(No Model.) 4 Sheets—Sheet 1.

W. A. LEGGO, Jr.

SPROCKET WHEEL.

No. 524,830. Patented Aug. 21, 1894.

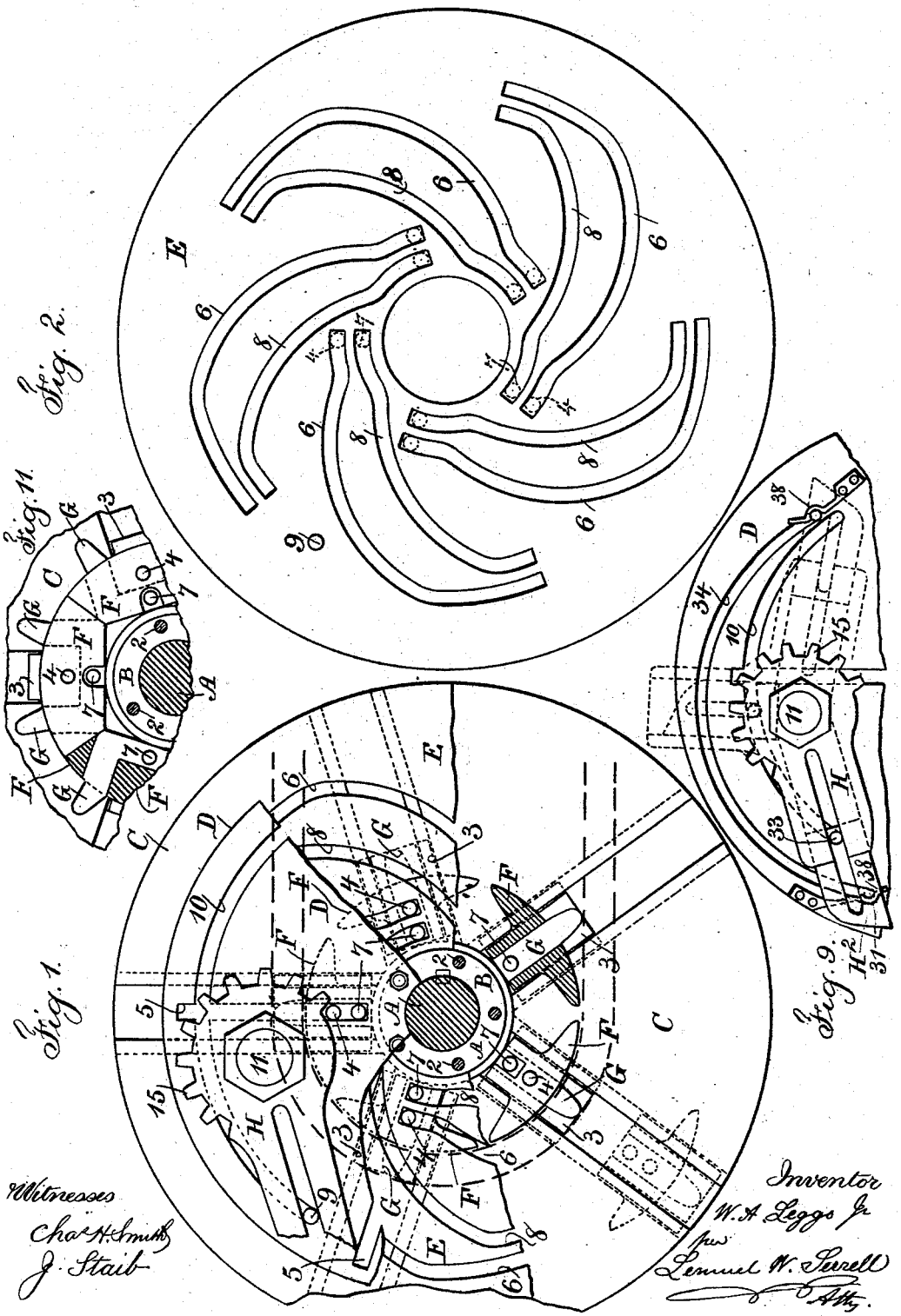

Fig. 2.

Fig. 11.

Fig. 9.

Fig. 1.

Witnesses
Chas. H. Smith
J. Stair

Inventor
W. A. Leggo Jr.
per
Lemuel W. Serrell
Atty.

(No Model.) 4 Sheets—Sheet 2.

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SPROCKET WHEEL.

No. 524,830. Patented Aug. 21, 1894.

