No. 618,650. Patented Jan. 31, 1899.

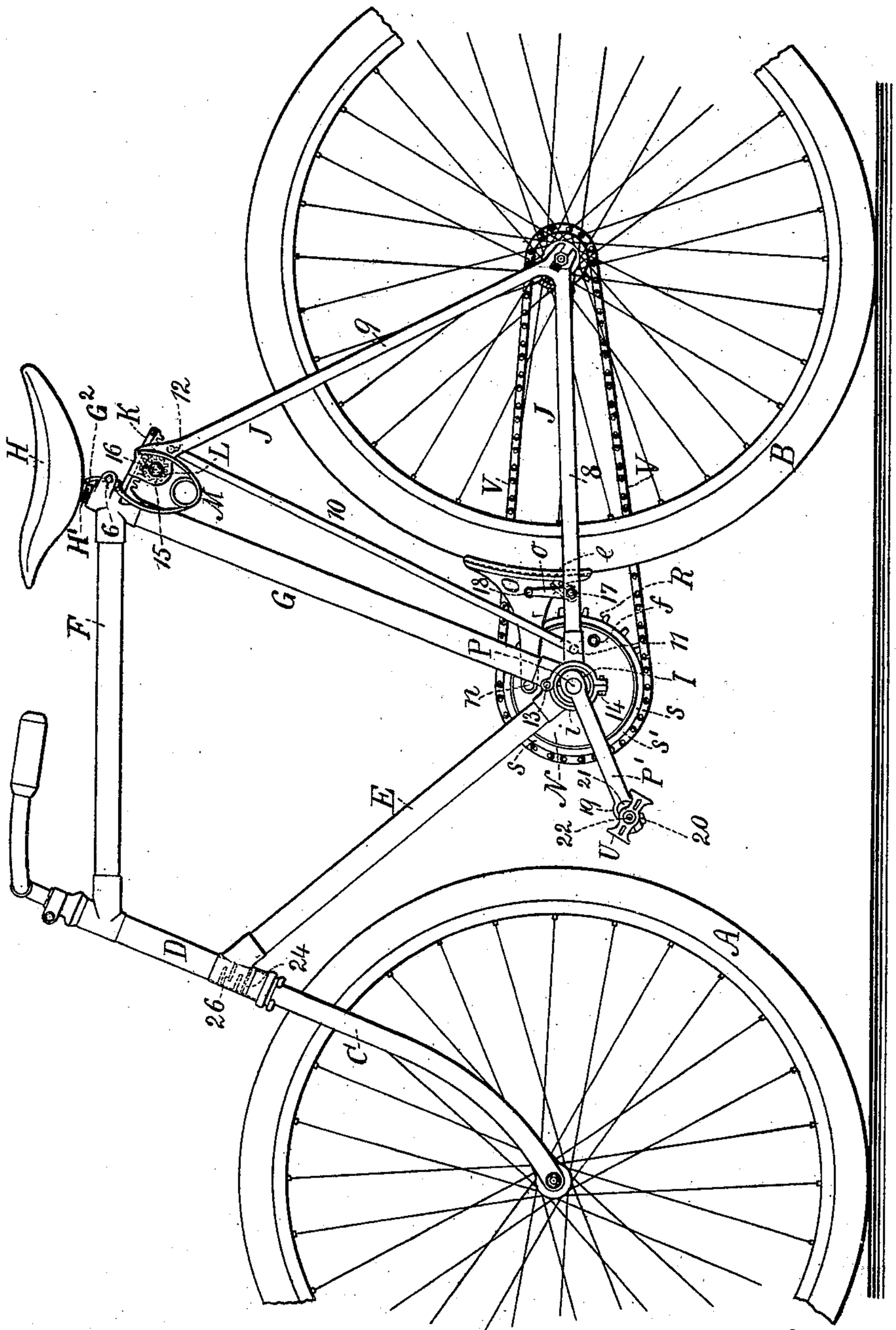
F. ECAUBERT.

BACK PEDALING BRAKE.

(Application filed Apr. 5, 1897.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



