

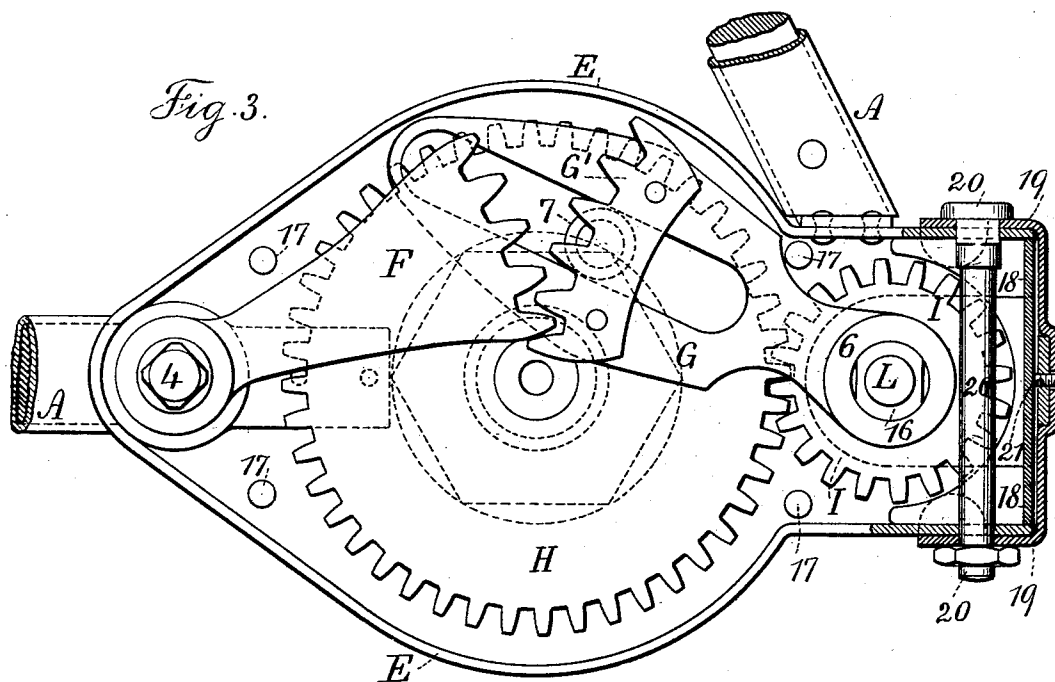
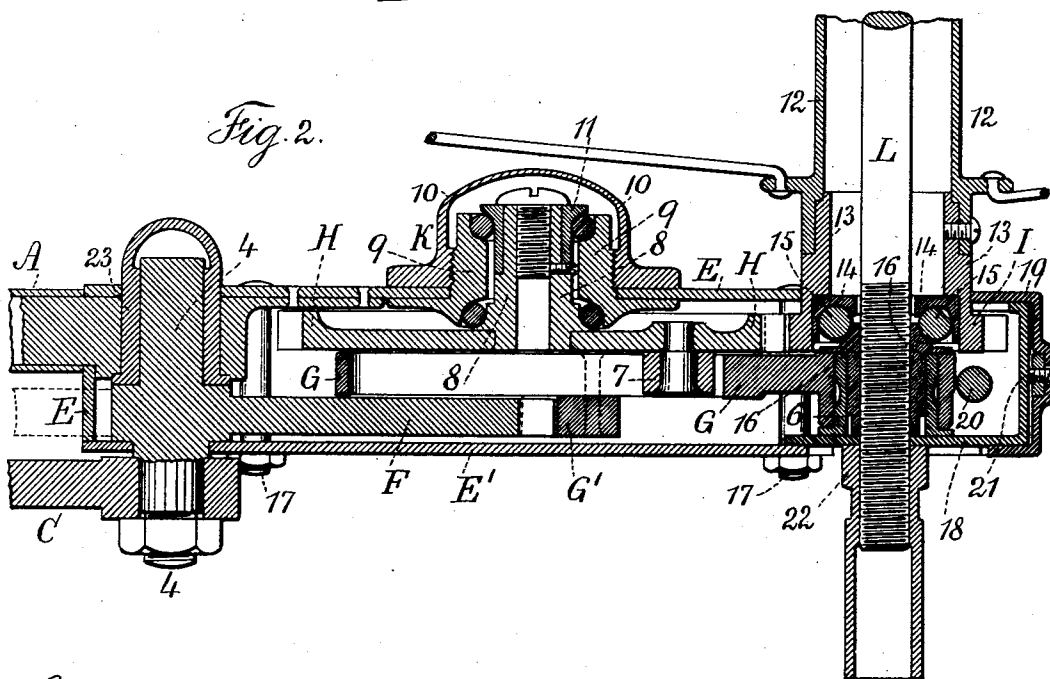
(No Model.)