Fig. 4

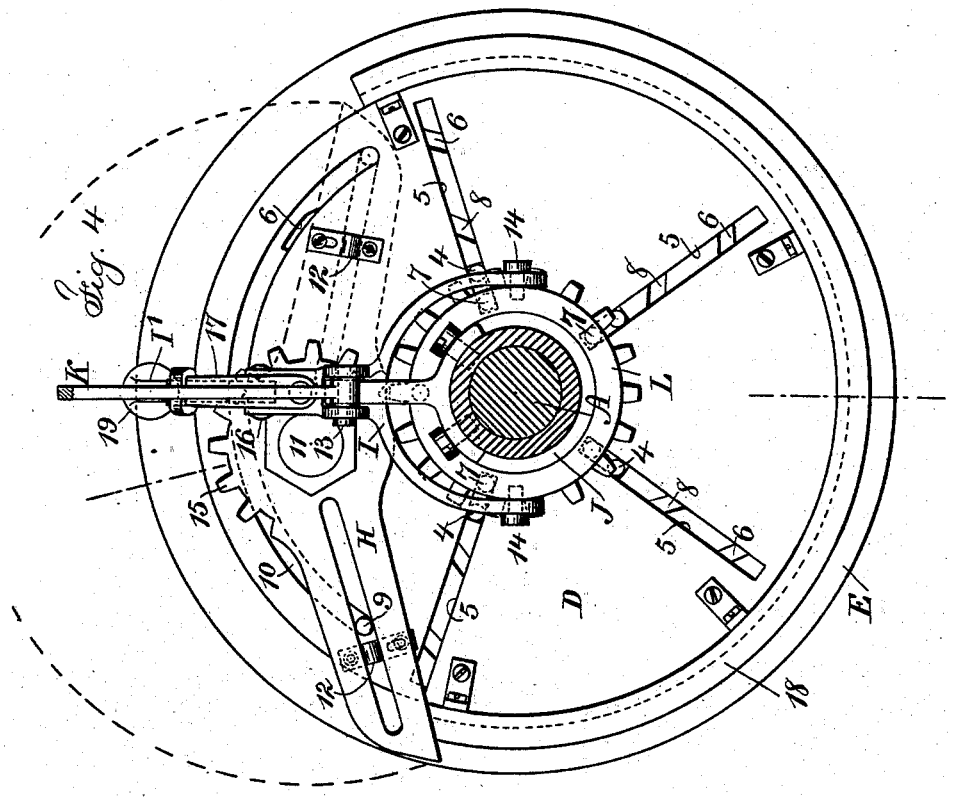
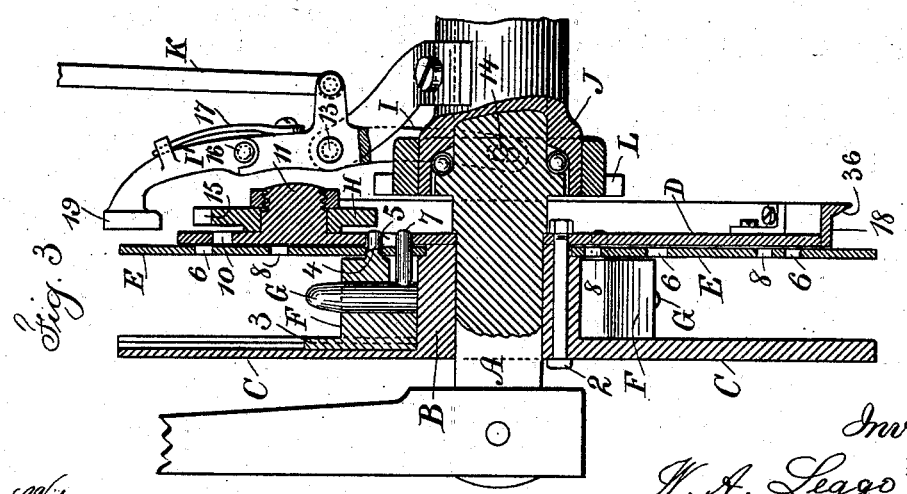


Fig. 3



Witnesses
Chas. A. Smith
J. Stair

Inventor
W. A. Leggo Jr
per Samuel W. Serrell
Atty.

(No Model.) 4 Sheets—Sheet 3.

W. A. LEGGO, Jr.

SPROCKET WHEEL.

No. 524,830. Patented Aug. 21, 1894.

Fig. 7.