Witnesses:
J. Staib
Chas. F. Smith

Inventor:
F. Ecaubert
by L. W. Serrell & Son
Attys

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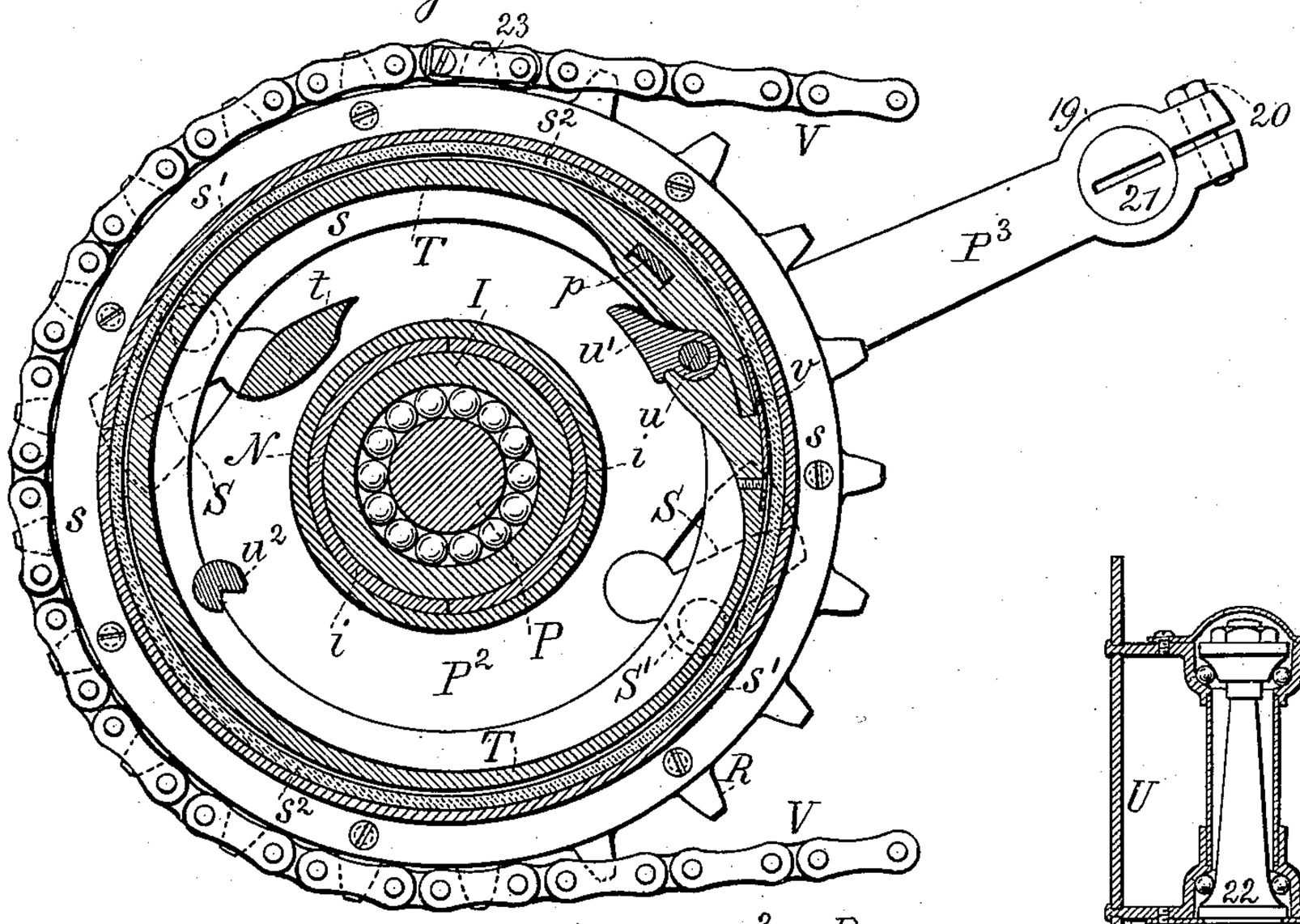
Fig. 3.



