(No Model.) 2 Sheets—Sheet 1.

G. BEEKMAN.

PROPELLING MECHANISM FOR CYCLES.

No. 578,387. Patented Mar. 9, 1897.

Fig. 1.

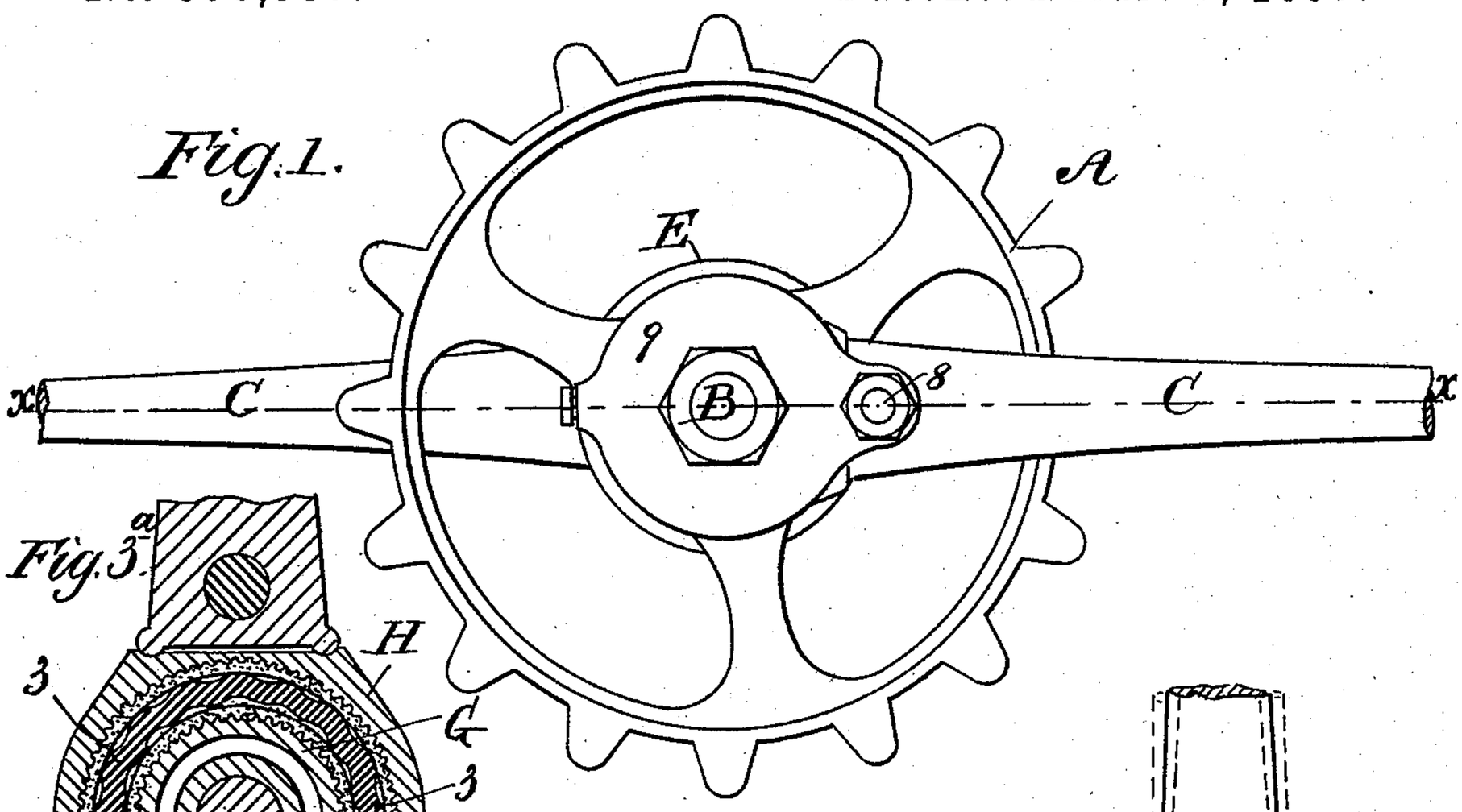


Fig. 3.

