No. 670,951. Patented Apr. 2, 1901.

S. S. EVELAND.

ANTIFRICTION BEARING.

(No Model.) Application filed Nov. 9, 1900.

2 Sheets—Sheet 1.

Fig. 1.

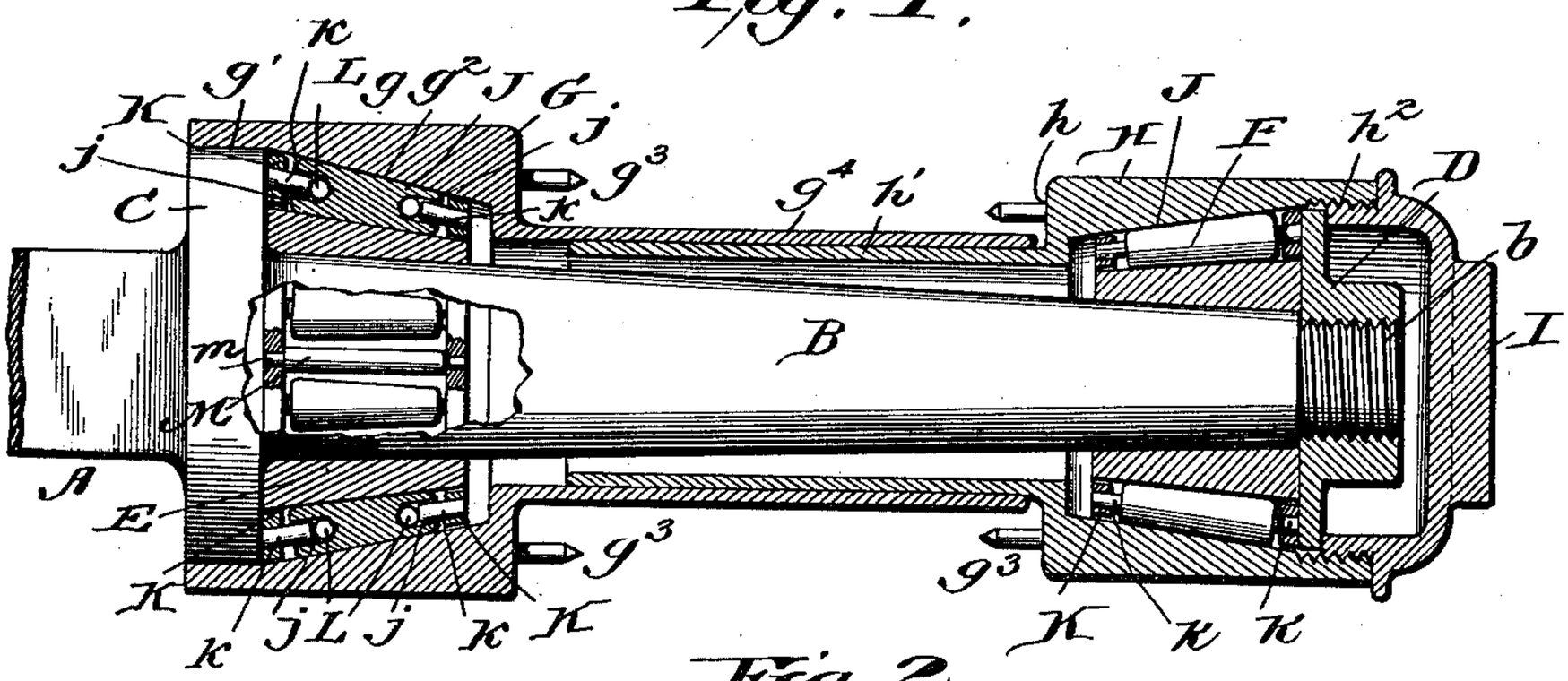


Fig. 2.