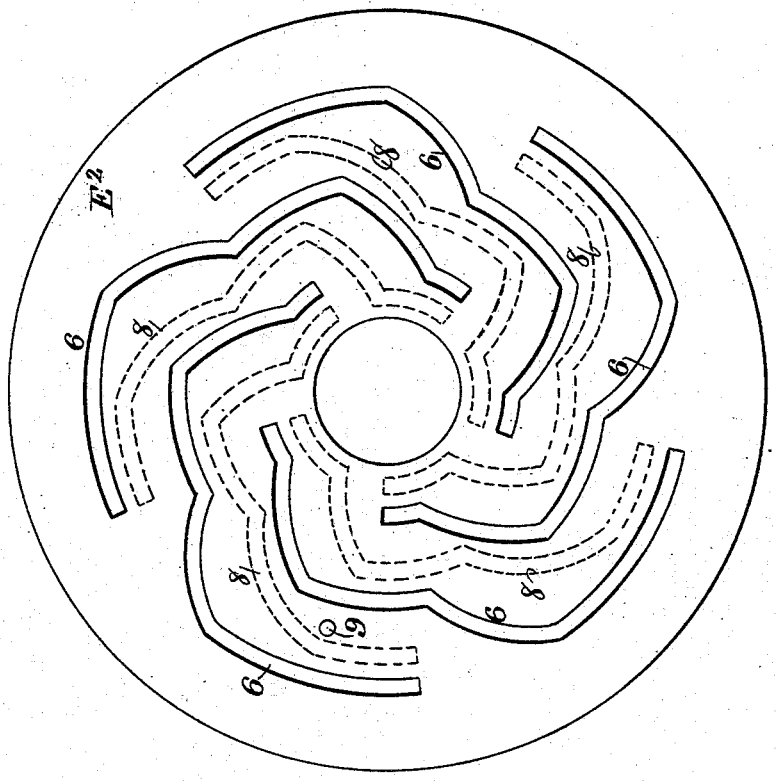
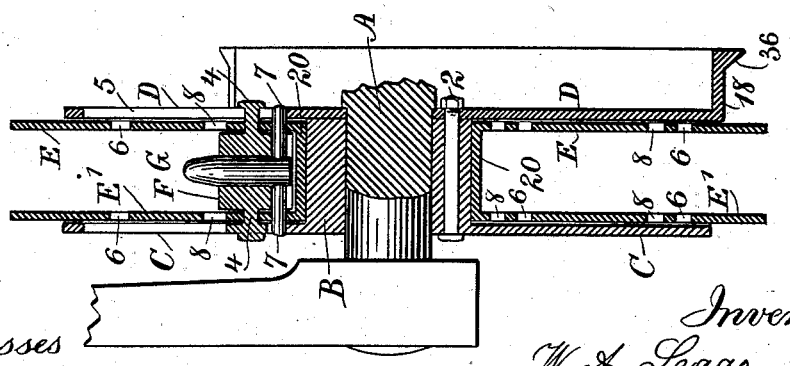


Fig. 5.



Witnesses
Chas. H. Smith
J. Stair

Inventor
W. A. Leggo Jr.
per Samuel W. Serrell
Atty.

(No Model.) 4 Sheets—Sheet 4.