Fig. 2.

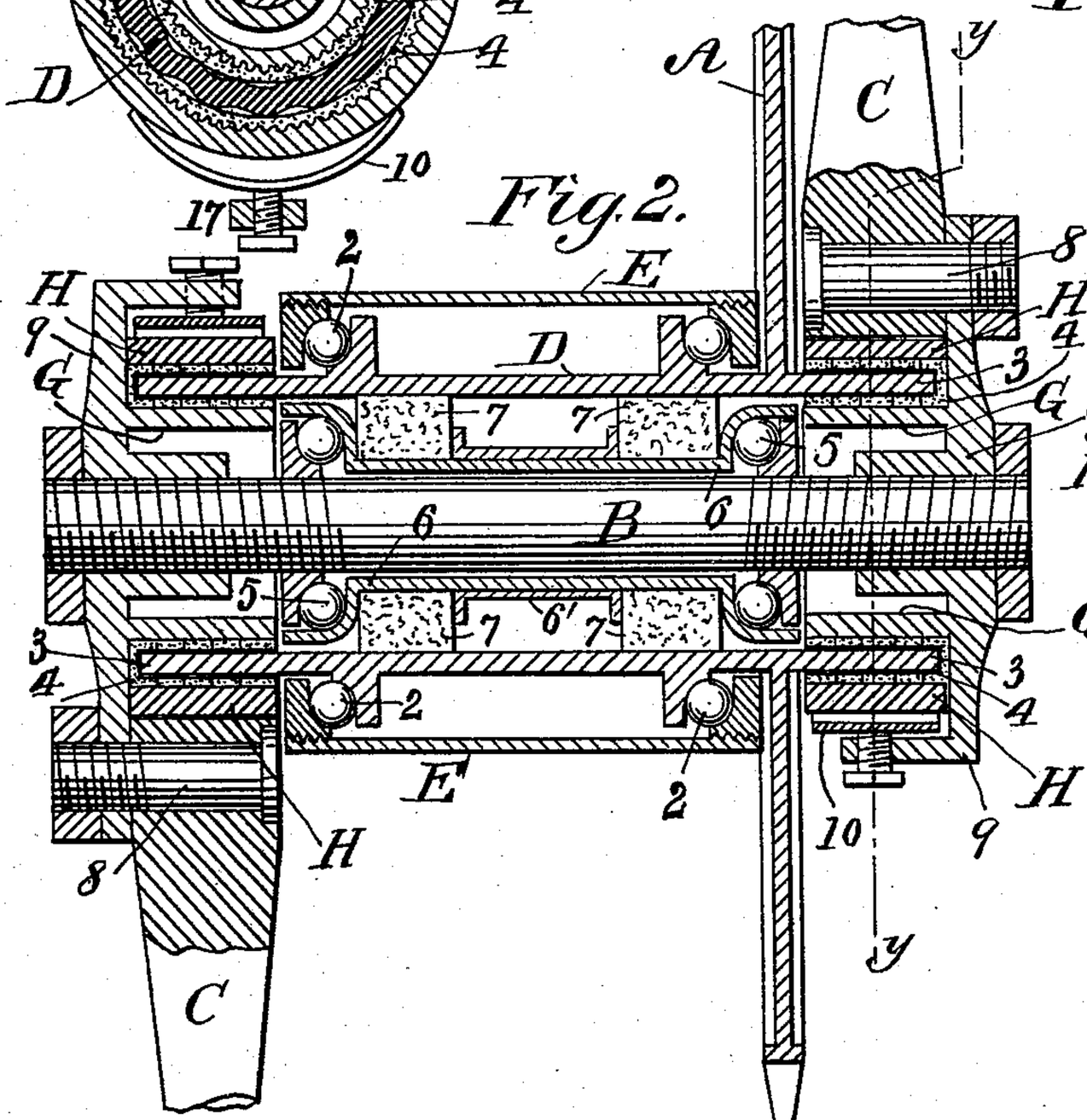
