No. 634,252. Patented Oct. 3, 1899.

V. WEBER.

BICYCLE GEARING.

(Application filed Oct. 17, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

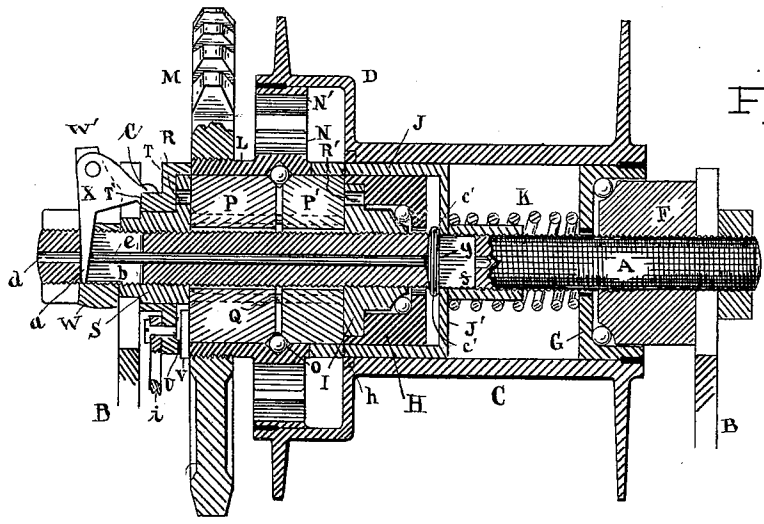


Fig. 2.

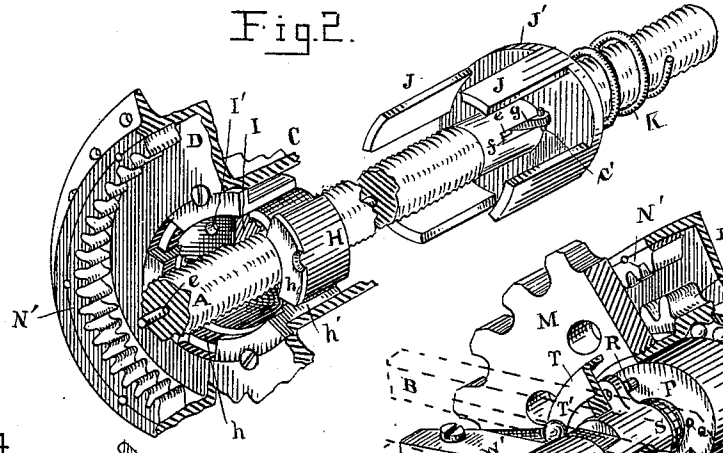


Fig. 3.

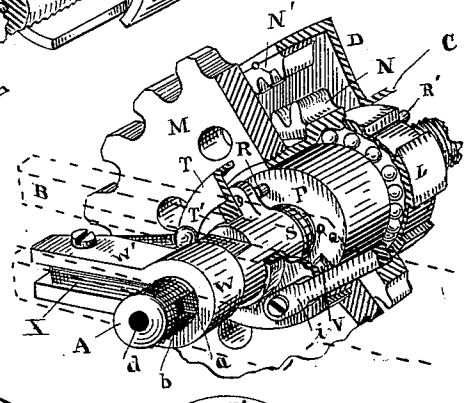
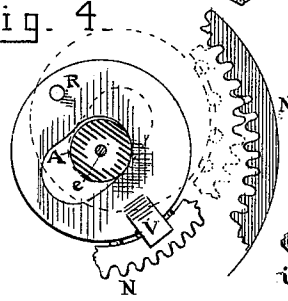


Fig. 4.



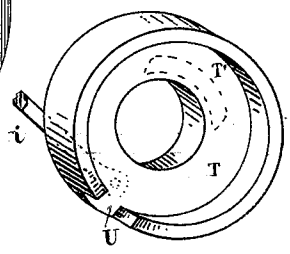


Fig. 5.

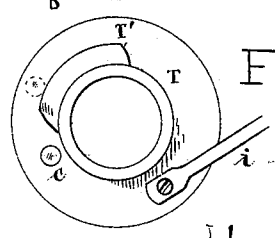


Fig. 6.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 8.

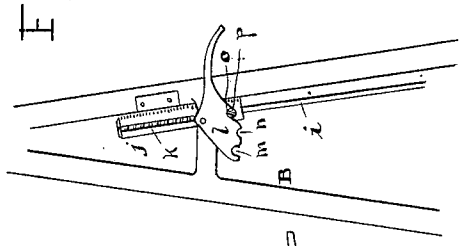


Fig. 9.