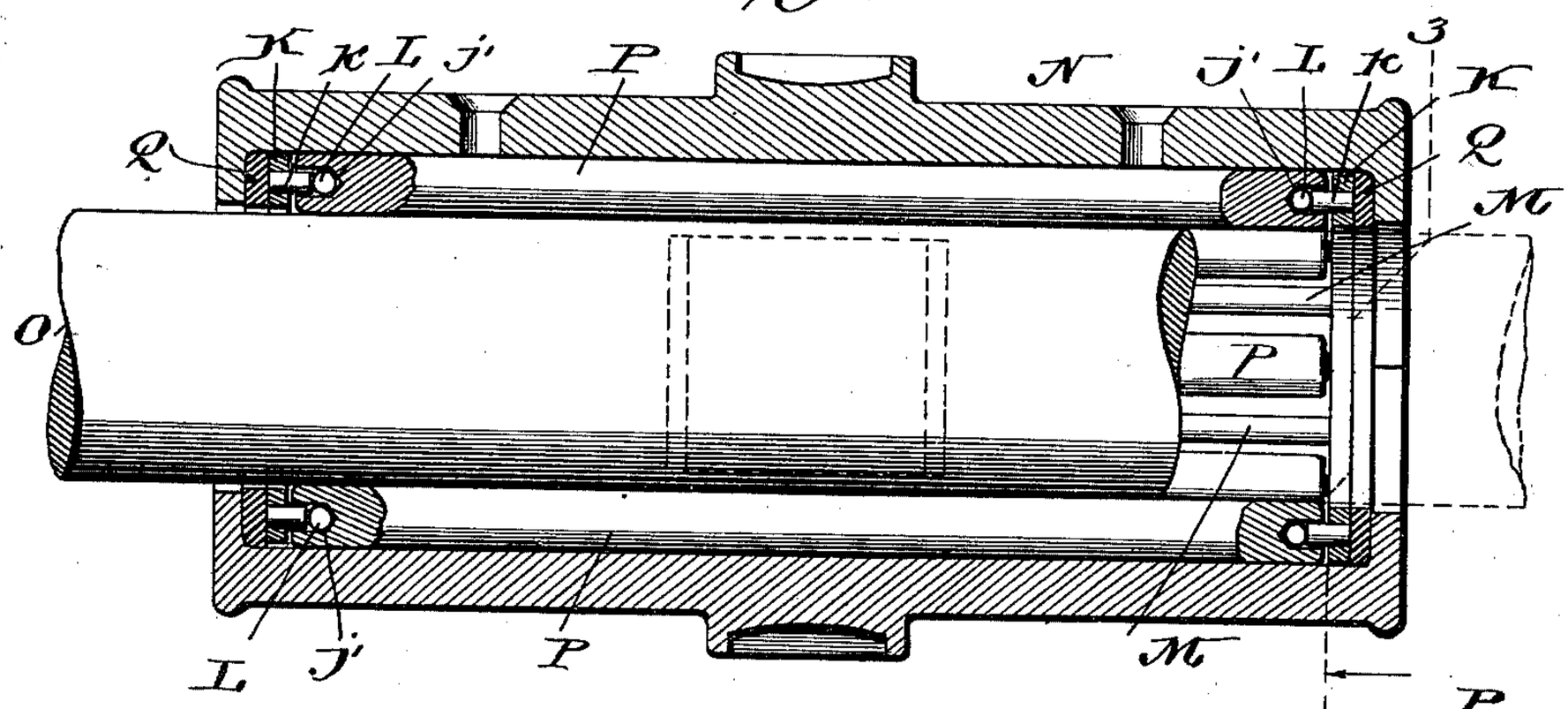


Fig. 3.