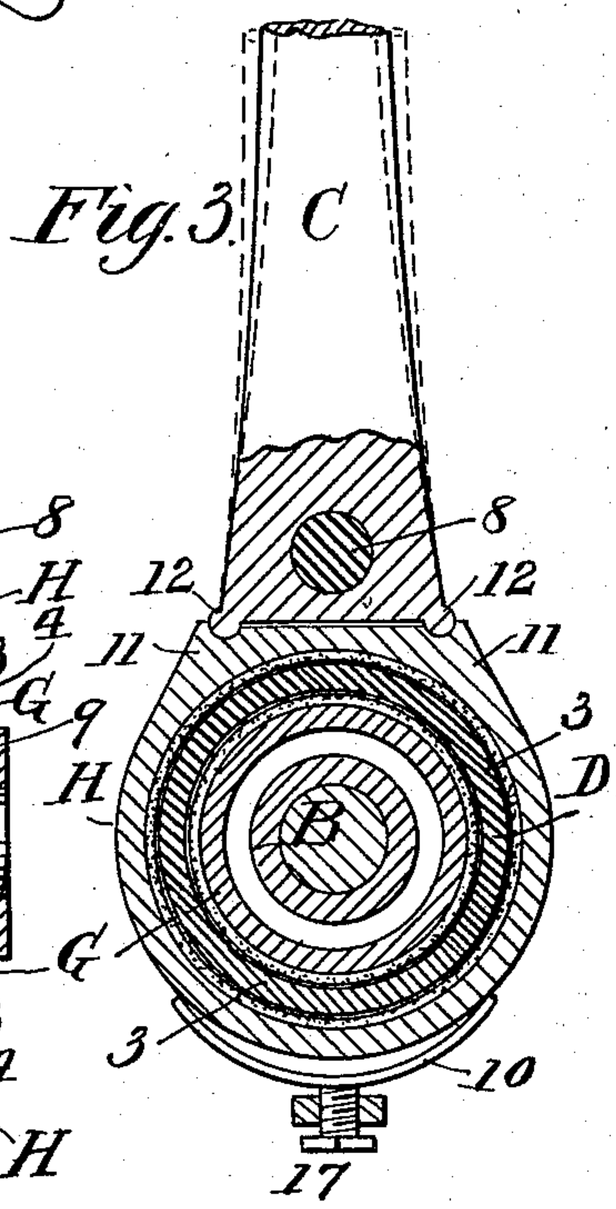