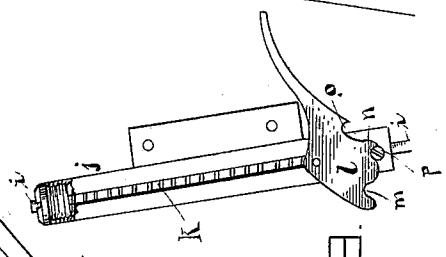


Fig. 7.

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UNITED STATES PATENT OFFICE.

VALENTIN WEBER, OF PEORIA, ILLINOIS.

BICYCLE-GEARING.

SPECIFICATION forming part of Letters Patent No. 634,252, dated October 3, 1899.

Application filed October 17, 1898. Serial No. 693,705. (No model.)

To all whom it may concern:

Be it known that I, VALENTIN WEBER, a citizen of the United States, residing at Peoria, in the county of Peoria and State of Illinois, have invented certain new and useful Improvements in Bicycle-Gearing; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to bicycle-gearing.

The object of the invention is to furnish a simple gear-changer for bicycles easy of manipulation and positive in its action.

To this end I provide the construction shown in the drawings forming a part of this application, and in which—

Figure 1 is a longitudinal section of the shaft and the various necessary parts. Fig. 2 is a perspective view of a portion of the shaft, showing various portions of the gear-changing mechanism thereon, but separated to better show construction. Fig. 3 is also a perspective view of a section of the shaft, showing other parts, which in practice engage with the portions shown in Fig. 2. Fig. 4 is a face view of a swinging gear-carrier, showing the two extreme positions thereof. Fig. 5 is a perspective view of a cam-plate used in changing the speed-gear. Fig. 6 is a face view of the same, showing a cam upon its surface, together with an operating-rod. Fig. 7 is a view of a portion of a bicycle, showing an operating-rod connected with the plate described in Fig. 6, which runs up to a point near the saddle and there controlled by a cam arrangement. Fig. 8 is a view of the rear of the bicycle-frame, showing the cam arrangement attached thereto. Fig. 9 is an enlarged view of the cam arrangement shown in Fig. 8.

In the figures, A is the shaft of the rear wheel, which is held in the usual manner between the rear bifurcated ends of the frame B.

C is the hub, having bearings on the shaft by means of the cones F and I (on the shaft) and cups G and H, (in the hub,) as in usual practice. The cup H is fitted snugly within the hub, and its flanged end *h* is let into the wall of that portion, so as to be flush therewith. Said cup is grooved longitudinally on its periphery, as shown at *h'*, Fig. 2, to form tunnels between it and the hub, said tunnels being occupied by projections or fingers J upon a sliding clutch J'. This clutch surrounds the shaft and at certain times is controlled by a spring K, surrounding the shaft and bearing against the clutch and the cup G. The cone I is adjustable on the shaft by screw-threads or other good means. An aperture I' is made in the flange of said cone, the use of which will be hereinafter explained. A drum L carries the sprocket-wheel M and a pinion N, the latter adapted to engage at times an internally-toothed gear-wheel N' within the enlargement of the hub and lies in the same plane as said gear. A ball-race O is turned in the interior of the said pinion, and two cones P and P', having beveled ends, which together form also a ball-race, are inserted in the sleeve L and are rigidly connected together by screws Q or their equivalents. These cones are provided with two pins R and R', the latter entering the aperture I' in the cone I, before described. The former pin is in line with the pin R' and has similar pivotal connection with a fixed sleeve S, screwed onto the shaft and held in the frame B. Each of the cones just referred to is provided with a slot slightly wider than the diameter of the shaft A and extends from the immediate center of the cones to a point near the edge thereof, forming in this manner a slot concentric with the pins or pivots R and R', or, more correctly, the slots are arcs of a circle whose center lies in the pins described. It will be seen by this that any movement of the cones about the pins or pivots will move the pinion N also about the same pivotal point. The pins may be placed in the cone I and sleeve S and the holes in the cones P P' and acquire the same results. A cam-plate T (shown in Figs. 5 and 6) is slipped upon the sleeve S and is given an oscillating movement thereon by an operating-rod to be described. A cam T' is secured to or forms part of the plate T and is concentric with its bore. The flange of the plate T is notched at U and engages a lug V on the cone P, which is shown opposite the pin R'. Upon the shaft, outside the frame B, is a yoke W, having the ears W'. Between is pivoted a dog X, whose point *a* projects within a longitudinal slot *b* in the

shaft, near the end thereof, as shown, while the head *c* on said dog approaches the cam T′ and is operated thereby. The shaft is provided with a longitudinal bore *d*, wherein is a pin *e*, which extends through to the clutch J′ and slightly beyond it, and a transverse slot *f*, similar to the slot *b*, is cut in the shaft at about its middle length, and a cross-head *g* is held therein by pins *c′ c′*. As before stated, the yoke W, carrying the dog X, is located outside the fork of the frame and is held against rotary movement by the binding of the lock-nut usually employed and by a shoulder projecting within the fork, but not shown. The cross-head is designed to bear against and operate on said clutch J′ by a pressure of the pin E, due to the dog X, giving longitudinal movement to the clutch when disengaging the elements composing the driving mechanism for the high gear.

