposed respectively at the respective sides of the mouth of the conduit 9, and exist on a common curved plane concentric with respect to the axis of the axle 3.

The guide faces 8 are oppositely disposed tapered plane surfaces, transversely considered, extending from the outer side edges of the roller way 6, conveniently at an angle of about 45 degrees to the plane of the bearing faces 7, the lower portions of said respective guide surfaces conveniently extending somewhat below, so to speak, said bearing faces, with the result that slight circumferential recesses are formed; thus, as will be seen, the outer wall of each recess constitutes one of the guide surfaces.

10 are rollers arranged to bear and tread upon the stationary bearing faces 7 on the one hand, and the axle 3, or parts identified with it, on the other. Said rollers, in the preferred embodiment of my invention, are each equipped with a region of relatively large diameter, such as that designated 11, in contact with the axle or its associated parts, and preferably having an annular face of tapered section as shown,—two regions of relatively small diameter, designated 12, conveniently disposed one on each side of the portion 11, and adapted to bear or tread upon the bearing faces 7, said regions 12 having acting faces in parallelism with the axis of the roller,—and two inclined faces designated 13, conveniently disposed one at each end of the roller, adapted to present respectively against the respective guide surfaces 8, said inclined faces being of convex profile.

The axle 3, as shown, is provided with an encircling thimble 14, having a radially extending flange 15 at its inner end, and a portion of reduced diameter at its outer end.

Said thimble is adapted for adjustment longitudinally of the axle, and its positive rotation with the axle is insured by the feathering of the thimble on the axle, as indicated in dotted lines at 18, Figure 1.

The outer end portion of the main body of the thimble, and also the reduced end portion of said thimble, are threaded, as shown particularly in Figure 1.

16 is a cone encircling the unthreaded portion of the inner end of the thimble.

17 is a cone tapped and threaded upon the threaded outer portion of the body of the thimble, and 39 is a nut threaded upon the reduced outer end portion of the thimble. The thread of the reduced outer end of the thimble runs in a direction opposite to that of the thread on the body of the thimble. Obviously, however, instead of providing said reduced end and said oppositely running thread, the thimble might be of uniform diameter throughout, corresponding to the ends of the axles 19, 20,—and in connection with the outer cone a jam nut, having a thread corresponding to that of said outer cone, and a washer, might be employed, as shown in Figures 3 and 6. The arrangement shown in Figure 1 obviates the necessity for a washer.

The conformation of the opposing edges of the cones 16 and 17 is such as to correspond to the faces of the portions 11 of the rollers, and in the embodiment illustrated said opposing edges are, therefore, oppositely inclined to conjointly form an approximately V-shaped annular track for said faces.

The thimble and cones rotate with the axle, as though a part of it, as they in effect are.

The general construction and arrangement of the parts shown in Figures 3 and 6, corresponds with that shown in Figure 1, except that in said Figures 3 and 6 the thimble 14 is dispensed with, the cones being mounted directly upon the axles. In the construction of Figures 3 and 6, the outer ends of the axles, that is to say the axle 19 of the front wheel and the axle 20 of the rear wheel, respectively, are threaded, so that while the respective inner cones encircle unthreaded portions of the respective axles, the outer cones are mounted and threaded upon the threaded portions of said axles. Each of the last mentioned inner cones is confined between the associated outer cone and a suitable shoulder formed upon its axle.

The rollers 10 are maintained in their appropriate distributive relation about the axles by any suitable rack or guide, such as those shown in Figures 2 and 4, that designated 21, shown in Figure 2, being such as I prefer to employ in connection with the crank axle, and that designated 22, shown in Figure 4, such as I prefer to employ in connection with the axles of the front and rear wheels.

In connection with the axle 19 of the front wheel, I provide a pair of boxes 24, fixed in any preferred manner to the frame of the machine, and I provide in connection with the axle 20 of the rear or driving wheel, a similar pair of boxes designated 25, which boxes are to be secured in any desired manner to the frame of the machine.

The boxes 24 and 25 correspond generally to the boxes 5 in association with which the crank-axle is employed. They are, however, structurally independent of each other, and independently supported on the main frame, instead of being united and supported by the casing 2, as in the arrangement shown in Figure 1.

Said boxes 24 and 25 contain annular roller ways, rollers, and cones, corresponding to the roller way, rollers and cones, already described in connection with the construction shown in Figure 1.

As heretofore pointed out, however, in the constructions of Figures 3 and 6 the thimble 14 of Figure 1 is dispensed with. It is, of course, obvious that thimbles 14 may be employed on the axles of the front and rear wheels, if desired, and also that said thimble may be omitted from the crank-axle if desired.

The axles 19 and 20, respectively, of the front and rear driving wheels, are entered in their respective pairs of boxes and rotate with respect to the same, the hubs 26 of said front and rear wheels rotating with the axles of said wheels.