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

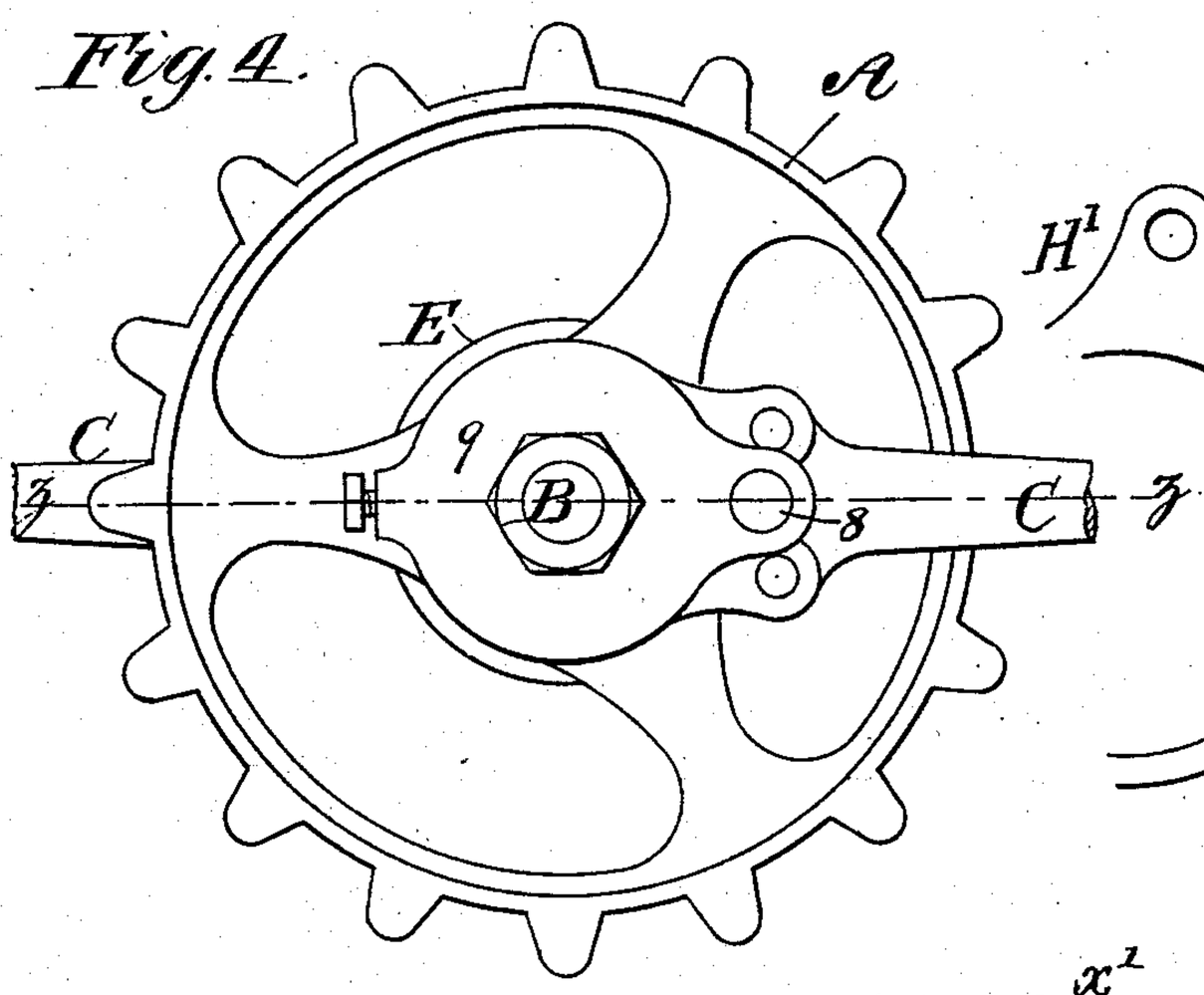


Fig. 7.

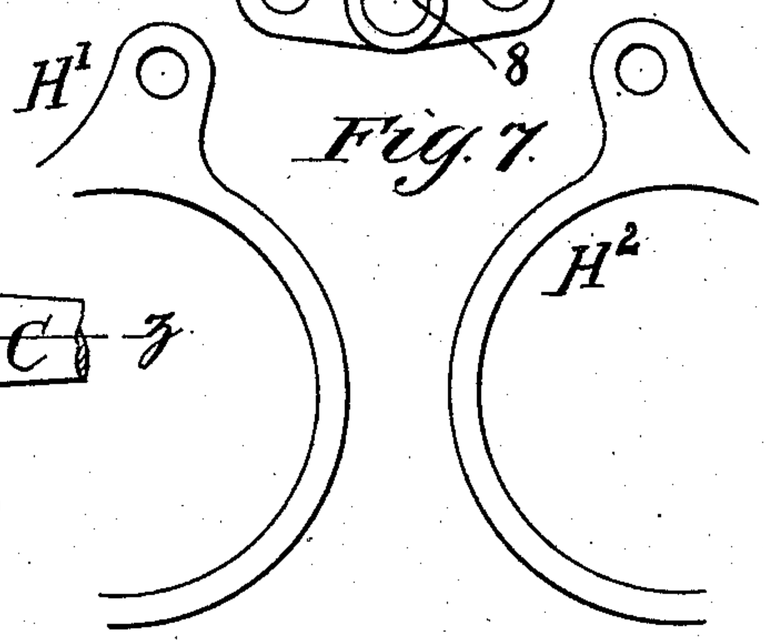


Fig. 5.

