No. 607,075. Patented July 12, 1898.

L. PETTERSON.

BICYCLE.

(Application filed Apr. 14, 1897.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1

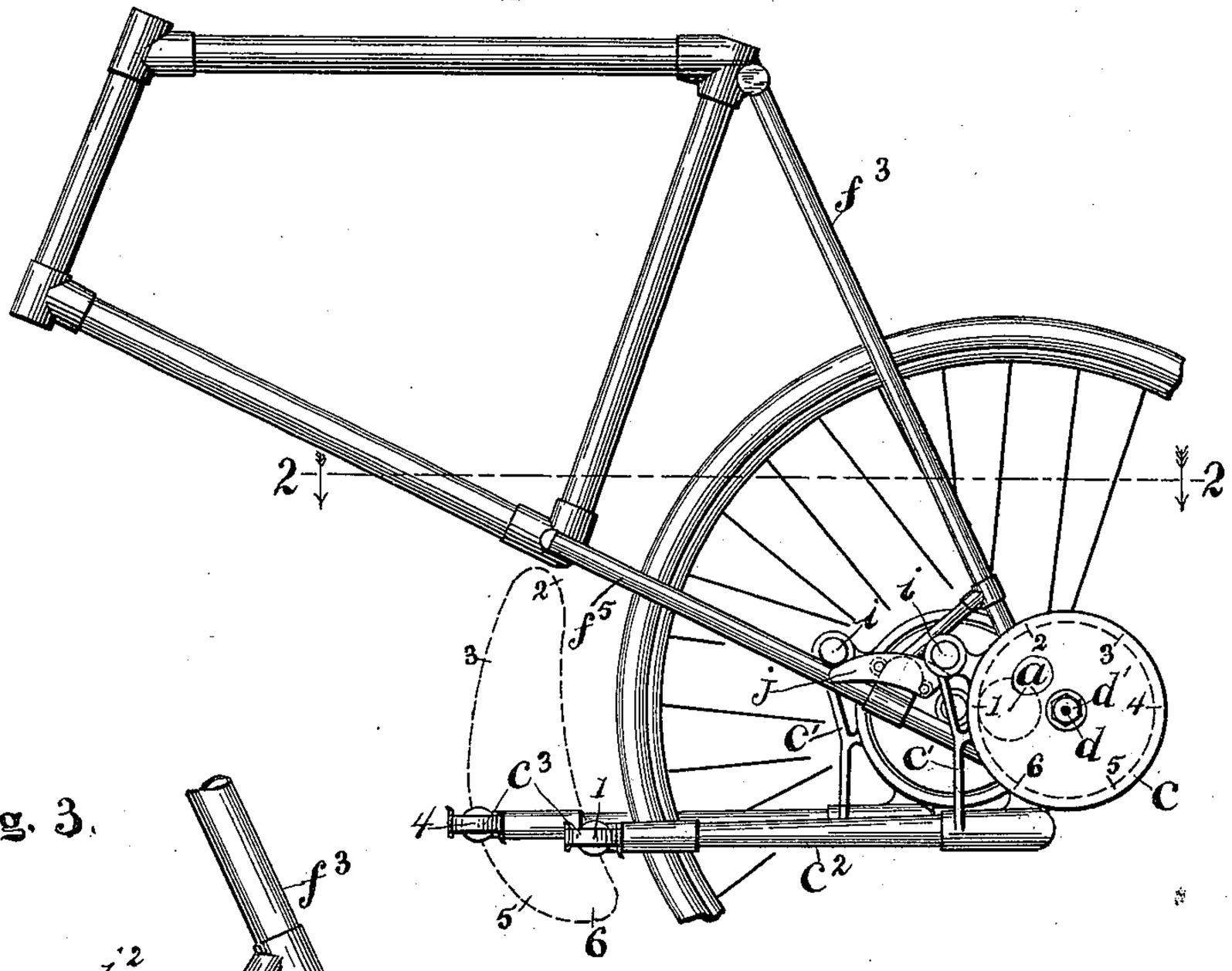


Fig. 3.