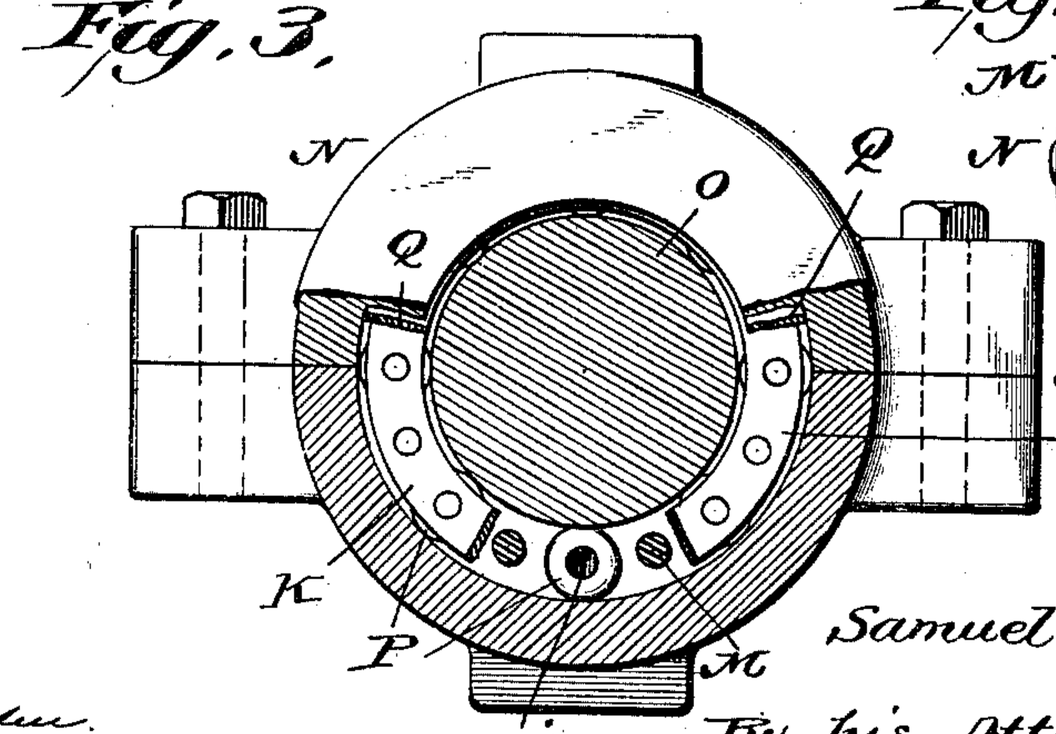
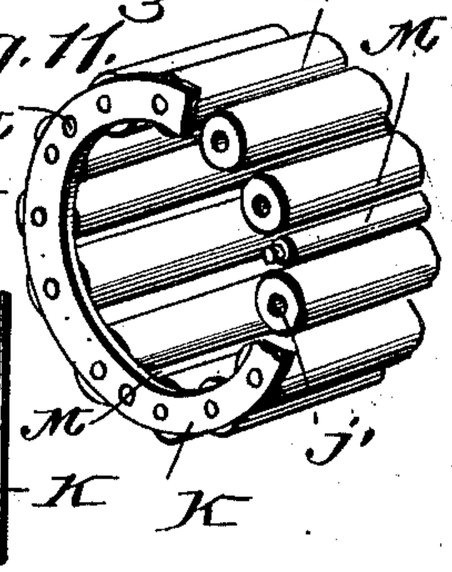


Fig. 11.



Witnesses
Wm. L. Spindler.
E. A. Ballock.

Inventor;
Samuel S. Eveland,
By his Attorneys,
Baldwin, Davidson & Wright.

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S. S. EVELAND.

ANTIFRICTION BEARING.

(Application filed Nov. 9, 1900.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 4.