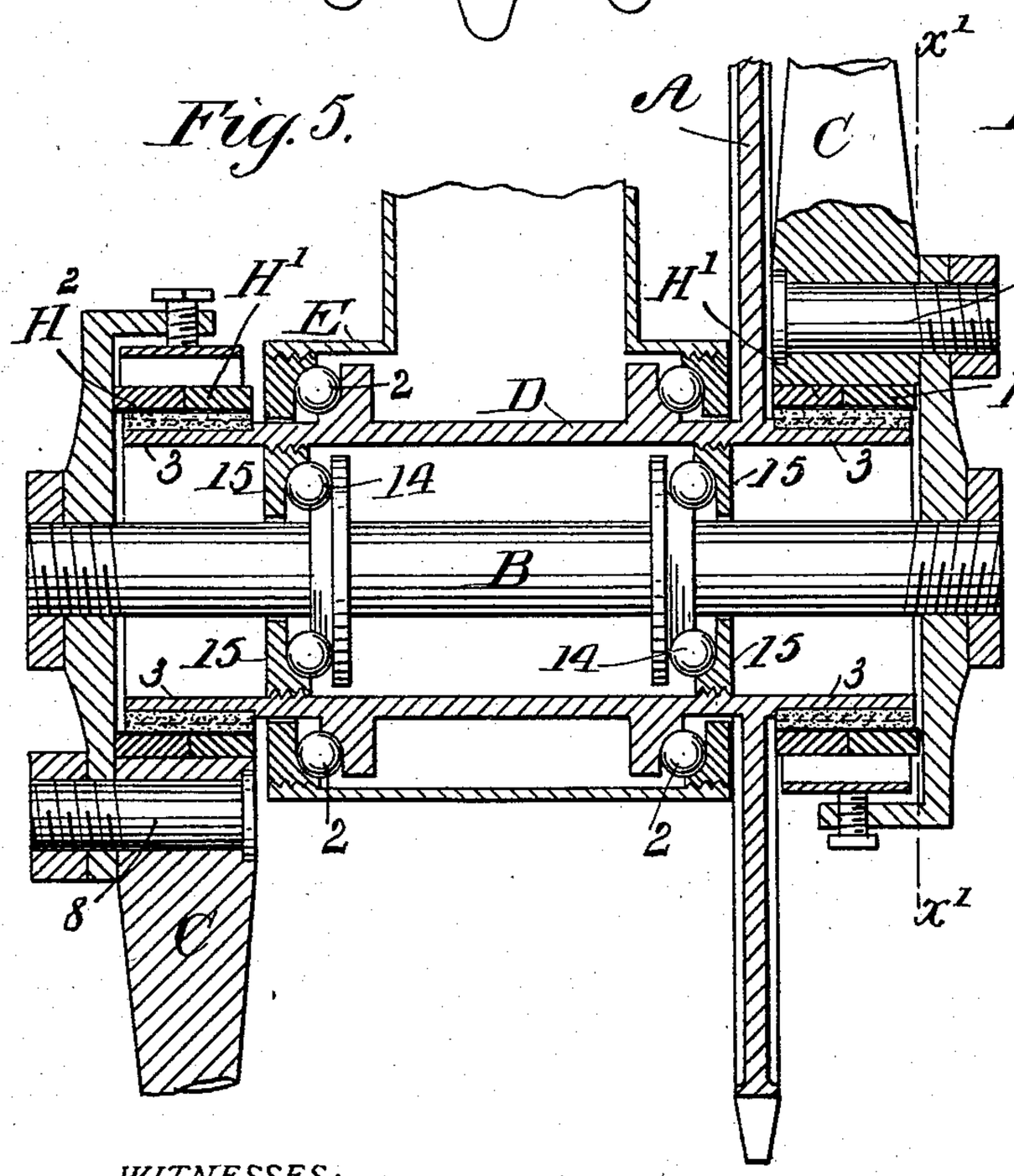
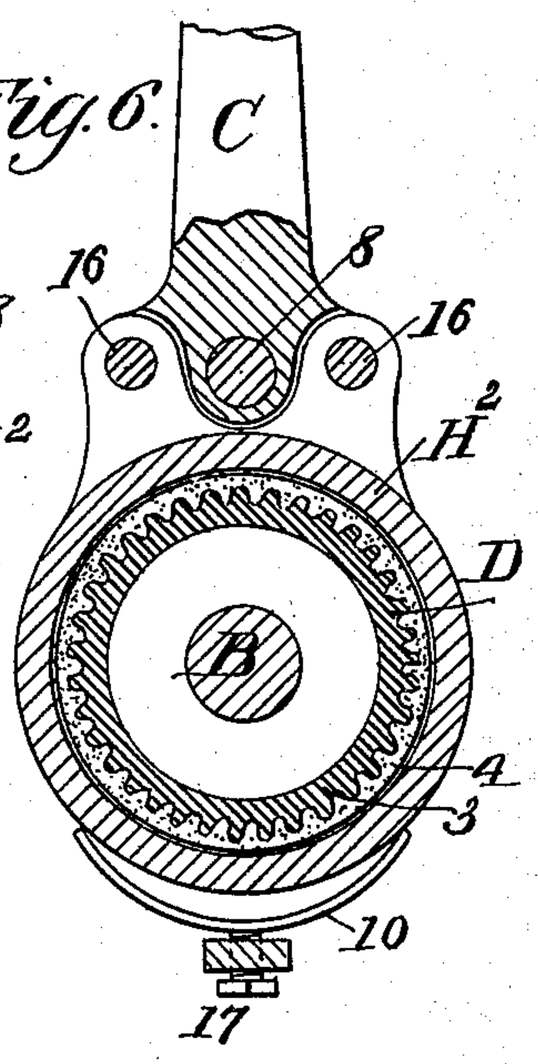


