(No Model.) 5 Sheets—Sheet 1.

J. H. EICKERSHOFF.

BICYCLE.

No. 588,698. Patented Aug. 24, 1897.

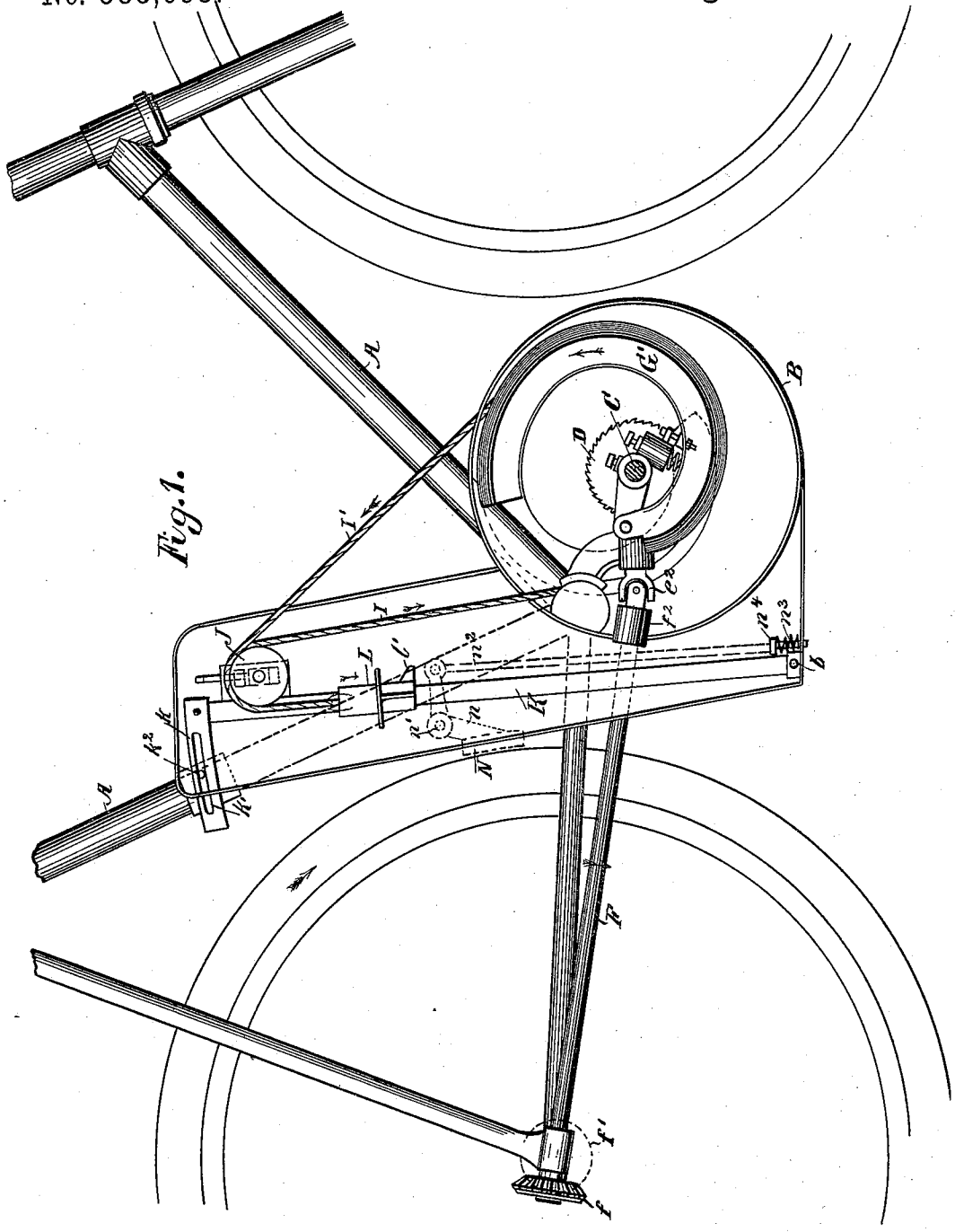


Fig. 1.

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(No Model.) 5 Sheets—Sheet 2.

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BICYCLE.