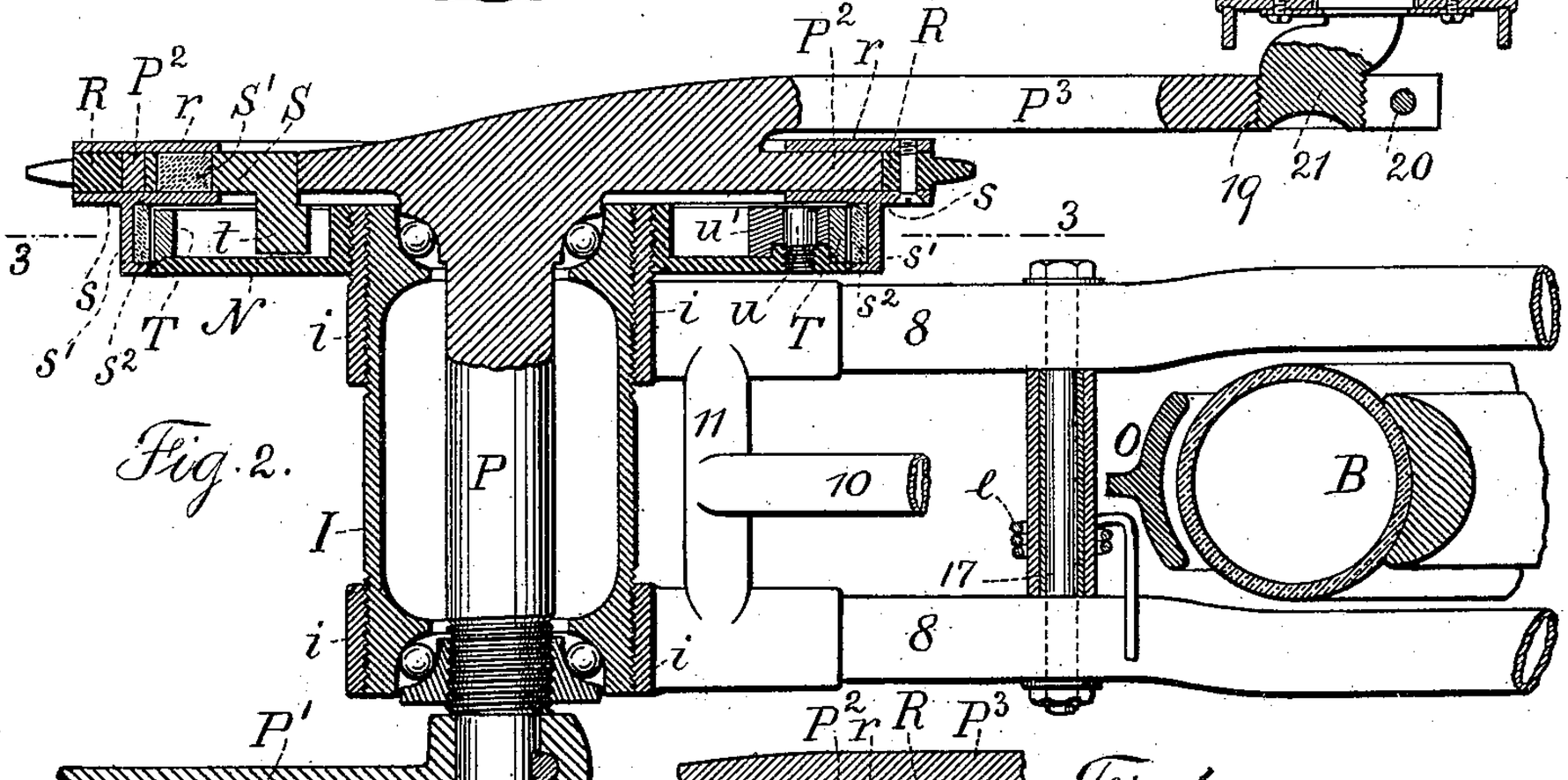


Fig. 2.

Fig. 6.

Witnesses:
J. Stair
Chas. H. Smith

Inventor:
F. Ecaubert
by L. W. Serrell & Son
Attys

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Fig. 5.

