(No Model.) 2 Sheets—Sheet 1.

G. G. BRANDENBURG.

BALL BEARING MECHANISM.

No. 556,249. Patented Mar. 10, 1896.

Fig. 1.

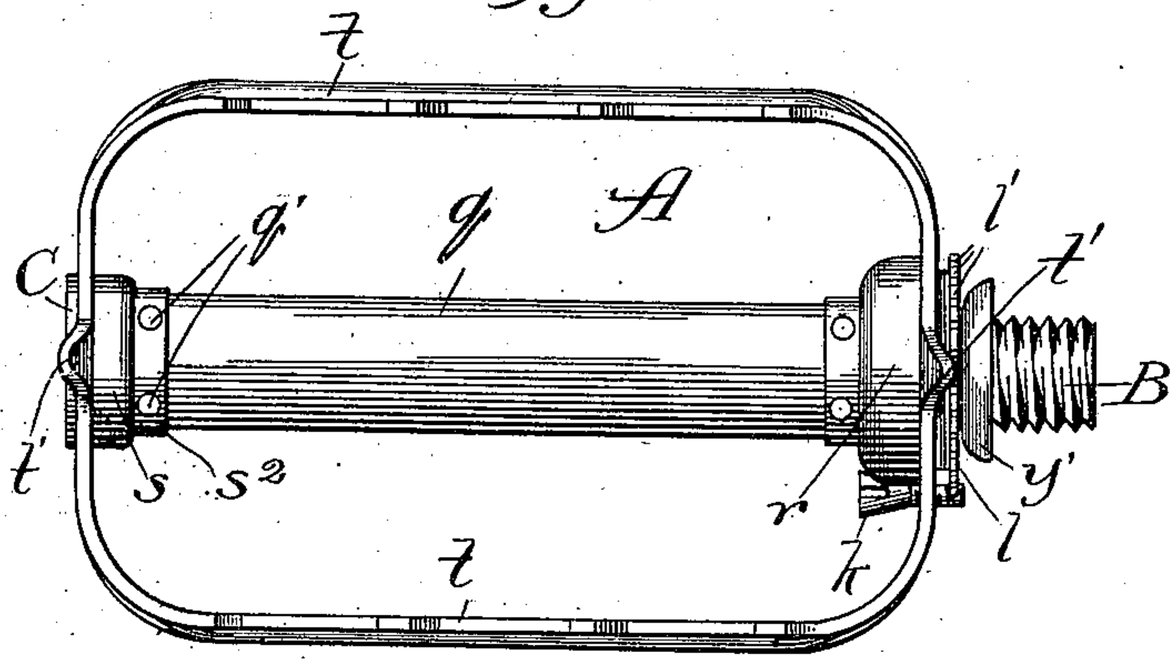

Fig. 2.

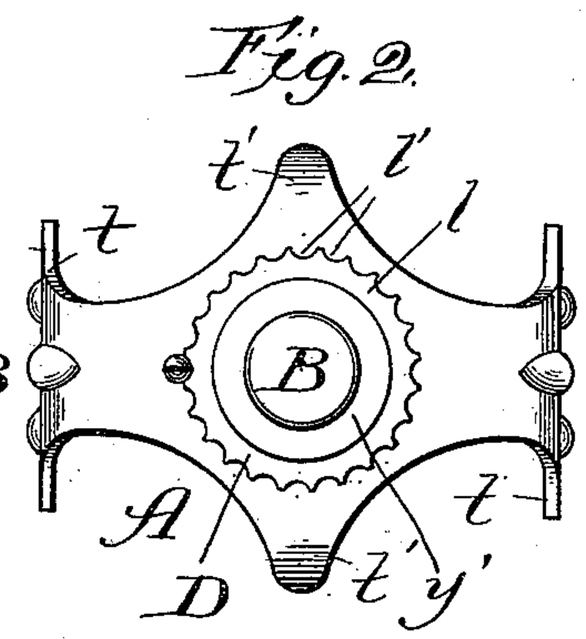

Fig. 3.