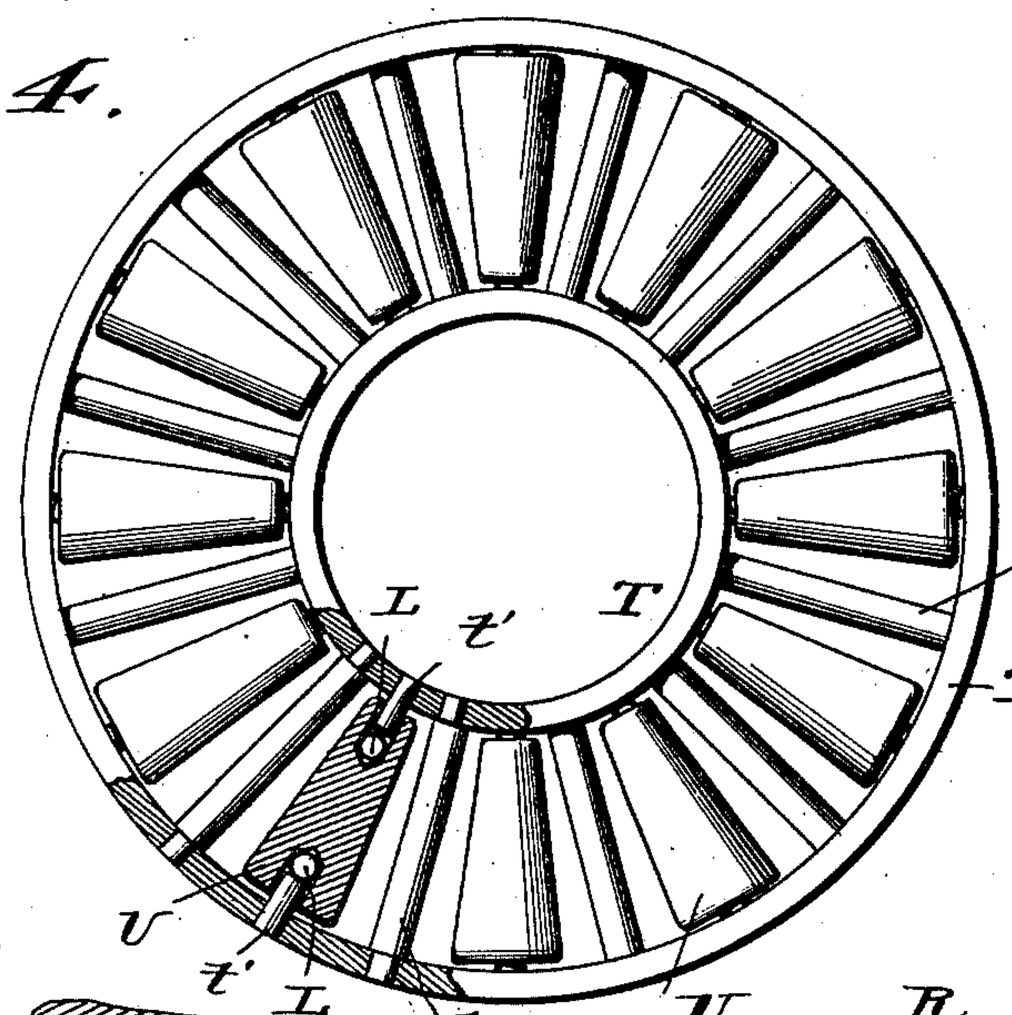


Fig. 5.

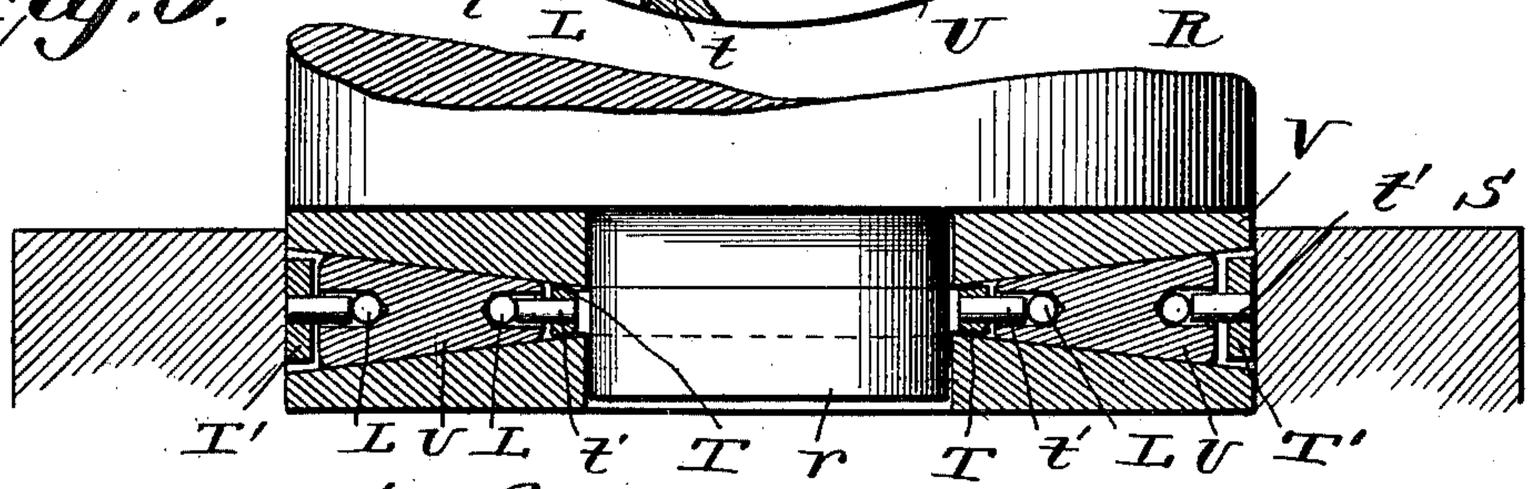


Fig. 6.