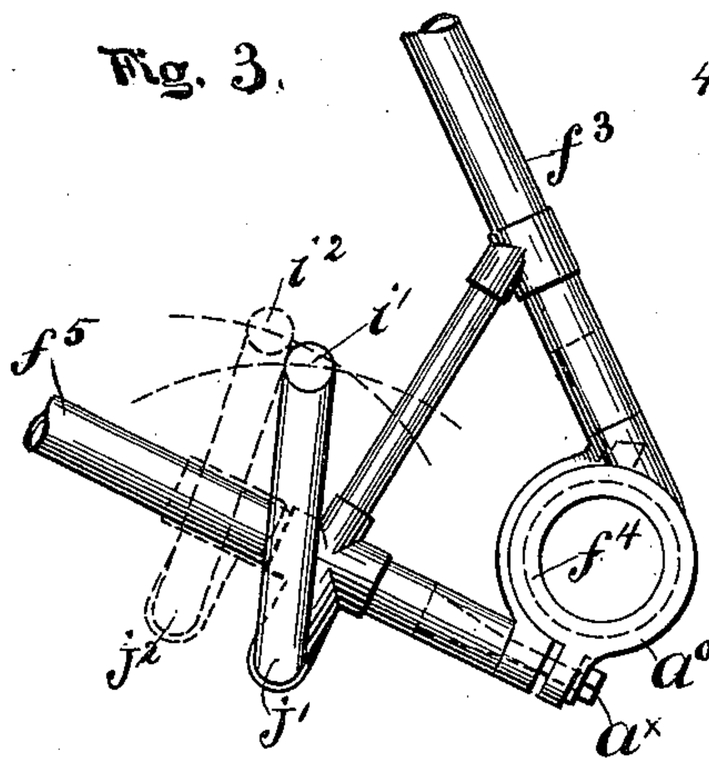


Fig. 2

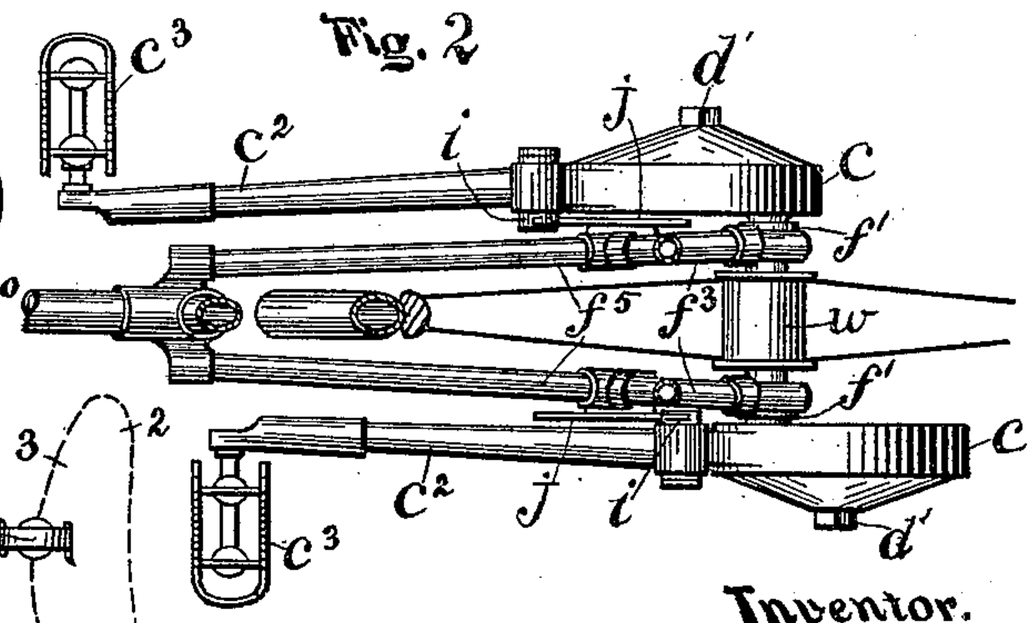
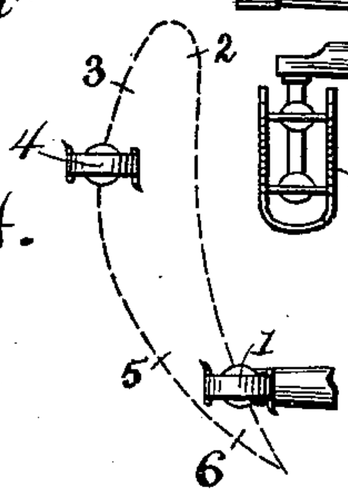


Fig. 4.