Fig. 6.



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UNITED STATES PATENT OFFICE.

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PROPELLING MECHANISM FOR CYCLES.

SPECIFICATION forming part of Letters Patent No. 578,387, dated March 9, 1897.

Application filed July 3, 1896. Serial No. 597,919. (No model.)

To all whom it may concern:

Be it known that I, GERARD BEEKMAN, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Propelling Mechanism for Cycles, of which the following is a specification.

My invention relates to means for changing the relative number of revolutions of the driving and driven parts of a bicycle by varying the intervals of pressure of the feet on the pedals, so as to engage a friction-clutch at each foot impulse and effect propulsion or retardation on the principle set forth in my Letters Patent Nos. 550,938 and 553,826.

My present invention consists in an improvement wherein the grip of the clutch is made more effectual or multiplied in force by certain novel features in the construction of its mechanism, as hereinafter described and claimed.

Referring to the accompanying drawings, in which like characters of reference indicate corresponding parts, Figure 1 is a side elevation of a sprocket-wheel and crank, illustrating a form of my invention in which the crank-shaft is diametrically movable. Fig. 2 is a horizontal section taken at *x x*, Fig. 1. Fig. 3 is a vertical section taken at *y y*, Fig. 2. Fig. 3^{A} is an alternative form of the vertical section in Fig. 3, showing the flange 3 internally and externally fluted. Fig. 4 is a side view showing a modification of my invention in which the crank-shaft is on a fixed axis of rotation. Fig. 5 is a horizontal section taken at *z z*, Fig. 4. Fig. 6 is a vertical section taken at *x' x'*, Fig. 5. Fig. 7 is a detail view showing the crank and clutch-collars in Fig. 6 detached.

A in the figures represents the sprocket-wheel of a cycle, which for purposes and meaning herein constitutes the "driven" part.

C C are the pedal-cranks, which, together with the outer grip members H H and the inner grip members G G, Figs. 1, 2, and 3, and together with the external grip members H' H^{2}, Figs. 4, 5, 6, and 7, for the purposes and meaning herein constitute the "driving" part.