The boxes 24 and 25 shown in Figures 3 and 6 consist of hollow casings 36, the outer faces of which are composed of cap pieces 37 in threaded engagement with face plates 38 in threaded engagement with the walls of the casings 36.

Obviously by removing a cap piece 37 or a cap piece and a face plate 38 together, access to the interior of a box may be readily had, and when desired the parts of the roller bearing readily removed and replaced.

The boxes 5 of the construction shown in Figure 1 are provided with face plates 38. The cap piece 37 is, however, not employed owing to the projection of the ends of the axle 3 beyond the boxes.

As will be understood, the point of contact between the curved faces 13 of the rollers and the guide faces 8 of the roller ways, which latter act to center the rollers, is very narrow, and approximately level with the bearing faces 7.

That is to say, the point of contact of the curved faces 13 with the guide faces 8 is in line with an element of the bearing faces 7, whereby there is no tendency of one part of the roller to move with greater speed than another. It will be obvious that by this construction, friction between the rollers and other relatively moving parts will be reduced to a minimum.

The guide faces receive any end thrust of the rollers, without permitting any slide or friction. In any position in which the wheel may be placed there will be no slip, and the leverage due to the differences in diameter

of different portions of the rollers will remain constant.

27 is a sprocket wheel mounted on the hub 26.

In Figure 5 I illustrate an arrangement by which the rear wheel may be conveniently and quickly adjusted with respect to the main frame.

23 is a drop forging, casting, or the like, to which the frame members 1 are connected in any usual or preferred manner, and having a pair of lugs 28 and a pair of curved slot bars 29, the two lugs 28 and the two slot bars 29 being spaced apart a distance corresponding to the distance between the boxes 25.

Each box has a pair of lugs 30 adapted to embrace one of the lugs 28 so that by the insertion through each set of lugs 28, 30, of a screw or pivot 31, said boxes will be respectively supported upon said respective lugs 28, capable, however, of a pivotal motion upon said screws or pivots 31.

Each of the boxes has a depending lug 32, extending in proximity with one of the slotted bars 29, and having an opening in registry with the slot 34 of said slotted bar. The slot 34 is slightly curved, its arc being concentric with the screw or pivot 31, and the openings in the lugs 32 remain in registry with the slots 34 in the movements of the boxes upon the screws 31 as pivots.

35 is a screw extending through the opening of the lug 32 and the slot 34 of the slot bar 29.

Obviously, by adjustment of the nuts on the inner ends of the screws 35, the lugs 32 and slot bars 29 may be clamped together, and the boxings will thereby be rigidly retained in any desired position with respect to the slot bars.

The operation of my apparatus will be readily understood. The rotating axles, 3, 19, 20, bear upon the portions of greatest diameter, 11, of the rollers 10, and said rollers 10 bear as to their regions of lesser diameter, 12, upon the bearing faces of the stationary roller ways, the axes of said rollers being closer to the bearing faces 7 of the roller ways than they are to the points of contact of the rollers with the axles or parts connected therewith.

Said axles 3, 19, 20, therefore, in their rotation, bear upon the relatively stationary boxes, that is to say, upon the stationary roller ways carried by said boxes, through the interposed rollers, and, the diameter of the portions of the rollers upon which the axles bear being in excess of the diameter of the portions of the rollers which bear upon the roller ways, it follows that the amount of power or rotative force of the axles consumed in effecting the rotation of the rollers upon the relatively stationary boxes is less than it would be were the axle and the roller way respectively in contact with portions of the rollers of uniform diameter, the economy in power being proportioned to the excess in diametric proportions of the portions 11 over the portions 12.

Manifestly, an outer cone 17 may be readily adjusted with respect to an inner cone 16 by the rotation of said cone upon the threaded member with which it is engaged. When it is desired to also provide for an adjustment of the inner cone, I resort to the arrangement shown in Figure 1, that is to say, I arrange in connection with an axle, the thimble 14 hereinbefore described, which in the drawings happens to be illustrated as used in connection with the crank axle.

Said thimble is, as explained, capable of longitudinal movement with respect to its axle. Manifestly, if the cone 17 be rotated to the right it will advance until its inner edge is in contact with the edges of the regions 11 of the rollers 10, and, upon further rotation, it will operate, bearing against said rollers, to draw the thimble, carrying the cone 16, outward,—that is to say, in the direction which will carry the outer edge face of the cone 16 against the regions 11 of the rollers 10.

On the other hand, rotation of the cone 17 to the left, and the rotation of the nut 39 to the right, it being assumed to have a thread the reverse of that of the cone 17, will operate, by reason of the bearing of said nut 39 against the inner face of the crank 4, to advance the thimble inwardly along the axle, carrying the cone 16 away from the regions 11 of the rollers.