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By

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L. PETTERSON.

BICYCLE.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 5.

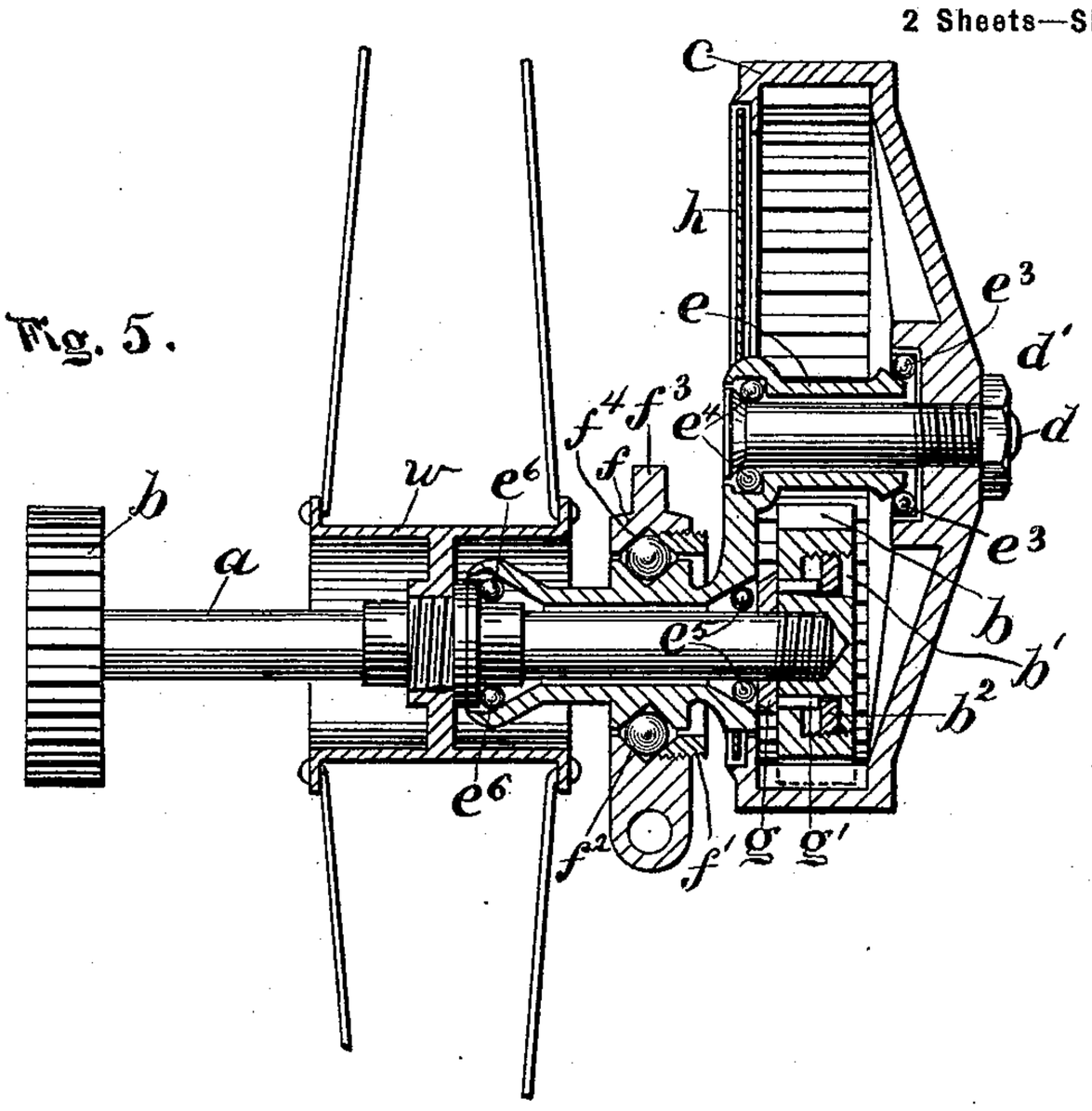


Fig. 6.

Fig. 11.