2 Sheets—Sheet 2.

J. T. PEDERSEN.
DRIVING MECHANISM FOR CYCLES.

No. 587,601.

Patented Aug. 3, 1897.



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UNITED STATES PATENT OFFICE.

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DRIVING MECHANISM FOR CYCLES.

SPECIFICATION forming part of Letters Patent No. 587,601, dated August 3, 1897.

Application filed September 14, 1896. Serial No. 605,691. (No model.)

To all whom it may concern:

Be it known that I, JOHANNES TH. PEDERSEN, a citizen of the United States, residing at Woodside, in the county of Queens and State of New York, have invented an Improvement in Driving Mechanism for Cycles, of which the following is a specification.

Bicycles ordinarily known as "safety-bicycles" have usually been propelled by sprocket-wheels and a chain from a crank-shaft, but in consequence of the wear upon the chain, the accumulation of dust, and the exposure of the parts chain-driven cycles are objectionable in many particulars. The present invention is for giving motion to the back wheel of the cycle by levers and gearing, so as to dispense with the chain and at the same time allow for the cycle being driven by a substantially vertical rise-and-fall movement of the feet instead of the circular movement heretofore required in propelling the cranks.

With the aforesaid object in view a pinion is provided upon the hub of the rear wheel and a larger wheel gears into the same, the proportionate size of the gearing being regulated according to the leverage required in propelling the cycle, and the foot-levers are pivoted and provided with pedals or foot-pieces at their front ends and at their rear ends are connected with slotted arms, there being a crank-pin upon the gear-wheel and a roller in the slotted arm, so that the gear-wheel is rotated and the pinion and driving-gear of the cycle propelled by the alternate upward and downward movements of the foot-levers, the parts being compact and easily protected from dust and of but little weight.

In the drawings, Figure 1 is a general elevation illustrating the positions of the parts. Fig. 2 is a sectional plan view, in larger size, showing the mechanism at one side of the wheel. Fig. 3 is an elevation, in larger size, of the mechanism with the cap removed and the auxiliary cap and end piece in section; and Fig. 4 is a diagrammatic elevation illustrating a modification in the positions of the parts.

A portion of a cycle-frame is represented at A and a portion of the back wheel at B. These parts may be of any desired character,

and there is a pinion I upon the hub of the wheel B, engaging a gear-wheel H, which is larger than the pinion, so as to obtain the necessary speed, and there is a slotted arm G, pivoted at 6, and a crank-pin and roller 7 are within the slot of the arm G, and the slot is of sufficient length for the crank-pin to revolve with the gear H and move backward and forward in the slot of the arm as such arm swings upon its pivot 6.

The parts named are in any suitable box or inclosure E, the same being preferably constructed as hereinafter more fully described.

It will now be understood that if a rocking movement is given to the slotted arm G the gear H will be rotated by the arm acting upon the crank-pin and roller that are within the slot, and the pinion will be revolved and the back wheel propelled at the proper speed, the same depending upon the proportionate sizes of the gear H and pinion I.

The slotted arm or actuator receives its motion from a connection to the foot-lever, and I prefer to employ the devices hereinafter described, and I remark that where two pinions are made use of near the respective ends of the hub of the wheel B two gears H and two slotted arms G will be required, and the box for containing the gears and other parts is to be provided at each side of the frame, and the parts are put together in such a manner that the slotted arm G on one side will be in the reverse position to the slotted arm on the other side, so that one pedal-lever giving motion to the slotted arm may be depressed while the other is elevated and one will be descending as the other ascends.

I prefer and use levers C C', with pedals or foot-pieces D at their front ends; and the lever C is pivoted at 4 within the gear-box E and provided with a toothed sector F at its rear end engaging the toothed sector G' upon the slotted arm G, there being similar devices at each side of the frame and wheel, but only one is represented in the drawings; and it will now be apparent that the slotted arm G receives its motion from the toothed sector F at the rear end of the lever C, and in so doing the movements given to the toothed sectors are communicated to the slotted arm and

from the same by the crank-pin, roller, and gear H to the pinion on the hub of the driving-wheel.