It is manifest, therefore, that by the employment of the arrangement shown in Figure 1, a very delicate and complete adjustment of the cones with respect to the rollers, to secure a very accurate fitting of said cones to said rollers, may be secured, and the described means for securing this adjustment may be, of course, applied in connection with any of the bearings shown.

Heretofore, it has been usual for the hubs of bicycle wheels to rotate upon axles extending through said hubs, the respective ends of the axles being secured to the main frame, the ball, roller, or other bearings employed to ease the rotation of the wheels being disposed between said hubs and the intermediate portions of the axles inclosed by said hubs, a position in which said balls and rollers and their associated parts are difficult of access.

In my improved construction, however, a wheel, hub, and axle, rotate together as an entirety, and the respective ends of the axle find their bearings in the boxes. By reason of this arrangement, ease of access to the roller bearings, as by removal of a face plate 38, without removing the wheel from the frame, is secured.

The means for adjusting the rear wheel with respect to the main frame is very inexpensive in its construction, and while strong and reliable in operation, enables a change of adjustment to be very readily made.

The crank axle may upon the removal of the cranks, be drawn endwise from the bear-

ings without disturbing their adjustment, said shaft being independent of said bearings except through the key connections between the thimbles and said axle. The key way of said key connection, as will be seen, extends the full length of the shaft.

Having thus described my invention, I claim—

1. In a roller bearing, in combination, an axle, a box, an annular roller way mounted in said box and provided with two bearing faces, a series of rollers disposed between said axle and said way, each roller having portions of different diameters and one portion of each roller being in contact with the axle and other portions of each roller being in contact with the faces of the roller way, inclined annular guide faces mounted in the box, and inclined annular faces formed on the rollers and adapted to make contact with the inclined guide faces, substantially as set forth.

2. In a roller bearing, in combination, an axle, a box, an annular roller way mounted in said box and provided with two bearing faces, a series of rollers disposed between said axle and said way, each roller having portions of different diameters one portion of each roller being in contact with the axle and other portions of each roller of diameter less than the portion first mentioned in contact with the faces of the roller way, two oppositely disposed inclined annular guide faces mounted in the box, and inclined annular faces formed on the rollers and adapted to make contact with the inclined guide faces, the inclined faces of the rollers being slightly convex, substantially as set forth.

3. In a roller bearing, in combination, a box, an annular roller way having a central conduit, and two bearing faces respectively disposed at the respective sides of said conduit, a series of rollers adapted to said roller way, each roller having a part of larger diameter extending into the conduit and portions of lesser diameter resting on said bearing faces, inclined annular guide faces mounted in the box and inclined annular faces formed on the rollers and adapted to make contact with the inclined guide faces and an axle extending through the box and in contact with the portions of the rollers of greatest diameter.

4. In a roller bearing, in combination, an axle, a box, an annular roller way mounted in said box, and provided with two bearing faces, a series of rollers disposed between said axle and said way, one portion of each roller being in contact with the axle, and other portions of each roller of diameter less than the portion first mentioned in contact with the faces of the roller way, inclined annular guide faces mounted in the box and inclined annular faces formed on the rollers, and adapted to make contact with the inclined guide faces, the inclined faces of the rollers being slightly convex, the point of contact between the said faces being in line with an element of that portion of the surface of the roller which is in contact with the said roller way, for the purpose set forth.

5. In combination, an axle, a roller way provided with bearing faces and also with oppositely disposed guide surfaces, one of said members being rotatable with respect to the other, and a series of rollers each being, as to different portions of its length, of dissimilar diameters and having a portion of larger diameter in contact with one of said members and a portion of smaller diameter in contact with the other of said members, and having its end portions respectively in contact with the said oppositely disposed guide surfaces, for the purpose set forth.

6. In combination, an axle, a roller way provided with oppositely disposed guide surfaces, and also with a plurality of bearing surfaces, one of said members being rotatable with respect to the other, and a series of rollers each being, as to different portions of its length, of dissimilar diameters and having a portion of larger diameter in contact with one of said members and a portion of smaller diameter in contact with the other of said members, and having its end portions respectively in contact with the said oppositely disposed guide surfaces, for the purpose set forth.

7. In combination, an axle, a roller way provided with oppositely disposed guide surfaces, one of said members being rotatable with respect to the other, and a series of rollers encircling said axle, each roller being as to different portions of its length of dissimilar diameters, and having a portion of larger diameter in contact with one of said members, and a portion of smaller diameter in contact with the other of said members, and having its end portions respectively in contact with the said oppositely disposed guide surfaces, the latter resisting the end thrust only of the rollers to prevent axial movement thereof, substantially as described.