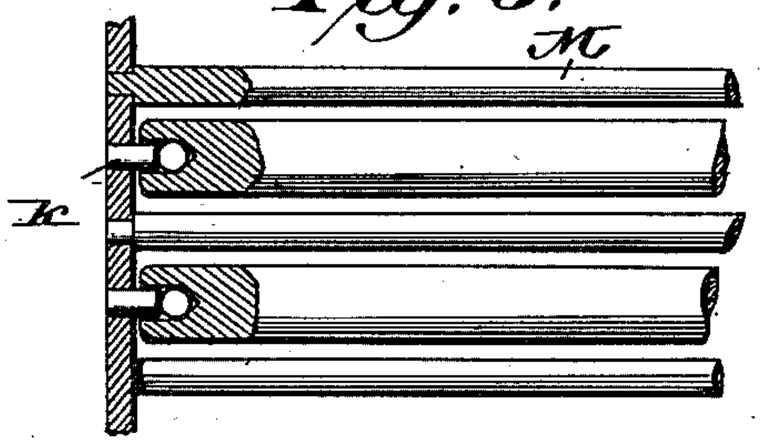


Fig. 7.

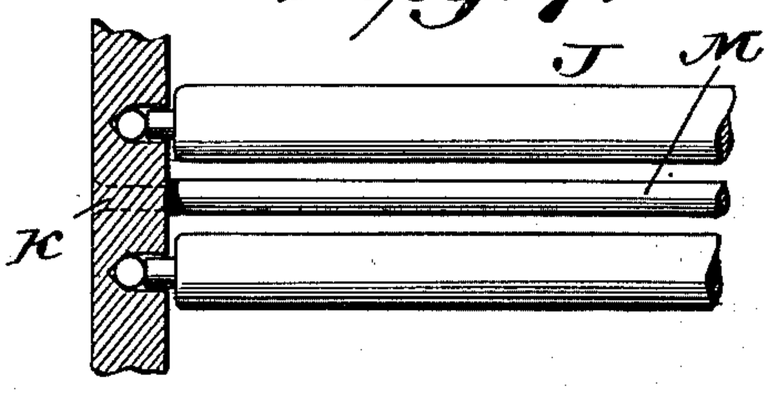


Fig. 8.

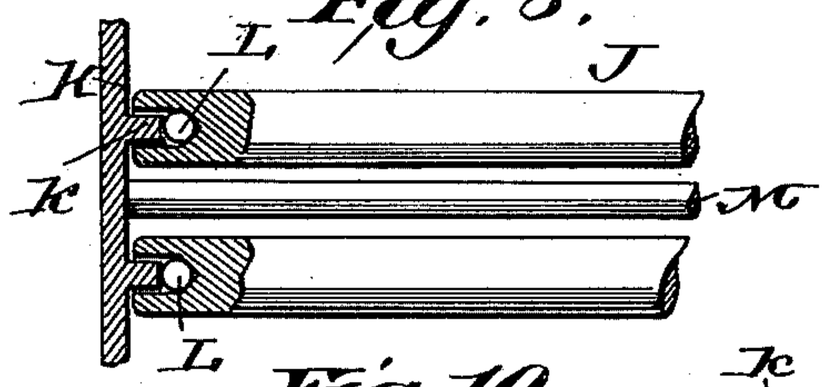


Fig. 9.

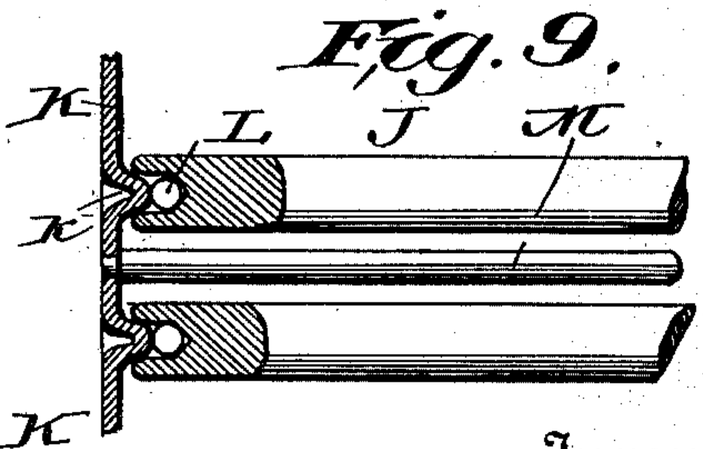
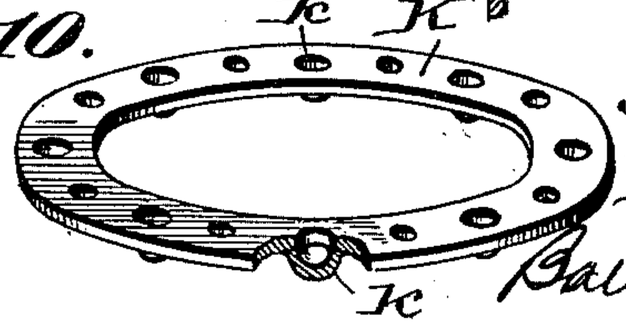