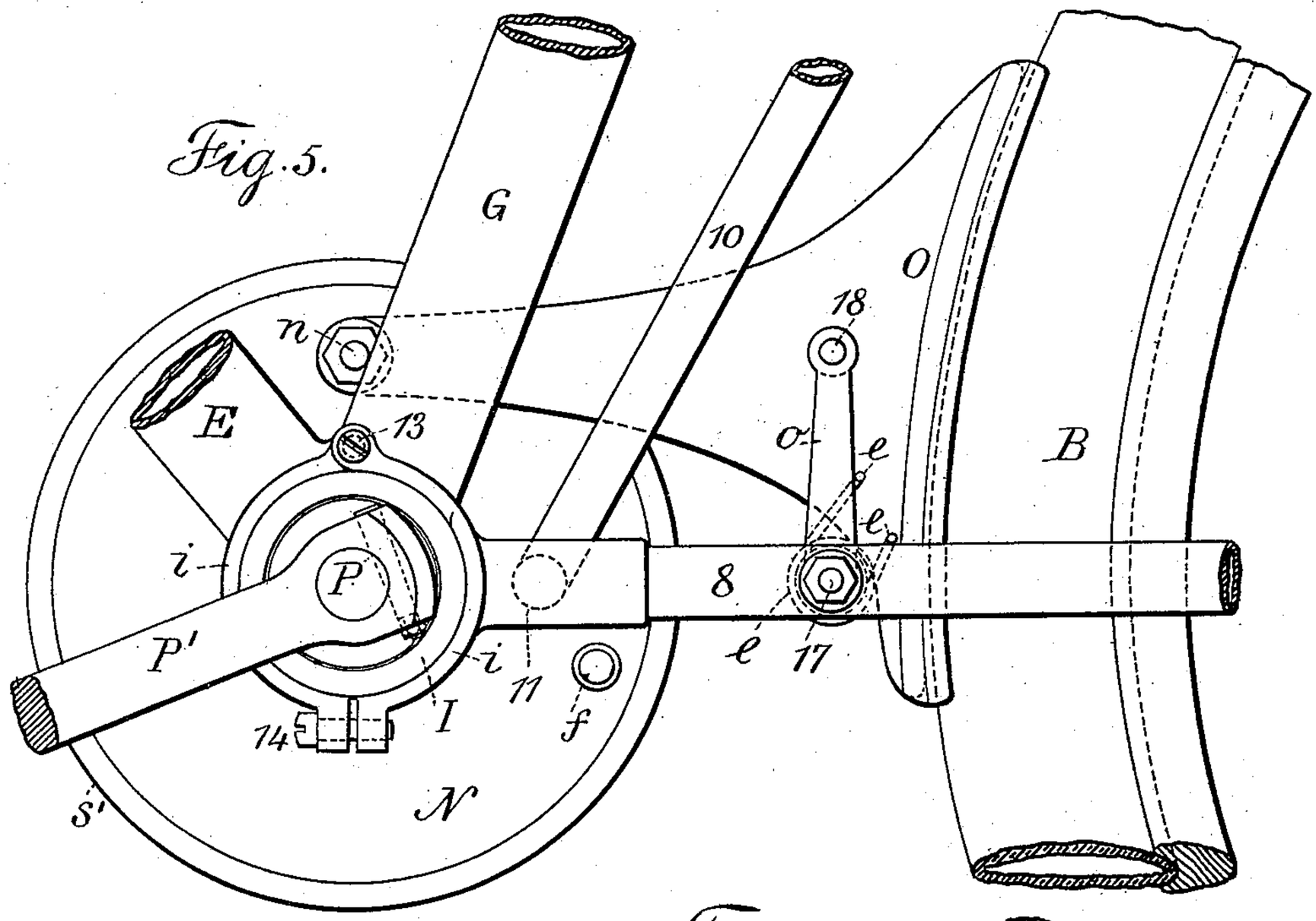


Fig. 4.

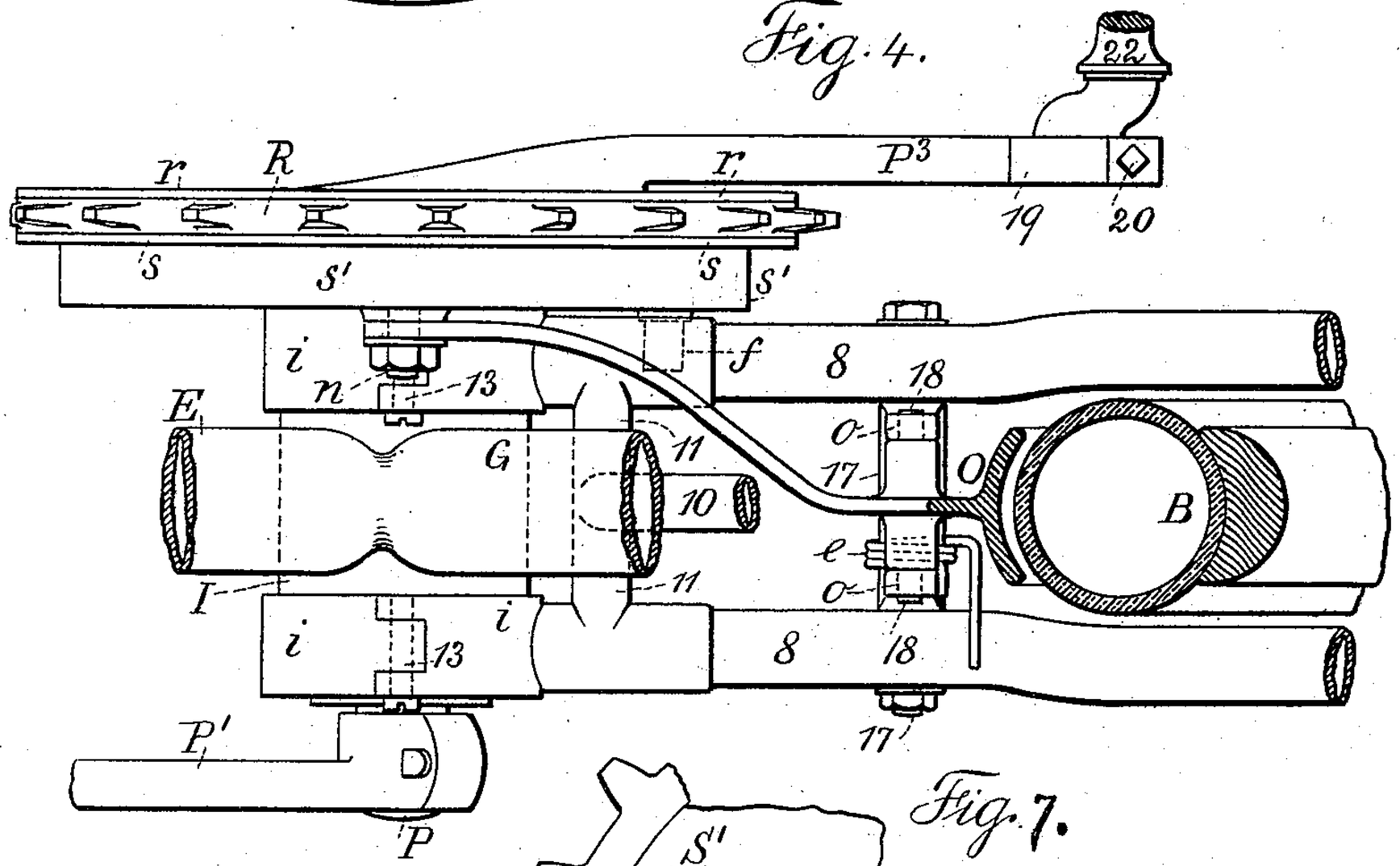
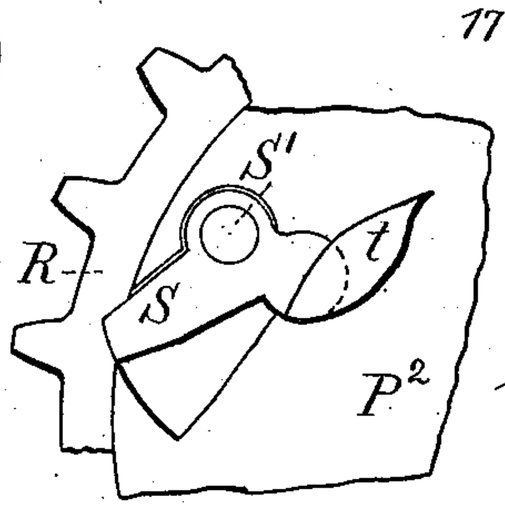