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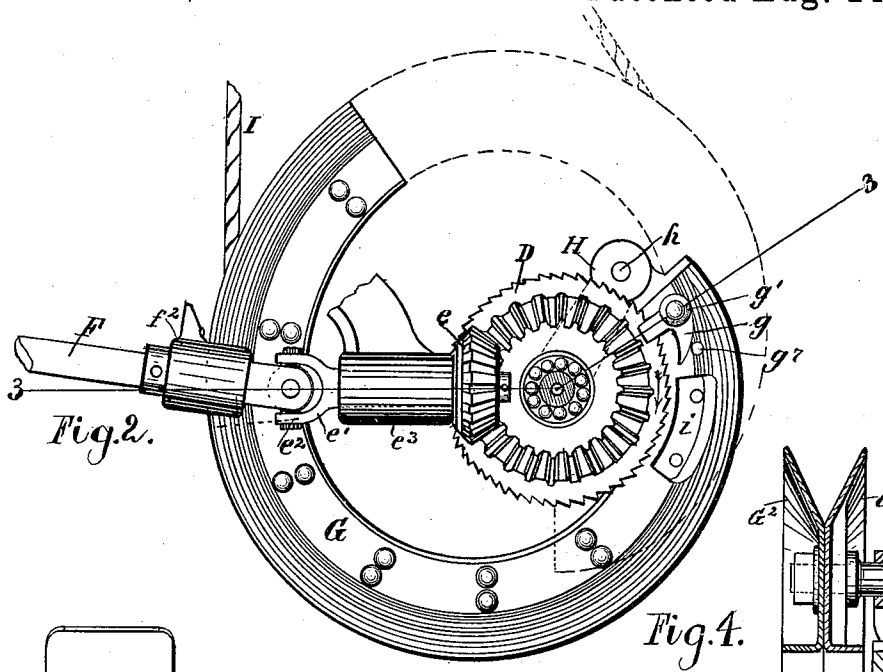


Fig. 2.

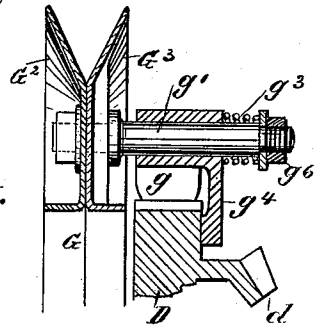
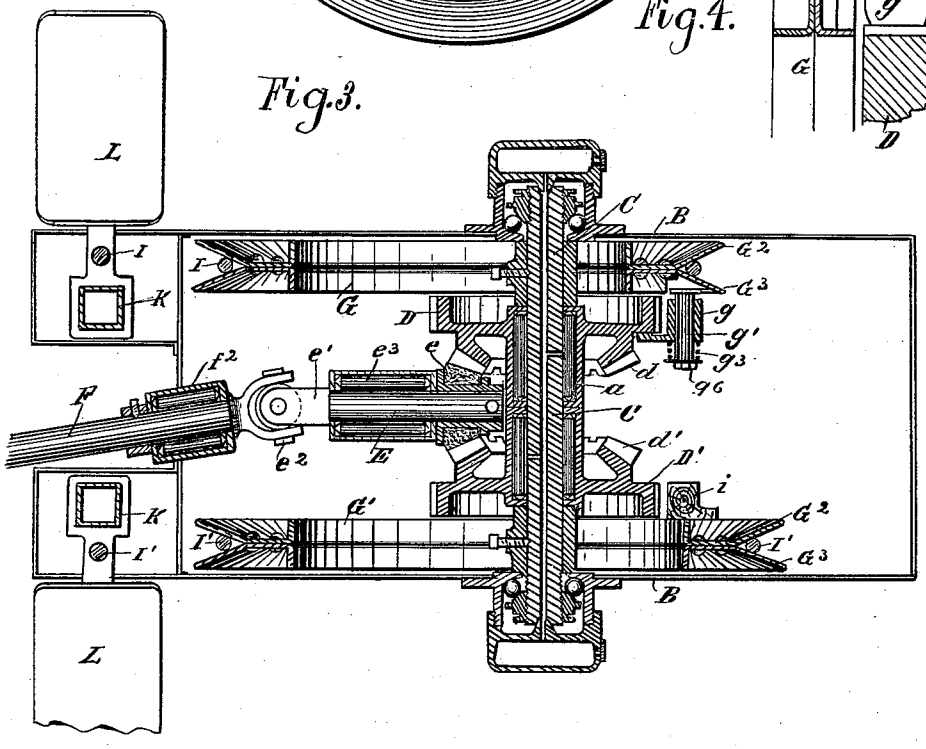


Fig. 4.