8. In combination, a rotatable axle, a stationary roller way provided with bearing faces and also with oppositely disposed guide surfaces, and a series of rollers encircling said axle, each roller being as to different portions of its length of dissimilar diameters, and having a portion of larger diameter in contact with one of said members and a portion of smaller diameter in contact with the other of said members and having its end portions respectively in contact with the said oppositely disposed guide surfaces, for the purpose set forth.

9. In combination, an axle, a roller way having oppositely disposed guide surfaces, the said surfaces being plane in transverse section, one of said members being rotatable with respect to the other, a series of rollers encircling said axle, each roller being as to different portions of its length of dissimilar diameters, and having its end portions of convex contour, and having a portion of larger

diameter in contact with one of said members and a portion of smaller diameter in contact with the other of said members, the end portions being respectively in engagement with the said guide surfaces, the latter resisting end thrust only of the said rollers for the purpose set forth.

10. In combination, an axle, a roller way having oppositely disposed guide surfaces, the said surfaces being plane in transverse section, one of said members being rotatable with respect to the other, a series of rollers encircling said axle, each roller being as to different portions of its length of dissimilar diameters, and having its end portions of convex contour, and having a portion of larger diameter in contact with one of said members and a portion of smaller diameter in contact with the other of said members, the end portions being respectively in engagement with the said guide surfaces at a point in line with the element of the surface of the roller at its portion of smaller diameter, for the purpose set forth.

11. In combination, an axle, a box, one of said members being rotatable with respect to the other, a roller way mounted in said box, the said roller way being provided with oppositely disposed guide surfaces, a series of rollers seated in said roller way and encircling said axle, said rollers being as to different portions of their length of dissimilar diameters and having a portion of larger diameter in contact with the axle, and a portion of smaller diameter in contact with the roller way, the end portions of said rollers being in contact with the said guide surfaces, the latter resisting end thrust only of the said rollers for the purpose set forth.

12. In a roller bearing, in combination, a box, an axle, a series of rollers, a thimble slidably mounted on the axle, a pair of cones mounted on said thimble, one of which is in threaded engagement therewith, the other one being loosely mounted thereon, and the opposing edges of said cones being inclined to receive between them the edges of disk-like projections of the rollers, substantially as set forth.

13. In a roller bearing, in combination, a box, an axle, a series of rollers, a thimble slidably mounted on the axle, a pair of cones mounted on said thimble, one of which is in threaded engagement therewith, the other one being loosely mounted thereon, and the opposing edges of said cones being inclined to receive between them and engage the edges of disk-like projections of the rollers, the threaded cone being held against movement in one direction by reason of its engagement with the said rollers, whereby the other cone may be adjusted with respect to said rollers, for the purpose set forth.

14. In combination, a box provided with a roller way, an axle, a series of rollers encircling said axle and seated in said way, a thimble slidably mounted on said axle and provided with a flange at its inner extremity, a smooth portion and a screw threaded portion, a cone mounted upon the smooth portion and abutting against the flange of said thimble, a second cone being in threaded engagement with the screw threaded portion of said thimble, each cone being in engagement with the said rollers, the threaded cone being held against movement in one direction by reason of said engagement, whereby the other cone may be adjusted with respect to said rollers for the purpose set forth.

15. In combination, a box, an axle, a series of rollers disposed between said box and axle, the said rollers being held against axial movement, and each roller having a disk-like portion of approximately V-shaped edge, a thimble mounted on said axle and having a threaded and an unthreaded portion, and a pair of cones mounted on said thimble, the opposing edges of which are inclined to approximately conform to the edge of the roller, the arrangement being such that rotation of one of the cones to the right while in contact with the said rollers causes a movement of the other cone toward the rotated cone.

16. In combination, a box, an axle, a series of rollers disposed between said box and axle, the said rollers being held against axial movement, and each roller having a disk-like portion of approximately V-shaped edge, and a pair of cones mounted on said axle, and adapted to engage said rollers, and one of said cones having screw-threaded connection with said axle, the said threaded cone being held against movement in one direction by reason of its engagement with the said rollers, and the other cone being adjusted toward the rollers at such time only as the threaded cone and the rollers are in engagement, substantially as described.

17. In a roller-bearing, in combination, a box, a series of rollers which are held against axial movement, a thimble feathered on the axle, a pair of cones mounted on said thimble, one of which is in threaded engagement therewith, the other one being loosely mounted thereon, the opposing edges of said cones being inclined to receive between them and engage the edges of disk-like projections of the rollers, the threaded cone being held against movement in one direction by reason of its engagement with the said rollers, whereby the other cone is adjusted with respect to said rollers, for the purpose set forth.

In testimony that I claim the foregoing as my invention I have hereunto signed my name this 19th day of March, A. D. 1902.

HERMON HINCKLEY.

In presence of—
THEO. CORNMAN,
H. R. LAIRD.