W. A. LEGGO, Jr.

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Fig. 6

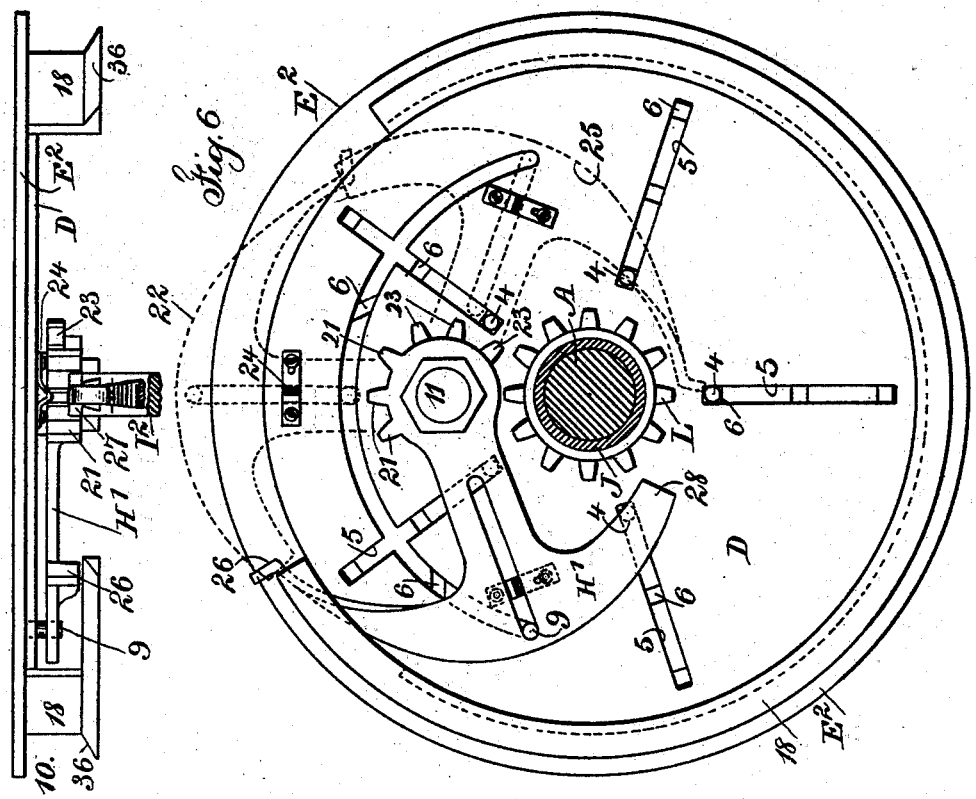
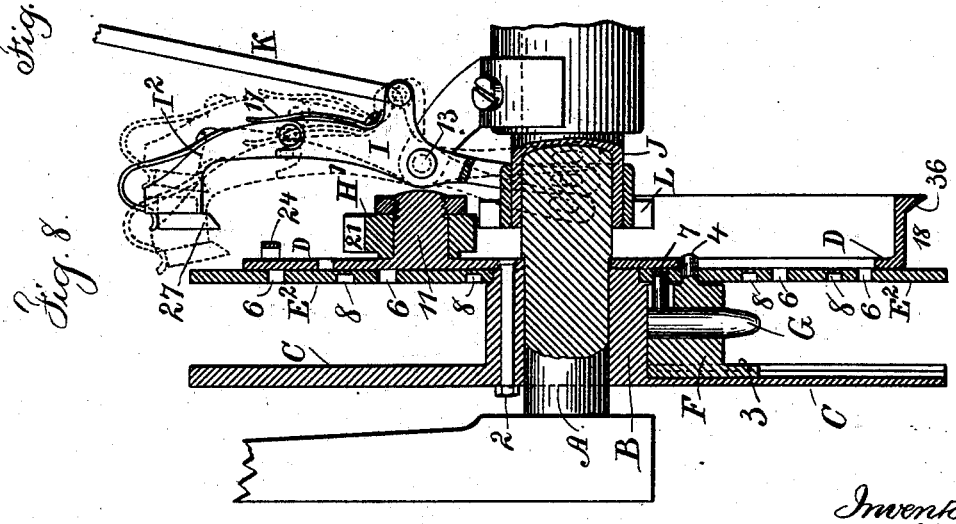


Fig. 10.

Fig. 8.



Witnesses
Chas. H. Smith
J. Stair

Inventor
W. A. Leggo Jr
by Lemuel W. Serrell
Atty.

UNITED STATES PATENT OFFICE.

WILLIAM A. LEGGO, JR., OF HARTSDALE, NEW YORK.

SPROCKET-WHEEL.

SPECIFICATION forming part of Letters Patent No. 524,830, dated August 21, 1894.

Application filed November 27, 1893. Serial No. 492,067. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. LEGGO, Jr., a subject of the Queen of Great Britain, residing at Hartsdale, in the county of Westchester and State of New York, have invented an Improvement in Sprocket-Wheels, of which the following is a specification.

The present improvement is especially adapted to use in velocipedes, but is not limited to the same, and, as distinguished from the devices that have heretofore been made, it relates to the separation of the projections or pins from the chain during the time that the diameter of the wheel is being increased or decreased, in order that the chain may rest upon the smooth and concentric or nearly concentric surface when the diameter is being changed, the projections being first withdrawn and then brought into action for holding the chain.

In my improvement when the sprocket wheel is of full diameter the chain pins are first withdrawn and then the diameter of the wheel is lessened while the chain is upon the substantially smooth surface thereof, and then the pins are projected from that surface or the pins held stationary while the segments are contracted to the smallest diameter to allow the pins to engage the chain, and according to my improvement the sprocket wheel may be constructed so as to have two, three or more different effective diameters according to the position of the respective segments as they are contracted or expanded in relation to the axis of the sprocket wheel.

In the drawings, Figure 1 is an elevation with portions of the respective disks removed to show the parts that would otherwise be behind such disks. Fig. 2 is an elevation of the cam disk. Fig. 3 is a vertical cross section. Fig. 4 is an elevation. Fig. 5 is a cross section illustrating a modification in the arrangement of the disks. Fig. 6 is an external elevation of the parts in their modified form. Fig. 7 shows the cam disk detached. Fig. 8 is a cross section representing the actuating lever and the parts adapted to use with the cam disk shown in Fig. 7. Fig. 9 is a modification of the lever H. Fig. 10 is a partial plan of Fig. 6, and Fig. 11 is a detached view of a double chain pin.