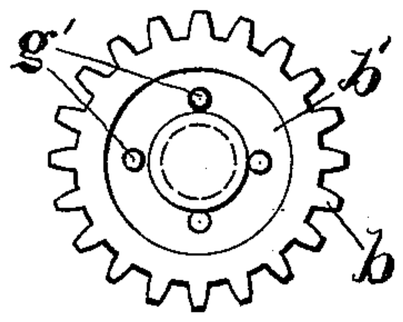


Fig. 7.

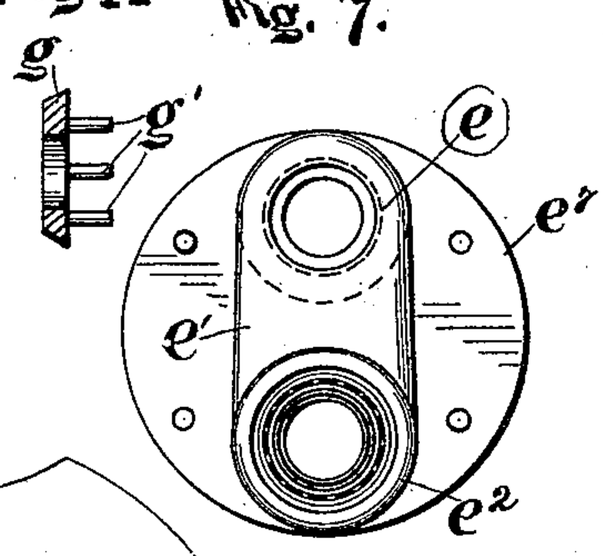


Fig. 8.

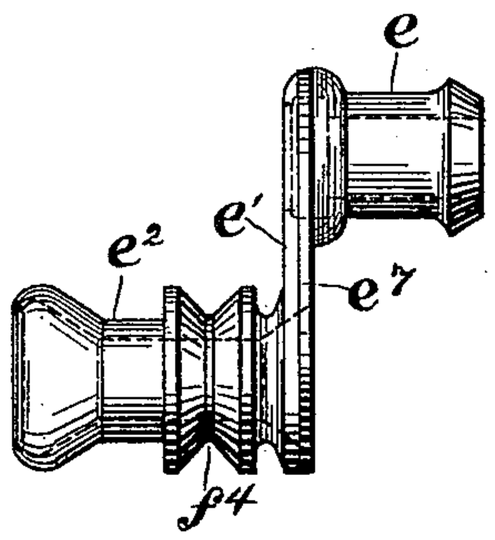


Fig. 9.

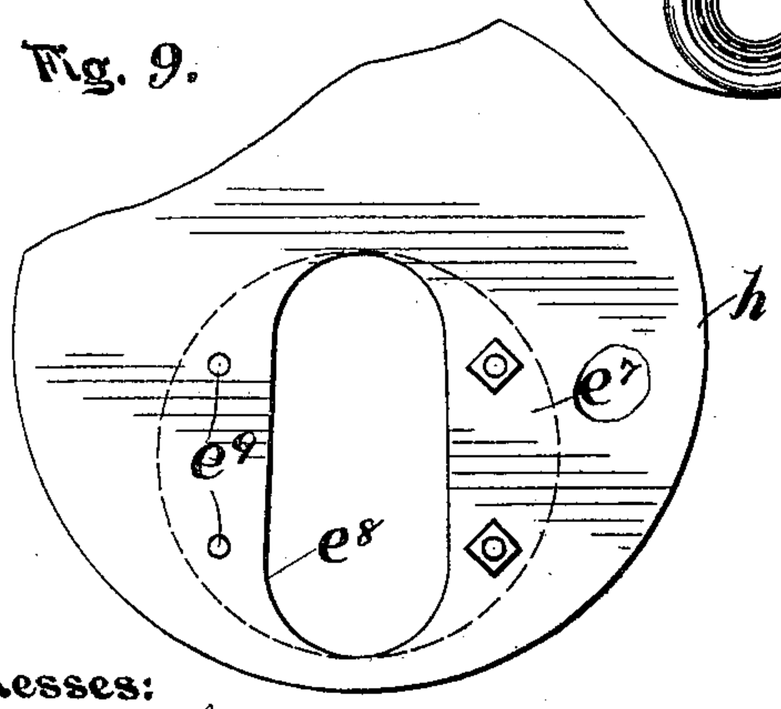
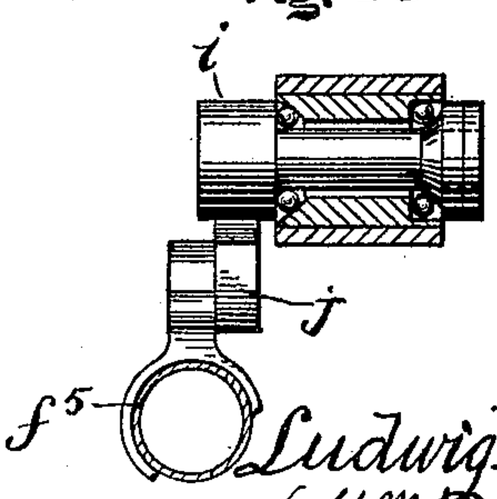