Fig. 10.



Witnesses
W. L. Spencer.
E. A. Bullock.

Inventor:
Samuel S. Eveland,
By his Attorneys,
Baldwin, Davidson & Wright

UNITED STATES PATENT OFFICE.

SAMUEL S. EVELAND, OF PHILADELPHIA, PENNSYLVANIA.

ANTIFRICTION-BEARING.

SPECIFICATION forming part of Letters Patent No. 670,951, dated April 2, 1901.

Application filed November 9, 1900. Serial No. 35,893. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL S. EVELAND, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Antifriction-Bearings, of which the following is a specification.

My invention relates particularly to roller-bearings of the class in which rollers are interposed between a shaft and a hub or casing surrounding the shaft. As an example of this class of roller-bearings I would refer to Letters Patent of the United States No. 602,047, dated April 5, 1898, granted to Charles B. Hobron. This patent shows a roller-bearing in which rollers of uniform diameter from end to end are interposed between a shaft or axle-arm and a hub or casing. The rollers are disposed at equal distances apart around the shaft and are held in place at opposite ends by roller-supports, consisting of rings provided with laterally-projecting lugs having sockets between them into which the ends of the rollers project. In each roller-socket a ball is arranged at the end of each roller and axially in line with the roller. The Hobron roller-bearing thus constructed has been extensively used with success, but in the practice of the invention I have discovered that for some kinds of roller-bearings the construction may be improved in such manner that the rollers may be arranged much closer together than in the prior construction, and the tendency for the rollers to drop out from their sockets after long use may be avoided. I have found also that the Hobron construction may be so modified as to materially increase the length of the rollers.

According to my present invention, instead of arranging the ends of the rollers in sockets and causing their peripheries to bear upon the walls of the sockets I in one form of my invention form recesses in the ends of the rollers into which project studs carried by rings adapted to surround a shaft or journal. Between the inner ends of the studs and the inner ends of the sockets I interpose balls which receive end thrust to relieve undue wear on the ends of the rollers and prevent friction which would otherwise occur if the ends of the rollers came in direct contact with plane or frictionless surfaces. A single ball is arranged in each socket and is disposed in the axial line of the roller and in the axial line of the stud which projects into the recess. Instead of forming recesses in the ends of the rollers and placing the studs on rings or annular supports recesses may be formed in the annular supports and studs formed on the rollers, a single ball being arranged in each recess, as before. By these arrangements the rollers may be placed much more closely together than in the prior construction and the tendency for the rollers to drop out, incident to the wear on the lugs between the rollers in the Hobron device, is avoided. The annular supports may be made quite thin and the rollers may extend close to the inner faces of the supports, and thus the rollers may be made materially longer than they were in the prior construction, where they projected between lugs which extended from a thick annular backing.

Other features of the invention, together with the details of construction, will be hereinafter more fully explained.

In the accompanying drawings, Figure 1 shows a longitudinal central section through a roller-bearing constructed in accordance with my invention. In this instance I have shown tapered rollers arranged within an axle-box. Fig. 2 shows a longitudinal central section through a shaft casing or bearing embodying my improvements, the shaft being shown in elevation and partly broken away. Fig. 3 shows a transverse section on the line 3 3 of Fig. 2. Fig. 4 is a plan view of an end-thrust bearing embodying my improvements, some of the parts being shown in section the better to illustrate details of construction. Fig. 5 is a detail view, partly in section and partly in elevation, of an end-thrust bearing embodying my improvements, showing the manner in which a shaft is supported on the bearing. Fig. 6 is a detail view, partly in elevation and partly in section, illustrating the construction of one form of my improved antifriction-bearing. Fig. 7 is a similar view illustrating a modification. Fig. 8 is a similar view illustrating how the bearing-studs may be cast integrally with the annular support. Fig. 9 indicates how the support may be made of sheet metal with the

bearing-studs struck up therefrom. Fig. 10 is a perspective view of a supporting-ring, such as shown in Fig. 9, parts being broken away in order to illustrate details of construction. Fig. 11 is a perspective view, with parts broken away, of a roller-bearing embodying my improvements, illustrating particularly how the rollers may be arranged close together.