Fig. 7.



Witnesses:
J. Stair
Chas. A. Smith

Inventor:
F. Ecaubert
by L. W. Serrell & Son
Attys

UNITED STATES PATENT OFFICE.

FREDERIC ECAUBERT, OF NEW YORK, N. Y.

BACK-PEDALING BRAKE.

SPECIFICATION forming part of Letters Patent No. 618,650, dated January 31, 1899.

Application filed April 5, 1897. Serial No. 630,682. (No model.)

To all whom it may concern:

Be it known that I, FREDERIC ECAUBERT, a citizen of the United States, residing at New York, (Brooklyn,) in the county of Kings and State of New York, have invented a Bicycle, of which the following is a specification.

In this cycle there is a crank-shaft barrel at the junction of the saddle-post tube and the brace extending to the tube for the fork, and this crank-shaft barrel has a projecting end that is peripherally grooved, and thereupon is a brake-disk having a pin connected with a brake supported by links, so that by turning this brake-disk more or less the brake is applied to the hind wheel. The crank-shaft passes through the crank-shaft barrel, and there is a crank upon one end, and usual ball-bearings are provided within the crank-shaft barrel, and upon the other end of the crank-shaft is a disk, and from this projects the other crank, and around this disk is a sprocket-ring that receives the chain extending to the rear sprocket-wheel, and a pawl upon the crank-shaft disk engages the sprocket-ring when the crank-shaft and cranks are being driven forward, and this pawl disengages from the sprocket-ring when the crank-shaft is held stationary, so that the parts are free to revolve when coasting. By turning the crank-shaft backward by the action of the pedals an expansive brake is brought into action within an annular flange upon the sprocket-wheel, so as to apply any desired extent of detaining friction to the sprocket-ring and through the chain to the back wheel. The pedals are also used to turn the brake-disk and apply the brake to the tire of the back wheel, and in case the chain breaks while applying friction to the sprocket-wheel the tire-brake is brought into action by a slight movement of the pedals. By this improvement I am enabled to apply the brake either through the chain or by the direct action of the brake on the periphery of the rear wheel and to control the brakes to any desired extent simply by the action of the feet upon the treadles, thus leaving the hands free for steering the machine and allowing for stopping the cycle in cases of emergency by the action of the feet with as much rapidity as is consistent with safety.

In the drawings, Figure 1 is a general elevation of the cycle. Fig. 2 is a horizontal section through the crank-shaft barrel and one of the pedals. Fig. 3 is a view of the interior parts behind the crank-shaft disk at the line 3 3 of Fig. 2. Fig. 4 is a plan view with part of the wheel and brake in section. Fig. 5 is an elevation showing the tire-brake, the crank-shaft barrel, and the portions of the frame immediately adjacent thereto. Fig. 6 is a section illustrating a modified connection of the brake-disk to the crank-shaft barrel, and Fig. 7 shows the pawl and part of the disk and sprocket-ring.

The front wheel A and back wheel B are of any desired character, and the stem of the steering-fork C passes through the tube D, and there is a bottom brace E and a top brace F, extending to the saddle-post tube G, and at the junction of the bottom brace E and saddle-post tube G is the crank-shaft barrel I. These parts are to be brazed together and provided with connecting-thimbles in any desired manner. The saddle H is of any desired character, and the saddle-post H′ is received into the tube G.