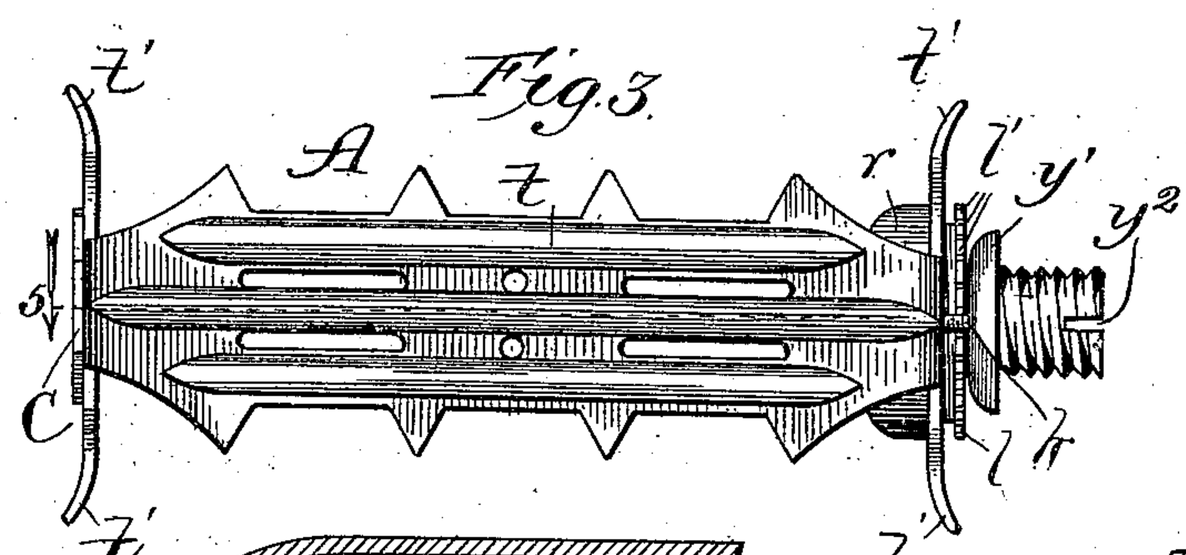

Fig. 4.

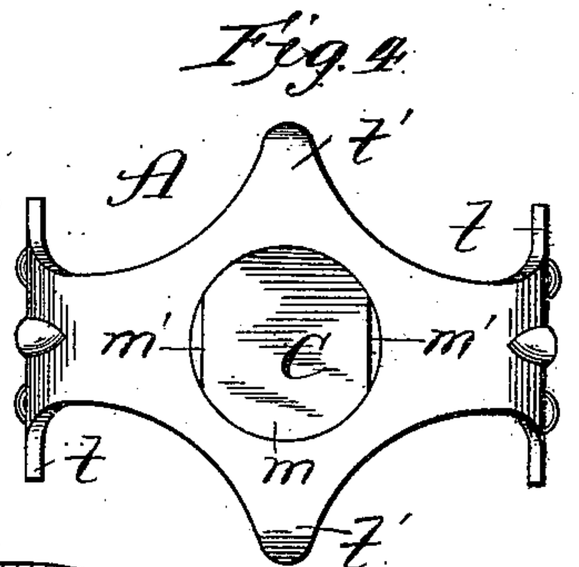

Fig. 5.