In Fig. 1, A indicates part of an axle, and B the axle-arm, which is in this instance tapered. A collar C is formed between the axle and the axle-arm, and the outer end of the axle-arm is screw-threaded at *b* to receive a nut D. On the inner end of the axle-arm is secured in any suitable way a tapered collar E, and a similar tapered collar F is secured in any suitable way to the outer end of the axle-arm. Inasmuch as the axle-arm B is tapered and the collars E and F are likewise tapered, both interiorly and exteriorly, they may be secured in place by being simply driven home, the tapered axle and the tapered openings in the collars being suitably shaped to insure the proper positioning of the collars on the arm. The axle-box or journal-casing is made up of two main parts G and H. The part G has an enlarged end or head *g*, having a portion *g'* surrounding the collar C on the axle, but it is not in frictional contact therewith. There is a space between the inside of the enlarged portion of the casing-section G and the outer wall of the collar E, the inner wall g^2 being tapered to accommodate the taper rollers, hereinafter referred to. The inner end of the head *g* is provided with spikes g^3, which enter the wooden part of the hub, and the part g^4, which is of reduced diameter, extends to the inner vertical wall *h* of the other section H of the casing. The portion g^4 of the section G surrounds a similar portion *h'* of the section H, and both portions g^4 and *h'* are out of contact with the axle-arm. The section H of the casing is shaped somewhat similarly to the section E, but at its outer end it is provided with screw-threads h^2 on the inside to receive a nut I. Between the collars E and F and the enlarged ends of the casing-sections G and H are interposed tapered rollers J. These rollers conform to the tapered walls of the collars and the casing-sections, but are so arranged that the casing-sections may be supported on the rollers and may revolve around them, or the rollers, with the casing-sections, may revolve around the collars E and F. Each roller is formed at each end with a recess or socket *j*, into which projects a stud *k*, attached to an annular support K. Each annular support K carries a number of studs *k*, corresponding with the number of rollers, and the studs are suitably inclined to correspond with the inclination of the tapered rollers. The inner ends of the sockets are preferably tapered, as indicated, and between the inner ends of the studs are interposed balls L. These are arranged in the axial line of the rollers and serve to hold the rollers in alinement and to take end thrust and prevent end wear. The roller-supports K are held together and held at a suitable distance apart by means of stay-rods M, which have reduced ends *m*, secured in any suitable way to the roller-supports, the construction being such as not only to hold the roller-supports together, but also to hold them at a suitable distance apart. Any suitable number of stay-rods may be employed. There may be one between each two rollers, or only three may be necessary. Where a smaller number of stay-rods are used, the number of rollers may be correspondingly increased. Preferably the rollers are mounted in their supports, and the stay-rods are secured before the rollers are placed on the axle. The rollers and roller-supports at opposite ends of the axle-arm are of substantially the same construction and operate in substantially the same way. It will readily be understood from an inspection of the drawings how the parts of the bearing are assembled. By adjusting the nuts D and I the rollers may be moved in their tapered sockets to take up wear.

In Fig. 2 I have shown my improvements applied to a shaft-bearing. The casing N may be of any suitable usual construction, being made in sections, as indicated, and having a central bore to receive the shaft O and also to accommodate rollers P. In this instance the rollers are of uniform diameter from end to end, and they are provided with recesses *j* at their opposite ends, in which are arranged balls L. The supports K are provided with laterally-projecting studs *k*, which enter the recesses in the rollers. The roller-supports are held together and held a suitable distance apart by stay-rods M. Preferably washers Q, of leather, fiber, or other suitable material, are interposed between the outer sides of the supports and the ends of the casing. The rollers bear on the shaft O from end to end and their ends come close to the inner surfaces of the roller-supports, not, however, being in frictional contact therewith, as the balls L prevent the rollers from moving endwise into contact with the supports, and thus hold the rollers in proper alinement and prevent unnecessary friction.