The crank-shaft barrel may project more at one side than at the other, preferably on the right side, so as to extend beyond the horizontal member 8 of the double angle-frame, and upon the screw-threaded end of the crank-shaft barrel the brake-disk N may be screwed, as seen in Fig. 12, or the disk may be on the grooved or screw-threaded cylindrical projection at the two-part eye, as shown in Fig. 2, and upon the back of this disk a stud *n* projects and receives the arm of the brake O, and there are links *o* pivoted at 17 between the horizontal members 8 of the double angle-frame J, and their upper ends are connected to the arm or plate of the brake O at 18, and this brake O is advantageously made concave on the face adjacent to the pneumatic tire of the back wheel B, and the brake itself is preferably an arc of a circle corresponding to the surface of the pneumatic tire. A spring should be provided at *e* to press the brake away from the wheel-tire, and a stop *f* limits the turning movement of the brake-disk N in this direction.

It is now to be borne in mind that the disk N can turn upon its bearing around the barrel I, and the brake will also swing upon the

links *o* and will be carried bodily toward or from the wheel by a partial rotation of the disk N, and the direction of rotation of the sprocket-wheel is such that any friction therefrom against the disk N will tend to draw the tire-brake O away from the wheel.

The crank-shaft P passes through the barrel I, and ordinary ball-bearings are applied between the crank-shaft and the barrel, and the crank P′ at one end may be of usual character, and upon the other end of the crank-shaft is a disk P^2, from which projects the crank P^3, and the sprocket-ring R surrounds the disk P^2, there being a ring *r* at the outer side lapping upon the surface of the disk P^2, and a ring or flange *s* on the inner side of the sprocket-ring extending over and surrounding the disk P^2. The rings *r* and *s* are permanently attached to the sprocket-ring and preferably by screws, as shown. One of these rings, however, may be made with the sprocket-ring as an inward flange thereupon. The cylindrical flange *s′* projects to the rear from the ring *s* and is permanently connected to such sprocket-ring or made as part of the same, so as to revolve with the sprocket-ring, and this sprocket-ring R can turn or revolve around the disk P^2 while such disk may be held stationary, but when the pedals are in use in propelling the cycle the power is communicated through the disk P^2 to the ring R by a pawl, as next described.

One, two, or more pawls S may be employed, and where there is more than one they should be at equal distances apart, so that the ends of the pawls may engage notches in the interior of the sprocket-ring R, and each pawl is made with a cylindrical pivot inserted laterally into a circular recess in the edge of the disk P^2, and the pawl extends between the back ring *s* of the sprocket-ring and the removable front ring *r*, and there is a transverse opening or eye through the pawl receiving into it a piece of cork S′ or equivalent material, such as leather or rawhide, the ends of which are in contact with the inner surfaces of the rings *r* and *s*, so that there is a friction upon the pawl. Hence if the sprocket-ring is turned faster than the disk P^2 the friction will swing the end of the pawl out from the recess in the sprocket-ring and disconnect the two, and when the disk P^2 is being turned more rapidly than the sprocket-ring is moving the friction will throw the pawl out against the interior of the sprocket-ring, and the pawl will slide upon such interior surface until it comes opposite to one of the notches within such sprocket-ring, and the pawl will then pass into the notch and connect the parts, so that they move together.

At one side of the pawl and projecting toward the brake-disk N is a cam *t*, for a purpose hereinafter described. Upon the brake-disk N is a stud *p*, carrying the thicker end of an expansion-brake T, the same being in the form of a strip of decreasing thickness coiled up into a circular form, with a mortise through it receiving the stud *p*, and adjacent to the stud *p* is a stud *u*, receiving a toggle-piece *u′*, that is provided with a shoulder receiving the extreme end of the expansion-brake T, the metal of the expansion-brake being thickened adjacent to the extreme end and shaped to coincide, or nearly so, to the other end of the expansion-brake, so that the exterior of the expansion-brake will be circular, and a thin lapping-plate *v* is connected to one end of the expansion-brake and passes into a depression in the peripheral surface of the other end of the expansion-brake, so as to make the peripheral surface substantially complete and adapted to act as a brake within the annular flange *s′* of the sprocket-ring R, and this annular flange may be lined with cork, leather, or other suitable material S^2, so that when the expansion-brake T is actuated a detaining-friction will be applied to the sprocket-ring and through the chain and rear sprocket to the driving-wheel, and it is advantageous to make on one edge of the expansion-brake T a circular rib to lap over the rabbeted exterior edge of the brake-disk N and to construct the expansion-brake so that it will contract closely around the rabbeted edge of the brake-disk and the contraction be thereby limited, so that the entire surface of the expansion-brake will normally be out of contact with the interior surface of the annular flange *s′*.

In practice I have found that leather and similar substances when employed in a brake for cycles are liable to injury from the heat that is generally and necessarily developed, the leather becoming shriveled by the action of the heat, and in cases where the brake-surface of leather may become wet it is liable to expand and tighten. When cork is employed for the brake-surface, I find that it does not expand by the action of moisture, and the heat that may be developed by the friction does not injure the same unless it is sufficient to char the surface of the cork, and even when this happens the surface of the cork may catch fire without the rest of the cork being injured by the action of the heat. Hence the cork surface for a cycle-brake has been found more efficient than other materials heretofore employed.