An operating-rod *i* is pivoted to the cam-plate T and extends upwardly to a point beneath the saddle, as shown in Figs. 7 and 8. The latter figure shows the means for operating the rod, and Fig. 9 shows the same enlarged to better show construction.

Upon one of the reaches of the frame is secured a tube *j*, within which is a spiral spring *k* and the end of the rod *i*. A cam *l*, having notches *m*, *n*, and *o*, is pivoted on the rod *i* in suitable manner, and as the cam is raised by means of its handle the rod *i* is also raised and a lug *p* on the said tube engages the notches referred to. This action results by reason of distance between each succeeding notch and the pivotal point of the cam increasing as the cam is raised. When lowered, the spring *k* brings the rod to its lower position, as at first.

Having thus fully described the invention and plainly shown its several parts in the drawings, the operation will now be fully understood.

In the position shown in Fig. 1 the mechanism used for high gear is in use. To show that such is the case, it will be noted that the sprocket-wheel and the drum L are as an integral part and that the fingers J of the clutch are in engagement with said drum, thereby forming a rigid connection between the said sprocket-wheel and the hub C by the channels in the cup H. Upon raising the cam *l* the cam T′ of the plate T, which has hitherto been free of the head *c* of the dog X, now engages that portion, and by reason of the pivotal connection of the dog X with the yoke W the point *a* is moved within the slot *b* in a direction to give the pin *e* longitudinal movement to shift the cross-head *g*, as well as the clutch J′, upon the shaft, thereby withdrawing the fingers J from the drum L and releasing that portion and its sprocket-wheel from the wheel-hub. In this position the hub revolves about its shaft and the sprocket remains free, and movement imparted to the pedals in no way affects the rear wheel, and therefore the device is in position for coasting, and the cam *l*, which operates the rod *i*, lies at this time at middle position *n*, as in Fig. 9. Bicycles may be built with this coasting feature and without the low-gear elements, if desired. By raising the cam *l* still farther, so as to bring the notch *m* into engagement with the lug *p* on the rod, the cam-plate T is revolved still farther upon the sleeve S, thereby raising the lug V on the cone P by the notch U, swinging said cone and the cone P′ upon the pivots R and R′, as shown in Fig. 4, thus carrying the pinion N into mesh with the internal gear, where it remains (at low gear) until released by the opposite movement of the operating-cam in returning to the position started from. The notch U is of such width that while the cam-plate is moving about the sleeve S to disengage the high-gear elements those portions are made entirely free before the lug V begins to rise to engage the low-gear portions.

The lowering of the cam *l* permits all parts within the hub to move freely, and the spring bearing upon the clutch J′ throws that portion into engagement with the high-speed driving parts and pushes the pin *e* against the dog *a*, which is now free to move by reason of the withdrawal of the cam T′ from beneath its head *c*. The rate of speed at which the bicycle will move with a given number of revolutions of the pedals will depend upon the difference in the sizes of the sprocket-wheels when the sprocket M and the hub C are locked together, as for the high speed; but when the pinion N and the internal gear are in mesh the speed will be greatly reduced, the pedals moving at the same rate as before, because of the smaller size of the pinion as compared with the internal gear. The new features lie in providing the cones P and P′ with the pivots described, mounting the gear and sprocket upon these cones, and providing the cones with slots arranged in the arc of a circle, using the pivots as the center of that circle to accomplish the meshing of the gears, and the use of the dog X in conjunction with the cam T′ on the plate T, and the rod or pin *e* within the bore of the shaft and operated by the dog to disengage the parts in the manner described, all of which I consider new.

It is obvious that various changes in the construction of this device may be made without departing from the spirit of my invention.

I claim—

1. In bicycle-gearing, the combination with a shaft held in the bicycle-frame, of the wheel-hub having bearings on the shaft, an internal gear-wheel in the hub, a clutch surrounding the shaft, projections or fingers thereon, a spring for operating the clutch, openings through the hub portions for the passage of the fingers, a drum within the internal gear, channels therein for engaging the fingers of the clutch, a pinion on the drum for engag-

ing the internal gear, bearing-cones for supporting the drum, pivots on the cones for permitting lateral movement thereof and slots in the cones in the region of the shaft for permitting such lateral movement all for the purposes described.