Fig. 10.



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UNITED STATES PATENT OFFICE.

LUDWIG PETTERSON, OF CHICAGO, ILLINOIS.

BICYCLE.

SPECIFICATION forming part of Letters Patent No. 607,075, dated July 12, 1898.

Application filed April 14, 1897. Serial No. 632,110. (No model.)

To all whom it may concern:

Be it known that I, LUDWIG PETTERSON, a subject of the King of Sweden and Norway, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Bicycles, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part hereof, in which—

Figure 1 shows my said improved bicycle in side elevation with part of the frame and rear wheel and my specially-improved driving mechanism partly in outline. Fig. 2 shows a plan view of Fig. 1 below the cutting plane 2 2 of Fig. 1. Fig. 3 shows, on an enlarged scale, the construction of the frame part f^3 f^5 around the sleeve or crank-axle and modified forms of carriers for the fulcrum of the treadle. Fig. 4 shows a treadle in two positions, the lower position thereof showing it in an ascending stroke, while the upper position shows the treadle in its descending stroke, the broken-lined loop indicating the path of travel of the treadle resulting from the use of the link i' j^2. Fig. 5 shows a central vertical section of a pinion b and wheel c and crank on the axle at its highest position and with a part of the frame on the crank also in said section, a section of the wheel-hub and the ball-bearings and connections and a pinion only on the other end of the wheel-axle. Fig. 6 shows a front view of the pinion b. Fig. 7 shows the crank in end view. Fig. 8 shows the said crank in side view. Fig. 9 shows the dust-guard and indicates its connection to the crank. Fig. 10 shows the fulcrum of the treadles in the form of a roller in section on ball-bearings on its axle and the cam on which the fulcrum works and its attachment to the frame. Fig. 11 shows a sectional elevation of a ring g with pins g'.

Like letters of reference denote like parts.

The object of my invention is to produce a better driving device to the treadle of a bicycle. To attain said desirable end, I have devised a new mechanical movement, which may be applied to bicycles for said purpose, constructed as follows, namely:

I put the wheel-axle a into a box having a removable part a^0, held by a bolt $a^\times$ on one side, while the other side is held by a spur. The wheel w is attached centrally to the axle a, and to each end thereof are secured pinions b, and between said wheel and each pinion is a sleeve e^2 entirely free from the axle and provided at each of its ends with ball-bearings e^5 e^6 on the axle. The end of said sleeve and forming a part of it is a crank-lever e' and a sleeve-like handle e, of which the end at the lever is provided with an inside bearing on balls e^4, and the outer part or opposite end of said sleeved handle is beveled, so as to form an outer ball-bearing with the annular chamber in the coned web of the gear-wheel c to hold the balls e^3. Into the center of said wheel-web is threaded a stud d, secured further by a nut d', and around its interiorly-beveled head are ball-bearings with balls e^4. Said crank and its sleeved mechanism secures the proper contact of the wheel c with its pinion d, and thus their easy motion around the axle a. To the crank-lever e' is secured a circular flange e^7, and to the side thereof, toward the wheel w, is secured a disk h, having a slot e^8, fitting around the crank-lever e' and secured thereto through holes e^9, passing through the flange e^7, through which are passed bolts to secure said disk to said flange. Said disk h is centered on the axis of the stud d. The said disk thus closes the side opening of the wheel c in a rabbet therefor provided, wherein it plays as closely as possible without touching, thereby keeping said mechanism free from dust. Near the crank-lever e' is an outer groove on the sleeve e^2, which, with the chambered box at the ends of f^3 f^5 of the frame, forms a part of a ball-bearing chamber f^4, said chamber being completed by a beveled ring f', adapted to the beveled chamber for the balls f^2 and having the outer screw-thread fitting into the inner circumferential thread of the box f^4, whereby all looseness of that ball-bearing can be taken up. On the axle a is a coned annulus g, with pegs g' projecting from its base through holes into the annular chamber formed between the hub and circumferential part of the pinion b, and in said annular chamber is placed an annular nut threaded into said pinion adapted to press on said pegs and drive the coned end of said ring g against the balls e^5, whereby all