The sprocket-wheel A in each figure is mounted on a cylindrical shaft D, rotating in ball-bearings 2 2 in the frame-hanger E. The cylindrical shaft D has projecting annular flanges 3 3 at each end which receive the grip of the clutch. These flanges may be smooth, Fig. 3, or to promote grip may be longitudinally fluted or corrugated, Fig. 3^{A}. For the purpose of noiselessness and the prevention of frictional heat the adjacent frictional surfaces of the flanges 3 3 and of the grip members G and H H' H^{2} are separated by a series of washers, of rawhide or leather 4, Fig. 2, or by a cylinder, of rawhide or leather 4, Figs. 5 and 6. This rawhide or leather separating member may have a toothed inner surface, as shown in Figs. 3^{A}, 5, and 6. The rawhide or leather facings are thus prevented from slipping on the driving grip members H, H', H^{2}, and G, while permitting a varying slip on the flanges 3 3. Any other suitable form of separating member may be used for this purpose.

The pedal-shaft B in Fig. 2 is journaled in ball-bearings 5 5. The cup-piece 6, which is mounted in elastic bushings 7 7, is carried within the cylindrical shaft D, the spool 6' retaining the elastic bushings in position.

There are two series of grip members in the driving part in Figs. 2 and 3, the inner one G of which is fixed to the shaft B, and the outer one of which constitutes a ring H, having sockets 11 11, impinging upon corresponding shoulders 12 12 of the pedal-crank C, both of said members being controlled by the pedal-crank C. The pedal-crank C is pivoted eccentrically to the shaft B on a fulcrum-stud 8 in the plate or crank support 9, which is fixed to the shaft B. The outer grip member H and the inner grip member G are thus rotatively fixed with reference to one another about the shaft B, and the same are both diametrically movable, the member G being diametrically movable with the shaft B in the elastic bushings 7, and the member H being diametrically movable from pivot 8 with reference to said member B, the members G and H being diametrically movable with reference to the annular flanges 3 3.

The members H G, Figs. 2 and 3, are normally concentric with the member D, the pedal-crank C being centered on its fulcrum-stud 8 by means of a spring 10, and the pedal-shaft B being centered by the elastic bush-

ings 7 aforesaid. The spring 10 is mounted on a projection of the plate 9 and bears on the ring H, forcing the same so that its sockets 11 11 press on the shoulders 12 12 of the pedal-crank C, keeping the same centered on its fulcrum-stud 8 in a normal radial line to the center of the pedal-shaft B with sufficient rigidity to resist the mere weight of the rider's legs, but allowing the said pedal-crank to depart from its normal line, as indicated by dotted lines in Fig. 3, when propelling or retarding pressure is exerted. When such pressure is exerted, the strain on the fulcrum-stud 8 draws the plate 9 and grip member G toward the cylindrical shaft D, binding on the inner face of the flanges 3, while one or the other shoulder 12 of the pedal-crank, bearing on the corresponding socket 11 of the ring or grip member H, forces the same in an opposite direction, binding on the outer face of the flange 3, confining and effectually gripping the same on the inner and outer sides with a multiplied pressure greatly in excess of the actual pressure of the foot on the pedal.

Each pedal-crank C C is furnished with a similar independent clutch, as illustrated in Fig. 2.

In Figs. 4, 5, 6, and 7 the principle is the same as in Figs. 1, 2, and 3, but the shaft B is journaled on a fixed axis in ball-bearings 14 14 in fixed cups 15 in the cylindrical shaft D, and the inner grip member, such as G, Fig. 2, is omitted, there being two external grip members H′ H² in lieu of one, and these are actuated in opposite diametric directions simultaneously by the construction of the pedal-crank more clearly appearing in Figs. 6 and 7, in which the pedal-crank C is pivoted to the fulcrum-stud 8, as before described, but has the rings H′ H² connected to it at each side of its fulcrum-stud 8 by pins 16 16, so that, according to the direction of displacement from its normal radial line, the crank will pull one ring and push the other against the driven part, overcoming the centering tendency of the spring 10 and gripping the flange 3 in opposed directions with multiplied force, operating, in effect, similarly to the construction in Fig. 3.

The resistance of the spring 10 in Fig. 3 or Fig. 6 may be adjusted by a suitable set-screw 17.