2. In bicycle-gearing, the combination with a shaft held in the bicycle-frame, of the wheel-hub having bearings on the shaft, an internal gear-wheel in the hub, a clutch surrounding the shaft, projections or fingers thereon, a spring for operating the clutch, openings through the hub portions for the passage of the fingers, a drum within the internal gear, channels therein for engaging the fingers of the clutch, a pinion on the drum for engaging the internal gear, bearing-cones for supporting the drum, pivots on the cones for permitting lateral movement thereof and slots in the cones in the region of the shaft for permitting such lateral movement, a cam-plate for operating the cones, means for moving said plate, a dog operated by the plate, a longitudinal bore in the shaft, a pin lying in said bore and operated by the dog for the purposes set forth and described.

3. In bicycle-gearing, the frame, a shaft held therein, a hub surrounding the shaft, bearings between the hub and shaft, a clutch upon the shaft within the hub, openings from the interior of the hub to the exterior thereof and occupied by the clutch portions, a gear-wheel within the hub and secured thereto, a pinion within the said gear-wheel, a sprocket-wheel having rigid connection with the pinion, bearing-cones for supporting the said sprocket and pinion, locking means between the pinion and the clutch, pivotal supports for the cones and slots therein for swinging them laterally, an operating portion for moving the cones in their pivots, a longitudinal bore in the shaft, a pin or rod occupying said bore and means between the said operating portion and said rod for giving longitudinal movement to the clutch all for the purposes set forth and described.

4. In bicycle-gearing a shaft, a hub having bearings thereon, an internally-toothed gear-wheel within the hub, a pinion within the gear-wheel, a sprocket operating with the pinion, a clutch on the shaft, depressions in the pinion for engaging the clutch, bearings for supporting the pinion and sprocket-wheel, pivotal supports for the bearings, said pivots being longitudinally arranged whereby the bearings may be given lateral movement thereon for the purposes described, a cam arranged to oscillate about the shaft for swinging the bearings, a dog adapted to be operated by the cam, a bore in the shaft, a pin in the bore for operating the clutch, said pin being operated by the dog and means for giving the cam its oscillatory movement as described.

5. In a speed-changing gear for bicycles, a shaft, a hub having bearings thereon, bearing-cones surrounding the shaft and adapted to swing eccentrically thereto, pivots on the cones, such pivots permitting the movements described, a sprocket-wheel and pinion having bearings on the cones, a spring-pressed clutch sliding on the shaft adapted to engage the sprocket and pinion, a bore for the shaft, a pin lying in said bore for shifting the clutch, a dog for engaging the pin, an oscillating cam for operating the dog and pin, and means for giving the cam its oscillatory movement for the purposes set forth and described.

6. For a speed-changing gear for bicycles, a shaft, a wheel-hub having bearings thereon, an internal gear for the hub and sprocket, a pinion adapted to engage the internal gear, means for engaging and disengaging said gear and pinion, in combination with a slidable clutch on the shaft consisting of a plate J′ having fingers J; grooves h' in the hub portion receiving the fingers said fingers adapted to engage the pinion and sprocket, a spring for engaging the clutch with the hub, a slot in the shaft, a cross-head in the slot and a pin in such shaft for moving the cross-head for disengaging the said clutch and hub as set forth.

7. In a speed-changing device for bicycles, the combination with the shaft, hub, internal gear, pinion and sprocket arranged as set forth, of bearing-cones for supporting the latter, pivots on the extremities of the cones parallel with the shaft, the same being situated between the shaft and the periphery of the said cones, fixed supports on the shaft for supporting the pivots, slots in the cones concentric with the pivots, a plate T swinging on one of the said fixed supports, a lug on one of the cones operated by the said plate for swinging the cones on the pivots whereby the pinion carried thereon is moved to or from the said internal gear for the purposes set forth.

8. In a speed-changing gear for bicycles, a shaft, fixed cones thereon, a hub and sprocket having bearings on said cones, an internal gear for the hub, cones P P′ surrounding the shaft but free of it, a pivot in one of the cones eccentric to the shaft having support in one of the fixed cones described, a pivot on the opposite cone in line with the first, a fixed support on the shaft for carrying such pivot, a slot in the cones for the passage of the shaft therethrough, the same being concentric with the said pivots for permitting movement of the cones thereon eccentric to the shaft, in one plane, a cam for moving the cones on the pivots, means within reach of the rider for shifting the cam, a sprocket-wheel and pinion fixed together and having bearing on the said cones P P′, the pinion adapted to engage the internal gear due to the eccentric movement described, the movement of the sprocket and pinion being concentric with the crank-

shaft of the bicycle whereby the distance between the driving and driven sprockets is not changed, a shiftable spring-actuated clutch on the shaft, fingers thereon for engaging the said pinion and sprocket, grooves or channels in the hub portion for receiving the said fingers, a longitudinal bore for the shaft, a pin lying therein for operating the clutch in one direction and a dog engaging and moving the pin and operated by the said cam all substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

VALENTIN WEBER.

Witnesses:
C. JOHNSON,
CHARLES J. WOLFE.