The shaft A or axle is either adapted to the reception of cranks or pedals at the ends thereof to form a driving shaft, or it may be the shaft of the wheel of the velocipede, as the present improvements are available for increasing the diameter of the sprocket wheel upon the pedal shaft or upon the wheel shaft, or both, it being understood that where the present invention is applied to both sprocket wheels the effective diameter of the sprocket wheel upon the crank or pedal shaft is to be lessened and then the effective diameter of the sprocket wheel upon the wheel shaft is to be increased to take up the slack of the chain, or the reverse, or in cases where the sprocket wheel with the present improvements is only applied either to the crank or pedal shaft or to the wheel shaft, an idler may be made use of for taking up the slack of the chain, or the distance between one shaft and the other may be varied according to the relative diameters of the sprocket wheels, so that the chain may not be either too tight or too loose when the effective diameter of the sprocket wheel or wheels is changed, and as the present invention is available with sprocket wheels that are used upon other machines than a velocipede, the devices for adjusting the position of the shaft or for simultaneously or successively acting upon the sprocket wheels are not herein described in detail but the improvements are described with reference to one sprocket wheel.

Upon the shaft A is a hub B which is to be permanently fastened to such shaft in any suitable manner, and from this hub the disks C and D project, and the disk C and hub B may be in one, and the disk D, which preferably is the inner disk, is made removable, the same being secured by bolts and nuts 2.

Between the two disks and preferably adjacent to the disk D is a cam disk E that can be partially rotated, and it is preferable to make an offset or shoulder around the outer end of the hub B over which the hole in the cam disk E sets, so that the cam disk is held in its proper position by the shoulder but is free to be rotated.

The segments F are between the cam disk E and the front disk C and they are adapted to being moved radially, or toward and from the axle A and with this object in view such segments may be guided in any desired man-

ner; I have shown in Figs. 1 and 3, the segments as provided with guide blocks 3 running in undercut or dovetailed radial grooves in the disk C, and such segments are also provided with pins 4 that project through cam slots 6 in the disk E, and also such pins pass into the radial slots 5 in the disk D; and it will now be understood upon reference to Fig. 2, that if this disk E receives a partial rotation the cam slots 6 in said disk will force the segments F either outwardly or inwardly according to the direction of rotation given to the cam disk E.

Each segment F is mortised radially or nearly so for the reception of a chain pin G which is free to be moved endwise in the mortise and it is provided with a right angle pin 7 which projects below the segment or may pass into the notched inner side of the segment when the pin G is projected to engage the links of the chain, and in the cam disk E a second set of slots 8 is provided into which the pins 7 of the chain pins pass, and these slots 8 are not parallel to the slots 6 but are shaped substantially as represented in Fig. 2 in such a manner that when the segments F are nearest the shaft A the pins 4 and 7 are in the concentric portions of the slots 6 and 8 and hence are held firmly and cannot be moved either outwardly or inwardly except by the partial rotation of the cam disk E, and when this cam disk E is rotated, the slots 6 first act upon the pins 4 to move such pins 4 and the segments F outwardly while the pins 7 and the chain pins G therewith connected still remain in the concentric portion of the slots 8 and after the segments F have been moved outwardly sufficiently to lift the chain off of the chain pins G, so that such chain only bears upon the curved outer surfaces of the segments F, then the segments F and pins G move uniformly by the action of the cam slots until the segments F arrive at their extreme outward projections, and the pins 4 of such segments are in the concentric portions of the slots 6 and the further movement of the cam disk E causes the slots 8 to project the chain pins G to cause them to engage the chain which passes around the sprocket wheel.

The chain itself is to be of any desired character and its position is illustrated by the dotted lines, Fig. 1, but the same is not shown in full lines, to avoid confusion.

The device for giving a partial rotation to the cam disk E may be of any desired character; I have however represented the pin 9 as projecting through the slot 10 in the disk D, which slot 10 is an arc of a circle, and the pin 9 projects beyond the face of the disk D sufficiently to be acted upon by the slotted lever H which is pivoted at 11 upon the disk D and it occupies the position shown by full lines in Figs. 1 and 4 when the segments F are drawn nearest to the hub and it occupies the position represented by dotted lines when the segments F are projected to their outward or larger diameter, and the slotted lever H is held in either one of these positions by any suitable means; I prefer to employ the angular springs 12 that are fastened to the disk D and are adapted to spring up into the slot of the lever H, but such springs are pressed back as the slotted lever is swung from one position to the other.

It is advantageous to provide a device that will act upon the slotted lever H while the shaft A and the parts connected therewith are in motion, and with this object in view I provide a lever I pivoted at 13 upon an arm extending from the frame of the machine or from the tubular bearing J for the shaft A, and this lever I may be conveniently moved by a rod K having a handle or other suitable appliance in a convenient position to be acted upon by the party riding the bicycle. This rod K may be provided with any suitable means for moving or holding it.