In carrying out the details of construction it is advantageous to provide an arbor 8, projecting from the gear-wheel H, such arbor running in the ball-bearings K, which are made upon the back portion of the gear-box E, the inner portion 9 of the ball-bearing being passed through the side of the gear-box from the inside and receiving upon the outside the screw-cap 10, by which the parts are held firmly in place, and the balls are between the inner bearing 9 and the arbor 8, adjacent to the gear-wheel H, and also between the arbor 8, the bearing 9, and the bearing-ring 11, that is secured to the back end of the arbor 8 by a screw. This allows the parts to be separated and at the same time forms a very reliable bearing for the arbor of the gear H. It is also advantageous to provide ball-bearings for the hub of the wheel B. I have shown the said hub tubular, as at 12, and the sleeve 13 of the pinion I extends to and is firmly connected with the hub 12, and in the pinion I there is advantageously a hardened-steel bushing 14 for the balls 15, and there is a bearing 16 upon the cross-shaft L, said annular bearing 16 acting with the balls 15 and bushing 14 to form the ball-bearing at one side of the back wheel, the other end of the back-wheel hub being similarly supported, and this cross-shaft L is sustained at its outer ends in the gear-boxes E, as hereinafter described.

In Figs. 1, 2, and 3 the slotted arm G is represented as having an eye passing around the cross-axle L, which forms a pivot for the same, and in this case the annular bushing 16 may be provided with a sleeve to receive the eye of the slotted arm G, and there are nuts for adjusting the ball-bearing and for holding the eye of the slotted lever upon the bearing, it usually being preferable to screw the annular bearing 16 directly upon the cross-shaft L and hold the same by a lock-nut or cross-pin, and the sleeve around this annular bearing 16 and within the eye of the slotted arm G forms the pivot 6 for said arm G. In cases where the slotted arms G are pivoted below the gear H, as seen in the diagram Fig. 4, there will be only the annular bearing 16 and lock-nut directly upon the cross-axle L at the ball-bearing.

It is advantageous to make the gear-box E with upper and lower flanges and to connect the back portion of the box firmly with the frame of the machine and to provide a movable cap E' to close the outer side of the box. This cap may be of any desired character and should be secured by bolts, which are shown at 17. It is necessary to properly support the cross-shaft L, and with this object in view the auxiliary cap 18 is made with a hole, through which the end of the axle L passes, and this auxiliary cap is within the

end piece 19, and the cap also has a flange adjacent to the edge of the pinion I to aid in excluding dust, and the end piece 19 has flanges that pass above and below the upper and lower sides of the gear-box E, and it also has a flange extending down behind the pinion I and terminating closely adjacent to the tubular sleeve of the pinion, and this end piece 19 is rigidly fastened to the end of the gear-box E by the bolt 20, that passes vertically through the end piece and through the top and bottom portions of the gear-box and is provided with a nut at the bottom, and a screw 21, preferably provided with a gib intervening between the end of the screw and the auxiliary cap, is used for pressing the auxiliary cap forward and in so doing bringing the teeth of the pinion I properly into gear with the wheel H, and this provides a sufficient adjustment to compensate wear in the gear-teeth, and it is advantageous to employ nuts 22 on the ends of the cross-axle L to clamp the same and the sleeve at 6 firmly to the auxiliary caps.

The pivots 4 of the levers C C' may be of any desired kind. I have represented in Fig. 2 the pivot as projecting from the sector F and passing into a steel bushing 23, that passes through the back portions of the gear-box and is driven in tightly. If desired, the lever C (or C') may be made as a forward extension of the sector F, as indicated by the dotted lines in Fig. 2, such lever projecting from the end of the gear-box E; but to aid in excluding dust I prefer to have the lever C outside the box E, and with this object in view the pivot 4 is extended through the cover E' of the box and receives upon it the eye of the lever C, the parts being suitably connected—as, for instance, the eye of the lever setting upon a squared portion of the pivot and being held in place by a nut, as shown in the drawings; and I remark that the pedal D upon the outer end of each lever C or C' may be of any desired character adapted to being acted upon by the foot, and hence such pedal rises and falls approximately vertical, and the feet in acting upon the respective foot-levers are alternately raised and forced down and the propelling movement is given to the cycle through the slotted arms, crank-pin, and gear, as aforesaid.