The effect of the construction shown is to produce spring-like cranks having a very limited range of elastic flexure. The grip members are closely fitted, so that no unnecessary lost motion occurs, and the springs 10 are of such tension and power as to avoid any looseness of the pedal-cranks.

In operation the device in its normal condition and under the mere weight of the legs of the rider will allow the driven part D A to revolve freely while the pedals are stationary or rotating at a different rate. The feet may rest on the pedals, which can remain idle while the bicycle is running, as, for instance, in coasting, which does not involve the dangerous necessity of removing the feet from the pedals. When force is exerted, the action of the grip members is of a wrench-like character, affording immediately a very powerful hold either for propulsion or brake action, at the will of the rider, and the frequency of the impulses can be made irrespective of the rate of speed, affording advantages in hill-climbing or varying grades or character of road corresponding to those set forth in my aforementioned patents.

The invention may be embodied in crank-and-chain propulsion, as illustrated, or it may be embodied in crank propulsion having the cranks applied directly to the shaft of the traction-wheel.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a cycle, the combination with a driven element, of two flexible cranks rigidly connected with relation to each other in substantially opposite radial positions upon their axis of rotation, and clutch mechanism operated by the flexure of said cranks whereby to engage with said driven element.

2. In a cycle, the combination of a rotary pedal-actuated driving part, a rotary driven part, the one having a round grip surface or surfaces, the other having a crank capable of flexure from its normal radius in either a forward or backward rotary direction, grip members operatively connected with said crank whereby they are rendered active by said flexure, and elastic means tending to resist motion of said flexure in either direction and to support the crank at an intermediate position of flexure whereby the grip members are released.

3. In a cycle-propelling mechanism, the combination of a rotary driven member, driving means and clutch mechanism thereon intermittently engaging with said driven member, rotary crank-supports, pedal-cranks flexibly mounted on said supports and engaging said clutch mechanism so as to actuate the same by the flexure of said cranks, and connecting means through the axis of rotation of the crank-supports rigidly connecting said supports together whereby the cranks are maintained in substantially opposite relation.

4. In a cycle-propelling mechanism, the combination of a rotary driven member, rotary driving means and clutch mechanism thereon intermittently engaging with said driven member, pedal-cranks movably mounted on said rotary driving means upon a center of flexure eccentric to the axis of rotation thereof and engaging said clutch mechanism so as to actuate the same by the flexure of said cranks in either direction, and elastic means tending to resist motion of said flexure in either direction and to support each crank at an intermediate position of flexure.

5. In a cycle, the combination of a rotary driven part having an annular flange or other round grip-surface, and driving mechanism

comprising annular grip members engaging by diametric movement in any direction with said flange or surface and a pedal-crank movably connected to said grip members so as to actuate them in opposed directions simultaneously by an initial movement of flexure of said crank in either a forward or backward rotary direction and suitable means whereby said crank is supported to revolve upon its axis of rotation.

6. In a cycle, the combination of a driven rotary part on a fixed axis, having an annular flange, a diametrically-movable internal grip member and shaft within said flange, a pedal-crank fulcrumed on a pivot eccentric to said shaft and connected thereto, an annular grip member external to said flange, projections on said crank near its fulcrum engaging with said external grip member, elastic means for centering said shaft, and elastic means for pressing said external grip member against the projections of the crank and thereby releasing said grip member and also centering the crank at a normal intermediate position of movement or flexure about its pivot.

7. In a propelling mechanism for cycles, the combination of a driven shaft having an annular flange at each end, a pedal-shaft elastically journaled within said driven shaft, pedal-cranks eccentrically pivoted on each extremity of the pedal-shaft, grip members on said pedal-shaft internal to said flanges having operative connection to said pedal-cranks, said parts arranged whereby rotative force applied to said pedal-cranks shall cause the grip members to clutch both sides of said flanges.

Signed at New York, in the county of New York and State of New York, this 2d day of July, A. D. 1896.

GERARD BEEKMAN.

Witnesses:

CHARLES E. FRANCIS,

EUGENE LUCAS.