The lever I is forked at its lower end and is provided with pins 14 that enter holes in the sliding pinion L, which pinion surrounds and slides upon the tubular bearing J, and when pressed toward the disk D the teeth of the sliding pinion L engage the teeth 15 that partially surround the hub or pivot of the slotted lever H, and when the pinion L is slid away from the teeth 15, the parts easily separate, leaving the lever H to be otherwise acted upon.

At the upper end of the lever I there is a jointed section I′ pivoted at 16 and provided with a spring 17 or equivalent device for holding the section in proper alignment with the lever I but permitting the section I′ to swing upon its pivot away from the disk D, and around this disk D is a rim 18 having a flange at its exterior edge, and this rim and its flange extend partially around the disk D and one end of the rim terminates adjacent to the slotted lever H when in one position, and the other end may terminate adjacent to the end of the slotted lever H when in the other position, and the projection 19 at the end of the section I′ is at such a distance from the axis of the shaft A that it will pass outside of the rim 18, but if pressed toward the disk D when the flange of the rim is adjacent to such projection 19, the flange 36 prevents the projection 19 passing toward the surface of the disk D until said flange 36 as it turns with the shaft A clears the projection 19, and such projection 19 then may rub against the flat surface of the slotted lever H that is below the surface of the flange 36 as such lever H passes by but is not caught by the projection 19, and then the said projection 19 assumes the position shown in Fig. 3 in the path of the end of the lever H, and the further rotation of the parts brings the outer end of the slotted lever H against the projection 19, and this projection 19 standing still, the disk D as it rotates carries the pivot 11 of the lever H along beneath the projection 19, and the lever H is turned from the position shown by full lines in Figs. 1 and 4, to the position shown by dotted lines, and in this

movement the slotted lever H acts against the pin 9 on the cam disk E, giving to the same the motion herein described and carrying the segment blocks F from their inner to their outer position and then projecting the chain pins G to cause them to engage the chain when the sprocket wheel has assumed its largest diameter.

In the movement before described it will be understood that the spring 17 yields when the end of the projection 19 rests upon the flange of the rim 18 and causes the section I′ to spring backwardly toward the disk D as soon as the lever H has passed the end of the projection 19, and when the rod K is moved in the other direction and the projection 19 is to be withdrawn from behind the flange of the rim 18, the spring 17 may also yield until the projection 19 passes clear of the flange of the rim 18. When the movement of the lever I takes place the pinion L is slipped along upon the tubular bearing J so that its teeth engage the teeth 15 of the lever H, and this pinion L being held from rotating by the pins upon the lever I, gives to the lever H a rotation in the opposite direction to that given by the projection 19, turning the said lever H back to the position shown by the full lines in Figs. 1 and 4; and it will be noticed that the teeth 15 upon the lever H separate from the teeth of the sliding pinion L as soon as the lever H has been restored to the position shown by full lines, and in so doing the segments F have been drawn in to form the sprocket wheel of the smallest diameter, as before mentioned.

Upon reference to Fig. 5, it will be observed that in place of using a single cam disk E, I have represented two cam disks E and E′ connected together by the tubular hub 20 which surrounds the hub B, and in this form the cam disks E and E′ are to be slotted precisely alike, and the segments F are to be provided with pins 4 at each side passing through the slots of the cam disks E and E′ and into the radial slots in the disk D, and the disk C is also to be provided with similar radial slots instead of employing the guide blocks 3, and in this arrangement the chain pins G are provided with pins 7 that cross over or project at each side in the form of a T, such pins passing through the slots in the cam disks E and E′ and into the radial slots in the disks C and D, and in this modification the cam disks E and E′ will act directly at each side of each segment F and at each side of the chain pins to project or retract the same uniformly and the risk of the parts sticking in their guides or slots will be reduced to a minimum.

The before mentioned devices can be made use of with the cam disk represented in Fig. 7, such cam disks being adapted to moving and holding the segments and chain pins at the extreme outward or extreme inward positions and at an intermediate position; and it will be observed that the slots in the cam disk E^2, shown in Fig. 7, are concentric at their inner ends and at their outer ends, as before described and similar to those shown in Fig. 2, and there is an intermediate or middle portion to each slot that is also concentric so that the movements of the segments and of the chain pins can be arrested midway between the extreme outer and inner positions when the cam disk E^2 is properly rotated; it is therefore only necessary to so modify the action of the slotted lever H as to give to the cam disk E^2 the proper movement to arrest and hold the same in one of three positions instead of either of two positions, and to effect this object the lever I, and the slotted lever H′ are made in substantially the form indicated in Figs. 6 and 8.