In Figs. 2 and 3 I have shown a stay-rod M interposed between each two rollers, but the number of rollers may be increased by omitting some of the stay-rods, as indicated in Fig. 11, where only three stay-rods are employed, and the rollers are arranged close together, side by side.

It will be observed that a single ball is employed in each socket or recess, and that it bears on the roller in the axial line thereof and on the stud in its axial line. In this way the sockets or recesses, as well as the studs, may be made small in diameter, and there is no weight or friction on the sides of the studs which would tend to bend or wear them. The weight is supported by the rollers them-

selves, and it is distributed along their surfaces from end to end, the frictional contact and the strain due to the weight being borne by the rollers which transmit the weight from the shaft to the casing or from the casing to the shaft. The studs only receive end thrust and are of sufficient strength therefor, even though of small diameter. It will thus be seen that the construction differs from those in which a plurality of balls are arranged around a stud within a recess in the rollers, or where a plurality of balls are arranged around a stud projecting from the ends of the rollers.

While I have called the rings K "roller-supports," they do not support the rollers in the sense that they take the most weight or strain. They support the rollers when the bearing is removed from the casing, and they also serve to hold the rollers in proper alinement, and in this sense they are roller-supports.

In Figs. 4 and 5 I have shown how my improvements may be employed in an end-thrust bearing. R indicates a vertical shaft provided with a projection *r* at its lower end of reduced diameter. S indicates a housing for the bearing. The improved bearing proper is shown in Fig. 4. It comprises two rings T and T', connected by stay-rods *t*, which are shouldered, as shown, so as to hold the rings concentrically and rigidly together. The rollers U are tapered and provided at opposite ends with recesses, in each of which a ball L is arranged. Studs *t'* project from the rings and enter the recesses in the rollers. A bearing thus constructed may be arranged in the housing and may bear upon the tapered end of the shaft R; but preferably I arrange on each side of the rollers a hard-steel washer V, which has a tapered or inclined surface on one side corresponding with the form of the rollers. The upper washer V (shown in Fig. 5) may be secured to the shaft R, but this is not necessary, as frictional contact between the washer and the shaft will be sufficient to hold them together, inasmuch as the rollers so relieve friction on the opposite side of the washer that the washer will move easily thereon, and the shaft will move with the washer rather than move relatively to the washer. The lower washer V rests in the bottom of the socket of the housing and does not tend to move therein, as the rollers readily move over its upper surface.

Fig. 6 shows somewhat more clearly than the other figures how the rollers may be constructed and how the supports may be arranged and connected.

Fig. 7 shows a modification in which, instead of forming recesses in the ends of the rollers, recesses are formed in the supports, and studs are formed on the ends of the rollers entering the supports. In Fig. 6 the studs *k* are shown as made separate from the supports and inserted therein.

In Fig. 8 I have indicated how the studs *k* may be cast integrally with the supports, while in Fig. 9 I have shown how the supports K may be made of sheet metal and the studs *k* stamped or struck up therefrom. The same arrangement is indicated more fully in Fig. 10. In every instance which I have indicated it will be found that provision is made for employing rollers of maximum length which receive all the weight without subjecting the supports to undue strain, and I have indicated how a maximum number of rollers may be employed, while yet employing supports of sufficient strength to sustain any strain to which they may be subjected.

My improvements may be embodied in roller-bearings of other forms than those illustrated; but the different kinds of roller-bearing illustrated show the ways now best known to me of carrying out my invention. I have devised other ways, and therefore do not wish to be limited to the particular arrangements shown.

What I claim as my invention is—

1. A roller-bearing comprising a series of rollers, supports at opposite ends of the rollers, studs projecting into recesses arranged in the axial line of the rollers, and a single ball in each recess arranged in the axial line of the roller between the end of the recess and the end of the stud.

2. A roller-bearing comprising a series of rollers, each of which has a single recess at each end, stud-carrying rings at opposite ends of the rollers, and a single ball arranged in each recess axially in line with each roller and between the inner end of each stud and the inner end of each recess.

3. A roller-bearing comprising a stud-carrying ring, with the studs formed integrally therewith, a series of rollers each of which is provided with a single recess at each end, and a single ball in each recess interposed between the inner end of the recess and the inner end of each stud.

In testimony whereof I have hereunto subscribed my name.

SAMUEL S. EVELAND.

Witnesses:
WINFIELD S. SEARD,
A. AUSTIN BUZBY.