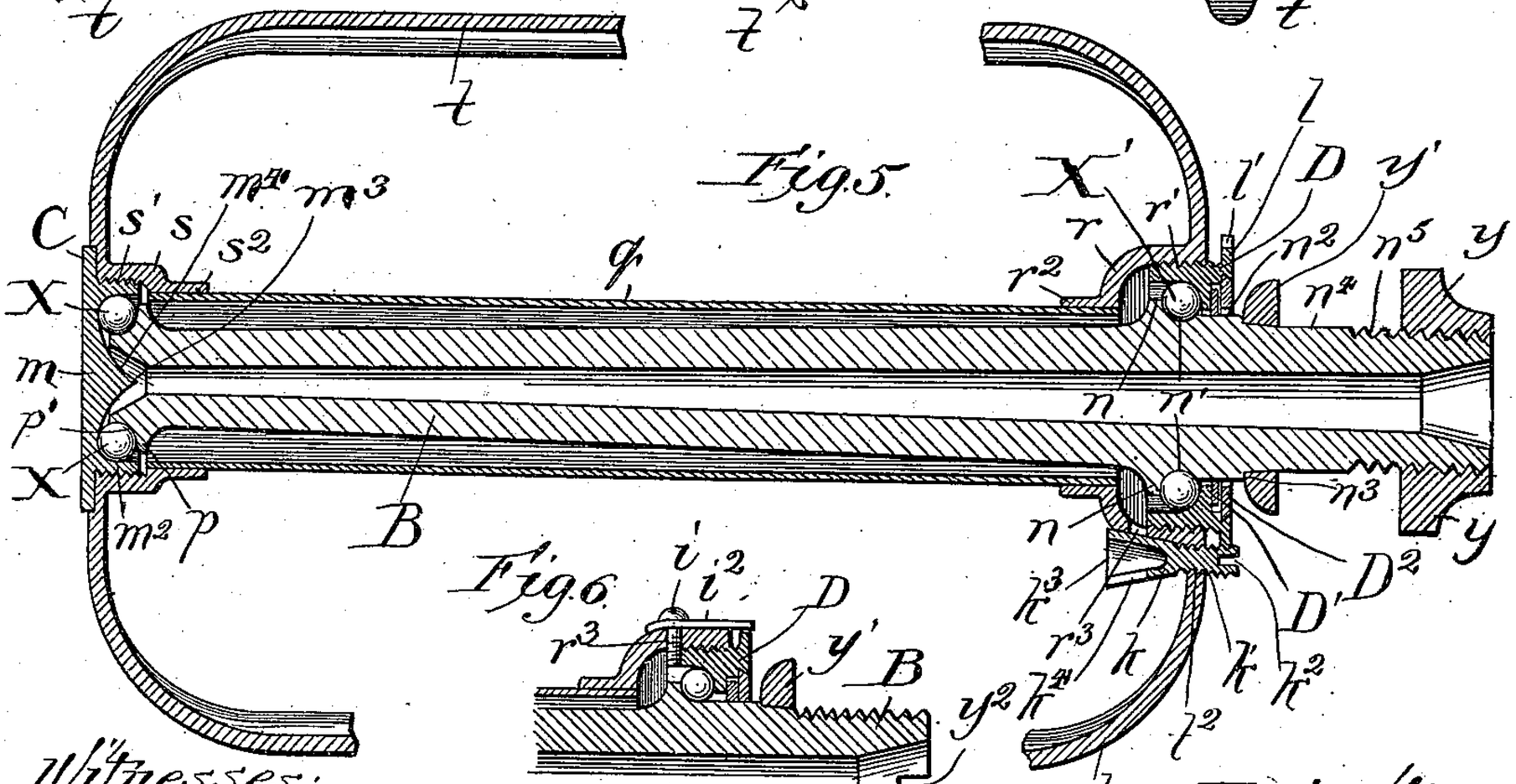

Fig. 6.

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(No Model.) 2 Sheets—Sheet 2.

G. G. BRANDENBURG.

BALL BEARING MECHANISM.

No. 556,249. Patented Mar. 10, 1896.

Fig. 7.