The lever H′ has three teeth 21 that are of full width and three teeth 23 that are of short width, and when the lever I is moved to draw the pinion L entirely back it does not engage either of the sets of teeth 21 or 23. When the pinion L is partially projected toward the disk D its teeth only engage the full or long teeth 21, and when the pinion L is fully moved toward the disk D its teeth engage the short teeth 23 and also continue to act upon the teeth 21, the object of this arrangement being that when the lever H′ is turned so as to stand radially and thereby to move the cam disk E^2 to bring the segments F to the middle position, such lever H′ can remain in the position indicated by the dotted lines 22, Fig. 6, and be held by the friction stop 24, and in so doing the pinion L will have been partially moved toward the disk D but it will not engage the teeth 23, but when moved fully toward the disk D, such pinion L will engage the teeth 23 and throw the lever H′ back to the position shown in full lines in Fig. 6, and when the lever H′ is thrown over into the position shown by the dotted lines 25, the teeth 21 will be engaged by a slight sliding movement of the pinion L so that the said lever H′ will be thrown by the action of the pinion L back to the position shown by the dotted lines 22.

The mechanism which I find advantageous to make use of for causing the section I^2 of the lever I to properly act upon the slotted lever H′ is as follows: It will be observed that the outer end of the lever H′ is different from the outer end of the lever H, and there is an offset lug 26 at one end of said lever H′, and upon reference to Fig. 8, it will be seen that the section I^2 at the end of the lever I is hook-shaped and the downwardly projecting end 27 in the position indicated by the full lines Fig. 8, will be in the path of the offset lug 26 and hence the lever H′ will be turned by the contact of the offset lug with the hook end 27 until the two parts separate as the lever H′ assumes the position shown by the dotted lines 22, and the lever I and its section I^2 may remain in the position indicated by full lines Fig. 8 and will cease to act as soon as the offset lug 26 separates from the hook end 27 and

the parts can continue to rotate. If now the lever I and the hook end 27 are swung so that the end 27 comes close to the outer surface of the disk D, its end 27 is in the path of the rear end 28 of the lever H′ so that such rear end 28 comes in contact with the hook end 27 and the lever H′ is swung from the position shown by dotted lines 22 to the position shown by the dotted lines 25. The rear end 28 of the lever H′ swinging inwardly clears the lower end of the hook 27 and the lever H′ remains in the position of the dotted lines 25 until otherwise acted upon.

When the lever I and its section I^2 are in the position last spoken of, the pinion L has been slid outwardly and farthest away from the teeth 21 and 23, and in order to turn the lever H′ from the position 25 to the position 22, it is necessary to move the lever I and bring the pinion L into contact with the teeth 21, and these will be acted upon by the stationary pinion L until the teeth 21 separate from the pinion L, such pinion L at that time being in the position shown by full lines in Fig. 8. If now the lever I is acted upon so as to push the pinion L closely toward the disk D, then the teeth of the pinion engage the shorter teeth 23 and turn the lever H′ back into the position indicated by the full lines in Fig. 6. If the lever I is moved from one extreme position to the other extreme position the segments and their chain pins will be moved from the extreme outward to the most inward positions, or the reverse, or the segments may be stopped at the intermediate position when moving either way.

By these improvements I am enabled to expand the sprocket wheel to the full diameter, or contract it to the smallest diameter or to maintain the segments of the sprocket wheel at an intermediate position so as to obtain three working diameters of the sprocket wheel.

It will be noticed by the dotted lines Fig. 4, that as the lever H is swung from one position to the other its outer end extends considerably beyond the periphery of the disk D. If this is objectionable in any particular character of velocipedes, the difficulty can be overcome by making the lever H in two parts, as indicated in Fig. 9, wherein the outer section H^2 is made to slide inwardly and it may be drawn in by the pin 33 acting at the inner end of the slot in the extension H^2, and the extension H^2 is moved outwardly by the pin 33 acting at the other end of the slot when the lever is turned into the position indicated by dotted lines in Fig. 9, but when the lever is turned back again into the position indicated by full lines it is necessary to project the extension H^2 into the path of the projection 19, and this may be effected by any suitable spring acting between the body of the lever and the slotted extension H^2, but by using a pin 31 in a slot 34 in the disk D the sliding extension H^2 will be carried in and out as the lever H is swung from one position to the other.

The slots in the cam disk E may be varied in shape so as to give the desired movements to the respective parts, and if desired the slots 6 for the pins 4 may be at an inclination instead of radial.

Under some circumstances it is preferable to make the end 27 of the lever extension I^2, Fig. 8, to slide radially and to bevel the lower end and to bevel the surface 36 of the flange 18, as shown in Fig. 8, and to employ a spring to press the end 27 downwardly, the object being to allow the lever I to be promptly moved by a downward pressure of the rod K, and in so doing to force the pinion L toward the disk D to cause such pinion L to turn the lever H or H^2 back and to bring the segment F toward the shaft A. In the form shown in Fig. 8 the bevel end of the piece 27 slides over the bevel of the flange to allow of the movement of said pinion, but the flat faces of the flange 36 and of the end 27 will prevent the movement of I^2 except between the ends of the flange 36.