It will now be understood that if the toggle-piece *u′* is turned upon its stud *u* it will press against the extreme end of the expansion-brake T and expand such brake within the annular flange *s′* of the sprocket-ring, and the shapes of this toggle-piece *u′* and the cam *t* on the pawl S are such that when the crank-shaft is turned backward by the action of the cranks and pedals and the pawl S thrown out of gear with the sprocket-ring, the cam *t* will be turned into the path of the toggle-piece *u′*, but will not act upon the same unless the crank-shaft is turned backward sufficient to carry the end of the cam against the toggle-piece *u′*, and thereby expand the brake T within the annular flange of the

sprocket-ring, and by this means the pedals and crank-shaft can be made to apply more or less power by the expansion-brake to the sprocket-ring.

Ordinarily the brake O will remain out of action when the expansion-brake T is applied, the spring *e* keeping the stop *f* against the frame, but should an unusual pressure be employed to turn the crank-shaft backward or should the chain break, the cam *t*, acting on the toggle-piece *u'*, will turn the brake-disk N and bring the brake O into action against the wheel-tire.

If it is desired to bring the brake O into action without using the expansion-brake T, so as only to act upon the tire of the wheel, the pedals may be stopped in such a position that the cam *t* on the pawl S, instead of contacting with the toggle-piece *u'*, may engage the stud u^2 on the brake-disk N and turn the brake-disk by a direct pressure thereon, so as to carry the brake O bodily against the periphery of the wheel, and in so doing the brake O will be actuated alone and without any assistance from the expansion-brake T, and as soon as the crank-shaft and pedals are started forward the parts automatically release themselves and assume the normal position for propelling the cycle.

In consequence of the expansion-brake T being normally out of action and contracted around the edge of the disk N there is no friction thereon nor any wear of the parts therefrom, and the cam *t* on the pawl moves around without touching anything, and when the pawl is thrown out of contact with the sprocket-ring such pawl swings inward and the cam *t* moves outward, and by the backward movement of the pedals this cam *t* passes in between the toggle-piece *u'* and the expansion-brake and swings such piece *u'* so that it acts like a toggle upon the end of the brake T to expand the same within the flange *s'*, and the swinging movement given to the toggle-piece *u'* not only expands the brake-ring T, causing it to fill the interior of the annular flange *s'*, but it presses the end portions of the expansion-brake bodily toward and against the interior of the brake-surface s^2, and this is especially the case where the joint *u* is formed of a stud projecting from the disk N, as shown in Fig. 2. Where there is a second pawl S, as seen in Fig. 3, it will be made without any cam *t*, as there should be only one pawl with a cam.

It is to be understood that when the pedals are actuated by the feet in propelling the cycle the disk N and pawl S revolve together and the pawl is in engagement with the sprocket-ring and the cam *t* passes around but does not touch the stud u^2 or the toggle-lever *u'*; but if the pedals and the disk N are held the pawl is swung by the friction and the cam *t* is turned, and when the parts are held by one of the feet this cam is near the stud u^2, and by pressing that foot downward the cam *t* is caused to press against such stud and apply the brake O. If the parts are stopped in such a position that a downward movement can be given by the other foot, the cam *t*, which will then be near the toggle-lever *u'*, is made to act thereon and expand the brake T and apply a friction to the sprocket-ring for braking the driving-wheel through the connection thereto of the chain V, and the extent of the brake action will be in proportion to the pressure applied by the foot and through the cam *t* to the toggle-lever *u'* and brake T.

Inasmuch as the propulsion of the machine and the action of the brake are controlled entirely by the pedals it is important to be able to adjust the leverage of the cranks and pedals so that the rider may have full control by the feet, both in propelling and in stopping the machine. To provide for this condition, the end of each crank-shaft is made with an internally-screw-threaded eye 19, with a clamp-screw 20, and within the eye is a screw-threaded plug 21, from which passes out an eccentrically-placed or crank-shaped spindle 22 for the pedal U. This pedal may be of any desired character; but the length of the crank can be varied at will by slackening the clamp-screw 20 and turning the plug 21 in the screw-threaded eye 19, and to effect this object it is advantageous to provide a cross-slot $21^{\times}$ in the rear end of the screw-threaded plug for the reception of a screw-driver or other implement for turning the plug within the eye, and thereby carrying the spindle 22 nearer to or farther from the crank-shaft, and by tightening the screw 20 the pedal will be permanently held in the position to which it has been adjusted.

In Fig. 12 the inner portion of the brake-disk N is represented as made with an annular recess and with a rib around the hub, and the eye *i* at the end of the horizontal member 8 is recessed to receive this hub and rib.

The chain V extends from the sprocket-wheel on the crank-shaft to that on the driving-wheel B, and at 23 a spring is shown as connected to the screw-pivot that unites the ends of the chain; but this forms the subject of a separate patent, granted April 19, 1898, No. 602,663.