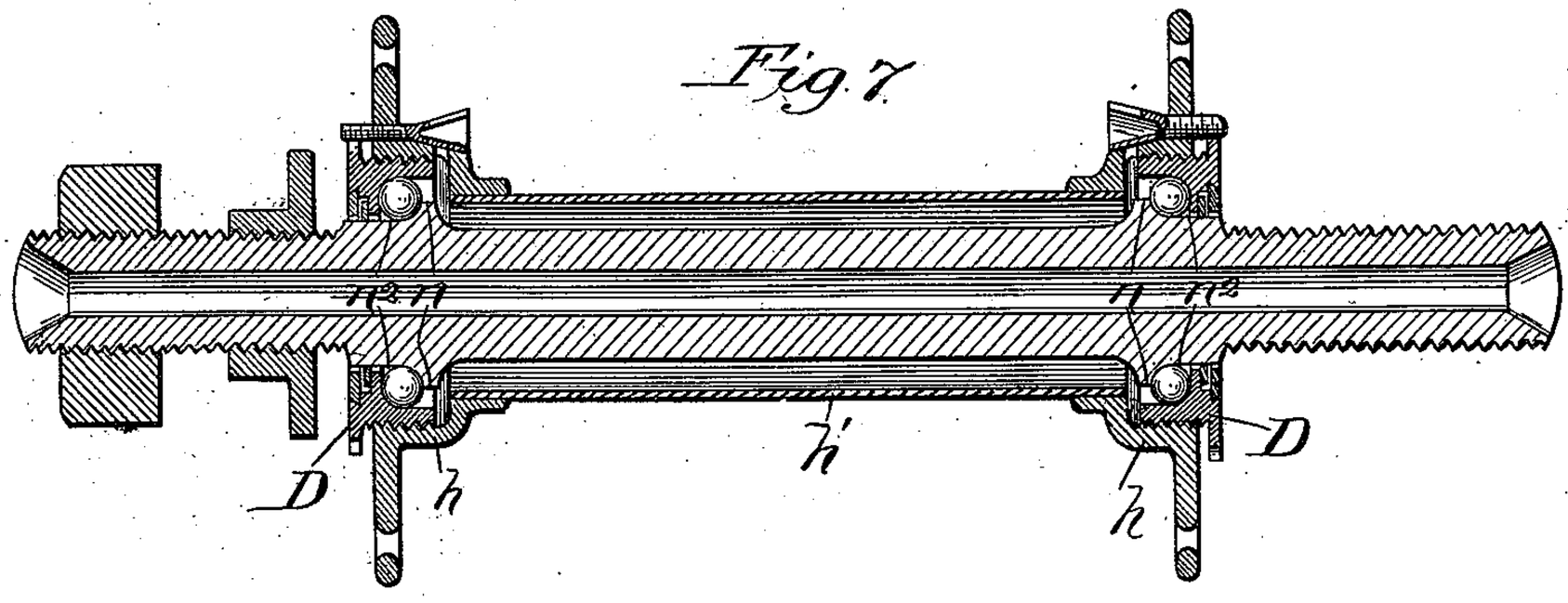


Fig. 8.

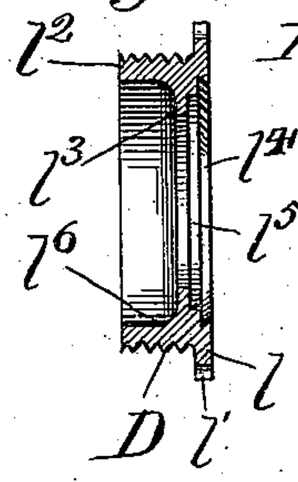


Fig. 9.

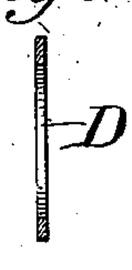


Fig. 10.

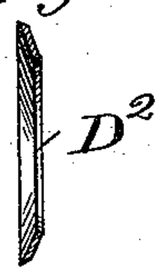


Fig. 11.

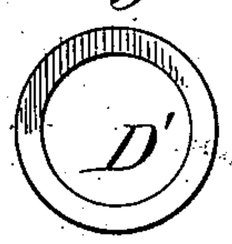


Fig. 12.

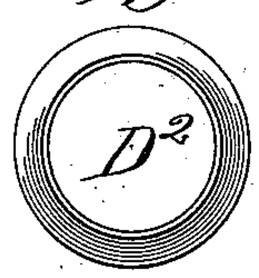


Fig. 13.