looseness of the sleeve e^2 on the shaft a may be taken up, thus making snug operative connection with all the said parts. On the outer and front part of the internally-geared wheels c are fixed brackets c', to which, at their upper end, is attached a fulcrum, which may be made in various forms, depending on the support given to said fulcrum. Said support may be in the form of a link turning on points $i' j'$ or $i^2 j^2$, the latter being somewhat differently hung and placed from the former, whereby it describes a somewhat different arc, as indicated by the two broken lines running through the centers $i' i^2$. Another and somewhat preferable form, perhaps, of said fulcrum is shown in Figs. 1, 2, and 10, where there is a shaft in said bracket on ball-bearings, as shown, with a roller i carried on a convexed cam j of about or slightly greater length than the diameter of the pinion b and attached to the cycle-frame, and to the lower end of said bracket are attached fixed arms or levers c^2, provided at their outer ends with treadles c^3, which thus complete my said structure, whereof the operation is substantially as follows, namely:

When the treadles stand as shown in Fig. 1, the right-hand treadle is on its downward motion and the left-hand treadle has made a short part of a return stroke. Power being applied to the right-hand treadle from the fulcrum i, rolling on the cam j, the wheel c will ascend, and as its outer gear or that which is farther from the center of the roller i is in mesh with the pinion b it will rotate the wheel w forward, and by means of this arrangement the treadle will have effect until it reaches the lowest point of its stroke, which is near the point marked 6. During said motion the roller i will pass from the front to the rear of the cam j, and the front of the gear c will now make front contact with the pinion b for the return stroke of the treadle. Owing to the reduced distance between the axes of the parts i and a the return stroke of the treadle requires proportionally less time. In the proportions here shown in Fig. 4 the proportion is about one to two. In other words, the time during which the down or propelling strokes are made for both treadles is four-sixths or two-thirds of the revolution of the wheel w instead of one to one, as in the ordinary crank arrangement, and there are no dead-centers for the treadles.

The loops shown in broken lines in Figs. 1 and 4 show the different motions of the treadle under the cam and under the link-supported fulcrums. Said loops or diagrams will vary with the arrangement of the support of the fulcrum on the wheel c. The levers c^2 and gear-wheels c form integral parts, which always move together.

What I claim is—

1. The combination with a pinioned axle and circular inside gear-wheel and treadle-lever with moving fulcrum-point integral with said gear-wheel and mechanism, revoluble on said axle, connecting said gear-wheel and pinion and supporting the cycle-frame, of an upwardly-convexed fulcrum-support to said fulcrum-point, substantially as specified.

2. The combination with a pinioned axle and circular inside gear-wheel with thereto integral treadle-lever and fulcrum-point, of an independently-rotatable sleeve with crank-lever and handle on said axle connecting said wheels, a frame-support on said sleeve and an upwardly-convexed fulcrum-support, substantially as specified.

3. The combination with a pinioned axle and circular inside gear-wheel thereto, a central fixed stud to said gear-wheel and mechanism, revoluble on said axle, with means to connect said wheels, a treadle-lever and fulcrum-point integral with said gear-wheel, of an upwardly-convexed fulcrum-support for said moving fulcrum-point, substantially as specified.

4. The combination with a pinioned axle and circular inside gear-wheel with fixed central stud, a sleeve on said stud with interior and exterior ball-bearings, a crank-lever to said sleeve connecting to an axle-sleeve with interior and exterior ball-bearings, a frame end on said exterior ball-bearings, and treadle-lever and thereto fixed moving fulcrum, integral with said gear, of a frictionless plate connected to said crank-lever and turning on said central stud, substantially as specified.

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