I claim as my invention—

1. The combination with a driving-wheel, crank-shaft, sprocket-wheels and chain, of two brake devices, one acting against the surface of the wheel and the other acting on the sprocket-wheel, a clutch connecting the driving devices in forward and releasing in back pedaling and mechanism between the crank-shaft and the respective brakes and actuated by the cranks, whereby either or both brakes can be brought into action by a backward movement of the crank-shaft, substantially as set forth.

2. The combination with the driving-wheel, crank-shaft, sprocket-wheels and chain and a clutch driving mechanism, of two brake devices actuated by a backward movement of

the crank-shaft, one of the brake devices being between the sprocket-wheel and the crank-shaft, the other brake device consisting of a brake to act upon the surface of the driving-wheel, a brake-disk or turning device around the crank-shaft and a connection therefrom to the brake, and a mechanism brought into action by the backward movement of the crank-shaft for partially turning the brake-disk and applying the brake to the driving-wheel, substantially as set forth.

3. The combination in a cycle with the frame and crank-shaft barrel rigidly connected and having an external screw-thread around the projecting end of the barrel, of a disk screwed upon such thread, a brake to the rear wheel and a connection therefrom to the said barrel-disk, cranks and crank-shaft passing through the barrel, a disk upon the crank-shaft, a sprocket-ring surrounding this crank-shaft disk, a pawl for connecting this disk and the sprocket-wheel in forward propulsion, and a cam projecting from the pawl and a projection on the barrel-disk that is engaged by the cam when the cranks are turned backward for moving the barrel-disk and applying the brake to the wheel, substantially as specified.

4. The combination with the cycle-wheel frame and crank-shaft barrel, of a brake for acting upon the periphery of the wheel, a brake-disk surrounding the crank-shaft and a connection therefrom to the brake; cranks, crank-shaft and a disk upon the crank-shaft, a sprocket-wheel surrounding the disk, a pawl for connecting the disk and sprocket-wheel and a projection upon the pawl for engaging the brake-disk and applying the brake to the wheel by a backward movement of the crank-shaft, and a frictional device between the sprocket-wheel and the crank-shaft disk for acting as a brake through the sprocket-wheel and connection to the driving-wheel, substantially as set forth.

5. The combination with the cycle-frame having a crank-shaft barrel with projecting screw-threaded ends, of a crank-shaft passing through the barrel, a disk upon the crank-shaft, a sprocket-wheel surrounding the disk and ring-flanges upon the sprocket-ring and at the sides of the disk, a pawl pivoted upon the disk and engaging the interior of the sprocket-ring and having a projecting cam at one side of the disk, an expansion-brake acting within a flange of the sprocket-ring and mechanism brought into action by the cam of the pawl when the latter is disengaged from the sprocket-ring and receives a backward motion from the crank-shaft and pedals, for applying the expansion-brake to the sprocket-ring, substantially as set forth.

6. The combination in a cycle with the sprocket-ring, crank-shaft and cranks, of a brake for the driving-wheel, clutch mechanism for connecting the crank-shaft and sprocket-wheel in driving the cycle, a brake for the sprocket-wheel and mechanism for actuating the same by a backward movement of the crank-shaft when the pedals are in one position, and mechanism for actuating the brake of the driving-wheel by a backward movement of the crank-shaft when the pedals are in a different position, substantially as set forth.

7. The combination with the crank-shaft barrel, crank-shaft and a disk thereon, of a sprocket-ring surrounding the disk, a pawl between the crank-shaft disk and the sprocket-ring, there being teeth within the sprocket-ring to engage the pivoted pawl in forward propulsion, rings or flanges for holding the sprocket-ring upon the crank-shaft disk, a disk around the crank-shaft barrel, an expansible brake supported upon such disk and acting upon the sprocket-ring and a projection upon the pawl and mechanism actuated thereby for expanding the brake and causing it to act upon the sprocket-ring, substantially as set forth.

8. The combination with the holding and moving surfaces in a cycle-brake mechanism, of a layer of cork between such surfaces, substantially as and for the purposes set forth.

9. The combination with the crank-shaft barrel, shaft and cranks, of a disk upon the crank-shaft, a sprocket-ring surrounding the disk, a pawl connection between the disk and the sprocket-ring to drive the latter forward and to release in back-pedaling, a second disk surrounding the end of the crank-shaft barrel and adapted to receive a partial revolution, a brake for the cycle-wheel and a connection from the same to the second disk, an annular flange upon the sprocket-ring surrounding the second disk and an expansion-brake supported by the second disk and acting within the annular flange of the sprocket-ring, mechanism for moving the second disk and for expanding the brake, substantially as set forth.

Signed by me this 1st day of April, 1897.

F. ECAUBERT.

Witnesses:
GEO. T. PINCKNEY,
S. T. HAVILAND.