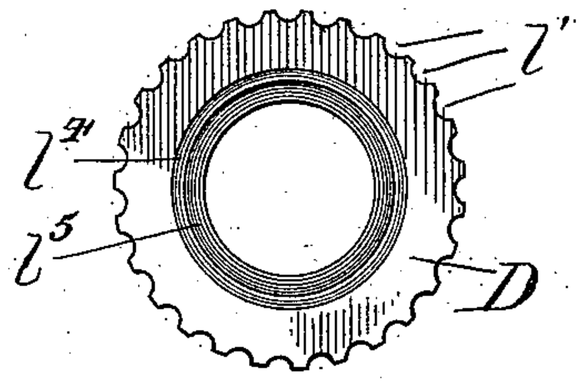
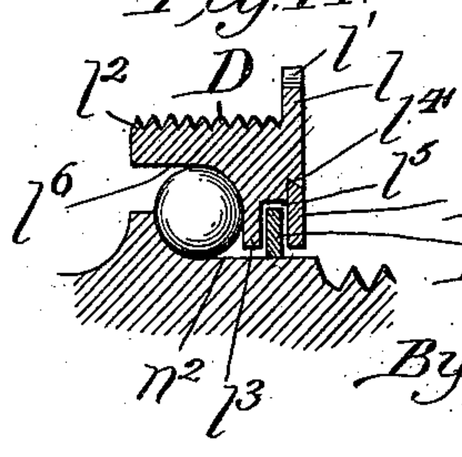


Fig. 14.



Witnesses:
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Inventor.
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UNITED STATES PATENT OFFICE.

GEORGE G. BRANDENBURG, OF CHICAGO, ILLINOIS.

BALL-BEARING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 556,249, dated March 10, 1896.

Application filed January 21, 1895. Serial No. 535,613. (No model.)

To all whom it may concern:

Be it known that I, GEORGE G. BRANDENBURG, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Ball-Bearing Mechanism, of which the following is a specification.

My invention relates to improvements in ball-bearings for vehicles generally, though more especially for bicycles.

My object is to provide a ball-bearing construction which shall render the parts readily adjustable to take up any wear in use, and which shall house the bearing-surfaces effectively against access thereto of dust and afford altogether a particularly light, strong, durable, and effective antifriction-bearing for its purpose.

To the above ends my invention consists in the general construction of my improvements; and it also consists in details of construction and combinations of parts, all as hereinafter set forth and claimed.

In the drawings, Figure 1 is a bicycle-pedal involving my improvements; Fig. 2, an inner end view, Fig. 3 a side view, Fig. 4 an outer end view, and Fig. 5 an enlarged broken longitudinal section, of the same; Fig. 6, a broken sectional view of the inner end portion of a pedal, showing a modified form of nut-lock; Fig. 7, a bicycle-wheel hub and axle provided with my improvements; Figs. 8 and 13, sectional and elevational views, respectively, of a bearing-nut; Figs. 9 and 11, sectional and elevational views, respectively, of a dust-washer; Figs. 10 and 12, sectional and elevational views, respectively, of a dished ring which when pressed into position forms a washer-retaining collar; and Fig. 14, an enlarged broken sectional view of a detail of the construction.

A is a foot-piece or pedal-frame, consisting of a loop of soft steel or other comparatively soft metal, formed with the serrated side bars t, end stop projections t', and inward-projecting cup-shaped outer end flange, s, and inner end flange, r. The cups or flanges s r are provided at their outer end portions with the internal screw-threads, forming threaded sockets s' r', and terminate at their inner end portions in the cylindrical projections s^2 r^2. Extending at opposite ends into the cylindrical projections s^2 r^2 and fastened thereto, preferably with rivets q', is a housing-cylinder q. The cups s r and cylinder q form the hub of the pedal.

B is a shaft or crank pin, which for the sake of lightness is made hollow and tapering, as shown. At its outer end portion the crank-pin is formed with a cone-bearing p, having an annular, preferably concave, ball-bearing surface p'. The inner end portion of the crank-pin is formed with a cone-bearing n, having an annular, preferably socketed, ball-bearing surface n', a straight cylindrical surface n^2, shoulder n^3, reduced and slightly-tapering portion n^4 and threaded end portion n^5.