If the slotted arm G is pivoted either above or below the gear H, as illustrated in the diagram Fig. 4, such slotted arm may receive motion in any desired manner, and I have shown a connecting-rod 24, pivoted at the rear end to the slotted arm and at the front end to a crank 25 upon the foot-lever 26, and with this construction there will be two foot-levers 26, one at each side of the frame upon the cross-shaft 27, and the connections will be made as before mentioned, so that one foot-lever 26 will be down when the other is up and one will be moving downward as the other is moving upward in giving motion

through the rods 24 to the slotted arm, as aforesaid.

It will be understood that in putting the parts together the pinion, ball-bearing at each side, and the cross-shaft are put together upon the tubular hub of the wheel, and then the parts are slipped into the frame, the rear end of the box E being open or formed as a jaw to allow for the insertion of such parts, after which the auxiliary cap, the end piece, and the bolt are put into position at the rear end of each box.

It will be observed by the diagram Fig. 4 that there are no dead-centers, as in crank movements, because when the radius to the crank-pin on one side is perpendicular to the slot of the link, and hence at the dead-point, the radius to the crank-pin on the opposite side is not at right angles to the slot of the link. Hence one of the foot-levers is always in a position to be acted upon in giving motion to the wheels.

I claim as my invention—

1. The combination with the wheel and frame in a cycle, of a pinion upon the hub of the wheel, a gear directly engaging such pinion and a crank-pin upon the gear, a short arm pivoted upon the axle of the wheel and having a straight slot therein receiving the crank-pin upon the gear, a pivotal support and a foot-lever thereon and extending forward of such support, and a connecting device between the back end of the foot-lever and the short slotted arm, substantially as set forth.

2. The combination with the wheel and frame in a cycle, of a pinion upon the hub of the wheel, a gear directly engaging such pinion and a crank-pin upon the gear, a short arm pivoted upon the axle of the wheel and having a straight slot therein receiving the crank-pin upon the gear, a case inclosing the gears, slotted arm and crank-pin, a pivotal support and a foot-lever thereon and extending forward of such support, and a connecting device between the back end of the foot-lever and the short slotted arm, substantially as set forth.

3. The combination with the wheel and frame in a cycle, of a pinion upon the hub of the wheel, a gear directly engaging such pinion and a crank-pin upon the gear, a short arm pivoted at one end and having a straight slot therein receiving the crank-pin upon the gear, a case inclosing the gear, pinion and slotted arm, a pivotal support and a foot-lever thereon and extending forward of such support, and a connecting device between the

back end of the foot-lever and the short slotted arm, substantially as set forth.

4. The combination with a wheel and frame in a cycle, of a pinion connected with the hub of the wheel, a gear engaging such pinion, a crank-pin for the gear, a slotted arm pivoted at one end, a sector upon the slotted arm, a foot-lever and sector upon its rear end engaging the sector upon the slotted arm for giving motion to the same, and to the crank-pin, gearing and cycle-wheel, substantially as set forth.

5. The combination in a driving mechanism for cycles, of a pinion upon the hub of the cycle-wheel, a gear-wheel engaging such pinion, a box for inclosing the gearing and ball-bearings for the hub of the cycle and for the arbor of the gear-wheel, a crank-pin and roller upon the gear-wheel, a slotted arm and a pivot at one end and receiving the roller and crank-pin into its slot, a sector connected with the slotted arm, a foot-lever pivoted at its rear end outside the box and a sector within the box connected to the foot-lever and engaging the sector on the slotted arm for giving motion to the respective parts in propelling the cycle, substantially as set forth.

6. The combination with the cycle-wheel, having a tubular hub, of a pinion connected to such hub, a box receiving the pinion and supported by the frame of the cycle, the rear end of the box being open for the reception of the hub of the wheel, a cross-axle passing through the tubular hub of the cycle-wheel and ball-bearings between the pinion and the cross-axle, an auxiliary cap receiving through it the end of the cross-axle, an end piece and cross-bolt by which the end piece is rigidly connected to the box for the gearing, and a screw acting to adjust the auxiliary cap, the cross-axle, the ball-bearings and the pinion in relation to the box and gearing for driving the pinion, substantially as set forth.

7. Bicycle-propelling devices comprising a pinion on the axle of the driving-wheel, a gear directly in mesh therewith, a swinging actuator and a crank-pin on the gear, and having a sliding connection with the actuator, a foot-lever independent of the actuator and extending forward of its pivotal support and a rearward connection therefrom to the actuator, substantially as specified.

Signed by me this 9th day of September, 1896.

JOHANNES TH. PEDERSEN.

Witnesses:

GEO. T. PINCKNEY,
S. T. HAVILAND.