If desired, the chain pins may be made with double points, as seen in the detached view Fig. 11, instead of with single points as in Fig. 1.

If desired, springs with recesses may be used, as seen at 38, Fig. 9, for catching the pin 31 and holding it and the slotted lever H in the extremes of the movements.

I claim as my invention—

1. The combination in a sprocket wheel, of segments and chain pins sliding through the segments, means for acting upon the segments to move them farther away or nearer to the axis of the wheel, and means for acting upon the chain pins so that their outer ends are in line or nearly so with the exterior surfaces of the segments at the time the segments are moved outwardly or inwardly, substantially as set forth.

2. The combination in a sprocket wheel, of disks and a connecting hub, segments between the disks, chain pins passing through the segments, cams for acting upon the segments to move them outwardly or inwardly and cams for acting upon the chain pins for moving them for engaging the chain or for separating the pins from the chain, substantially as set forth.

3. The combination in a sprocket wheel, of disks and a connecting hub, segments between the disks, pins projecting from the segments and guides upon the disks, chain pins passing through the segments and having laterally projecting pins, a disk with slots for acting upon the respective pins to move them outwardly or inwardly, and means for giving to the cam disk a partial rotation, substantially as set forth.

4. The combination in a sprocket wheel, of disks and a connecting hub, segments between

the disks, pins projecting from the segments and guides upon the disks, chain pins passing through the segments and having laterally projecting pins, a disk with slots for acting upon the respective pins to move them outwardly or inwardly, a lever pivoted upon the outer disk and acting to give motion to the cam disk, means for moving the lever, and giving to the cam disk a partial rotation, substantially as set forth.

5. The combination in a sprocket wheel, of disks and a connecting hub, segments between the disks, pins projecting from the segments and guides upon the disks, chain pins passing through the segments and having laterally projecting pins, a disk with slots for acting upon the respective pins to move them outwardly or inwardly, a slotted lever and teeth projecting around its pivot, a sliding pinion and a lever I to act upon the pinion to cause it to engage with or disengage from the teeth of the lever, and a projection to act against the outer end of the slotted lever to move it in one direction, substantially as set forth.

6. The combination in a sprocket wheel, of disks and a connecting hub, segments between the disks, pins projecting from the segments and guides upon the disks, chain pins passing through the segments and having laterally projecting pins, a disk with slots for acting upon the respective pins to move them outwardly or inwardly, a slotted lever and teeth projecting around its pivot, a sliding pinion and a lever I to act upon the pinion to cause it to engage with or disengage from the teeth of the lever, a projection to act against the outer end of the slotted lever to move it in one direction, and a rim around the disk interrupted adjacent to the slotted lever for acting upon the projection of the lever I, substantially as set forth.

7. The combination in a sprocket wheel, of disks and a connecting hub, segments between the disks, pins projecting from the segments and guides upon the disks, chain pins passing through the segments and having laterally projecting pins, a disk with slots with concentric end portions and intermediate inclined portions for acting upon the respective pins to move them outwardly or inwardly, and means for giving to the cam disk a partial rotation, substantially as set forth.

8. The combination in a sprocket wheel, of disks and a connecting hub, segments between the disks, pins projecting from the segments and guides upon the disks, chain pins passing through the segments and having laterally projecting pins, a disk with slots with concentric end and middle portions and intermediate inclined portions for acting upon the respective pins to move them outwardly or inwardly, and means for giving to the cam disk a partial rotation, substantially as set forth.

9. The combination in a sprocket wheel, of a series of segments and means for supporting and moving them nearer to or farther from the axis, and chain pins and means for separately moving the same for engaging the chain after the segments have been expanded or the reverse, substantially as set forth.

10. The combination in a sprocket wheel, of a series of segments upon which the chain rests, means for moving them nearer to or farther from the center of the wheel and separate chain pins or devices for engaging the chain, and means for moving such chain pins into engagement after the segments have been projected and for withdrawing such chain pins before the segments are retracted, substantially as set forth.

11. The combination in a sprocket wheel, of a series of segments and chain pins, a slotted disk for guiding the segments as they are projected or retracted, a disk with cam slots for acting upon such segments and a lever and means for actuating the same for turning the cam disk, a lever with a projection for engaging the intermediate lever that acts upon the cam disk to move the same in one direction, a sliding pinion and teeth projecting around the pivot of the disk for giving motion to the same in the opposite direction, substantially as set forth.

Signed by me this 23d day of November, 1893.

WILLIAM A. LEGGO, JR.

Witnesses:
GEO. T. PINCKNEY,
A. M. OLIVER.