C is a ball-bearing cup having a flange m provided, preferably, with straight edges m', a threaded part m^2 to engage the threaded socket s' of the pedal-frame, and a central conical projection m^3 surrounded by an annular ball-bearing recess m^4. The end of the hollow bearing-pin B is recessed to fit loosely over the projection m^3.

D is a bearing-nut having a flange l formed with a peripheral ratchet l', a cylindrical part l^2 threaded on its outer side to enter and engage the threaded socket r', and an inwardly-projecting annular stop or shoulder l^3. In the face of the flange l is an annular shallow dovetailed recess l^4, and between the recess l^4 and shoulder l^3 is an annular recess l^5 of less diameter than the recess l^4. The inner circumference of the part l^2 with the annular shoulder l^3 form a concave ball-bearing surface l^6. Fitting loosely in the recess l^5 is a preferably metal dust-washer D', which is held in place by means of a washer-retaining collar D^2.

As I prefer to construct the parts, the washer D' is placed in the recess l^5, and a collar D^2 is provided having a chamfered edge and of dished shape, as shown in Figs. 10 and 12, and which, while dished, is just capable of entering the recess l^4. Pressure is then exerted against the dished collar to flatten it out and cause it to expand at its chamfered periphery to fill out the dovetailed recess.

In adjusting the parts together the cup C is first screwed into place and the desired number of balls X is dropped into the housing-cylinder q. The crank-pin is then passed into the end r of the pedal-frame, and when

pressed in the direction of the bearing-cup the conical projection m^3 of the latter will operate to spread and position the balls so that they will lie between the bearing-surfaces $p' m^2$. The bearing-nut D is then passed over the end of the bearing-pin, filled with the balls X', and then screwed into the threaded socket r'. The dust-washer D' fits closely over the surface n^2 of the crank-pin B, and also fits closely in the socket afforded by the recess l^5 and collar D^2. The arrangement of the parts is such that the joints between the washer and surface n^2 and between the washer and the side walls of the socket in which it is held are dust-tight, while permitting free rotation of the washer in the socket.

In practice the diameter of the base of the socket l^5 is materially greater than the diameter of the dust-washer D', which fits therein. The dust-washer is thus allowed to play in the socket to a limited extent in the plane at right angles to the shaft. Any wear upon the adjacent balls or bearings will cause the washer to shift in the socket l^5 to an extent equal to such wear, so that the weight will always be upon the bearings and never upon the washer. This is a very important feature of my construction, because it enables me to provide and maintain a dust-proof joint about the shaft with a metallic washer which will not be affected by wear upon the shaft-bearings.

It has been usual hitherto to provide dust-washers of leather or other flexible material sprung into annular sockets on the bearing-nut crank pin or shaft, and it is found in practice that such washers, from the very fact of their being sprung into their seats, are loose and do not produce dust-tight joints. When saturated with oil, they swell and bind more or less against the bearing-surfaces, producing material friction, and they also tend to hold dust and grind it against the bearing-surfaces to the injury of the latter.

My improved washer is not only dust-excluding, but as it may revolve freely in its retaining-socket friction is reduced practically to the minimum.

Tightening of the bearing-nut D presses the balls X' into the socket-bearing n' and the balls X into the bearing-cup C, so that there will be no looseness of the parts. In the flange r, at the location shown, is an oiling-opening r^3, through which oil may be poured to lubricate all the bearing-surfaces. Adjacent to the opening r^3 is a threaded opening t^2 through the frame A for a screw k. The screw k has a threaded shank k', provided in one end with a socket k^2 to receive a screw-driver, and its opposite end portion is flared and recessed to form a cup k^3. In the side of the cup portion k^3 is a slot k^4. The screw k performs the offices of a lock for the bearing-nut D and a cover for the oiling-opening r^3. When the nut D is tightened, the screw k may be turned in the threaded opening t^2 to draw it into one of the peripheral sockets of the ratchet l', whereby the nut is locked against turning in the threaded socket r'. When it is desired to oil the bearings, the screw may be turned to cause the slot k^4 to register with the opening r^3. The spout of an oil-can may then be inserted into the cup k^3 and the oil poured without danger of its being spilled. After pouring in the oil, as described, the screw should be turned to move the slot k^4 out of register with the opening r^3, whereby the side of the cup portion will close said opening to prevent egress of oil and ingress of dust. The pedal is secured to its crank by passing the pin B through an opening therein, the crank being confined between the nut y and jamb-washer y' in the usual way.

The pedal-frame A should be of comparatively soft steel and more or less springy, so that under a severe blow in use it will yield or bend. It is found that such frames are much more durable than those of hard steel. The crank-pin B, bearing-cup C, and bearing-nut D should be of very hard metal—such as tool-steel—to resist wear at the ball-bearings, and my construction, which permits the frame to be of soft steel or the like and the bearings to be of tool-steel or the like, contributes materially to the durability and anti-friction properties of the pedal.

In the modified construction shown in Fig. 6 the oiling-opening r^3 is threaded to receive a plug in the form of a screw i, which screw also operates to tighten a spring-finger i', which by engaging a socket of the ratchet l on the bearing-nut D locks the latter against independent rotation. To unlock the nut D the screw may be loosened and the finger turned to one side, and to oil the bearings the screw must be withdrawn.

Fig. 7 shows my improvements applied to the hub and shaft or axle of a bicycle-wheel. On the axle are two bearing-cones n, with adjacent bearing-surfaces n^2, constructed substantially like the similarly-designated parts on the crank-pin described. Two bearing-nuts D, constructed in every way like those described, are employed, and they are screwed into cups or flanges h, forming part of the wheel-hub and corresponding in construction with the flange or cup r described. At opposite ends entering the flanges h and riveted thereto is a housing-cylinder h', corresponding with the cylinder q described.

In Fig. 5 the end portion of the crank-pin B where it is to pass through the crank is shown somewhat longer than in Figs. 1, 3, and 6, so that it may be fastened to the crank by means of the nut y. The other form is to be screwed into a threaded opening in a crank, a slot y^2 being provided for the insertion of a screw-driver. The two forms shown meet the requirements of the constructions of cranks provided by different bicycle-manufacturers.

While I prefer to construct my improved ball-bearing mechanism in every way as

shown and described, it may be modified in the matter of details without departing from the spirit of my invention as defined by the claims.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a ball-bearing, the combination with the shaft and hub surrounding the shaft and the inner bearing-surface for the balls upon the shaft, an outer bearing comprising a nut having screw-threads to engage screw-threads in the hub and provided with a peripheral ratchet, a threaded screw-hole and an oiling-opening in the hub, and a screw working in said screw-hole across the said oiling-opening and engaging the said ratchet, whereby it closes the said oiling-opening and locks the said nut, substantially as and for the purpose set forth.

2. In a ball-bearing, in combination with the shaft and hub surrounding the shaft and the inner bearing-surface for the balls upon the shaft, an outer bearing comprising a nut having screw-threads to engage screw-threads in the hub and provided with a peripheral ratchet, a threaded screw-hole and an oiling-opening in the hub, a screw k having a hollow flaring end k^3 and slot k^4, the screw passing through the said screw-hole to engage the said ratchet and lock the nut and extending across the oiling-opening, the screw being operative to register at its slot k^4 with the said oiling-opening, substantially as and for the purpose described.

3. In a ball-bearing, the combination with the shaft provided with the inner bearing-surface for the balls, of a hub loosely surrounding the shaft and provided with an end socket, an adjustable nut in the said socket, forming an outer bearing for the balls, and provided with an inner circumferential recess, a metallic dust-washer fitting closely upon the shaft and extending loosely into said recess and of less diameter than the recess to have play therein in the direction at right angles to the shaft, a dovetailed collar-receiving recess in the outer face of the nut, and a chamfered washer-retaining collar fastened in the said collar-receiving recess, substantially as and for the purpose set forth.

GEORGE G. BRANDENBURG.

In presence of—
M. J. FROST,
J. H. LEE.