Fig. 3.



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Fig 5

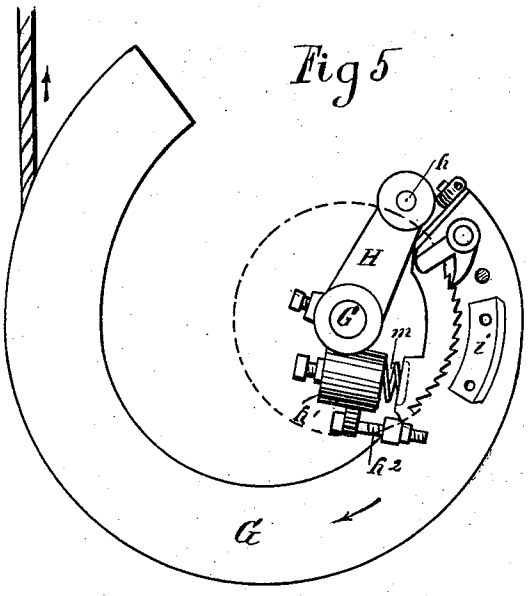


Fig.6.

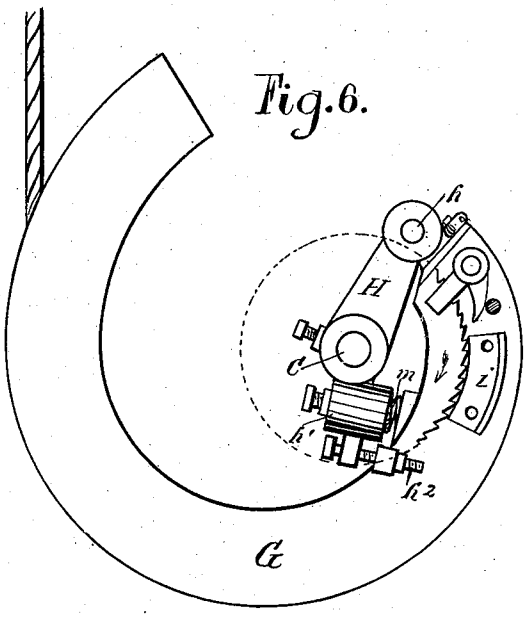


Fig.7.

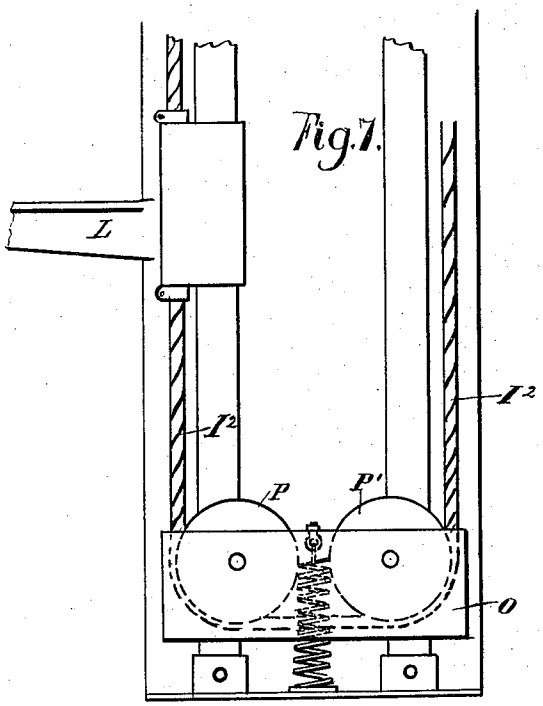
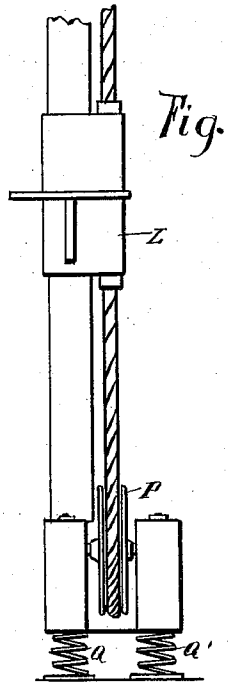


Fig.8.



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Fig. 9.

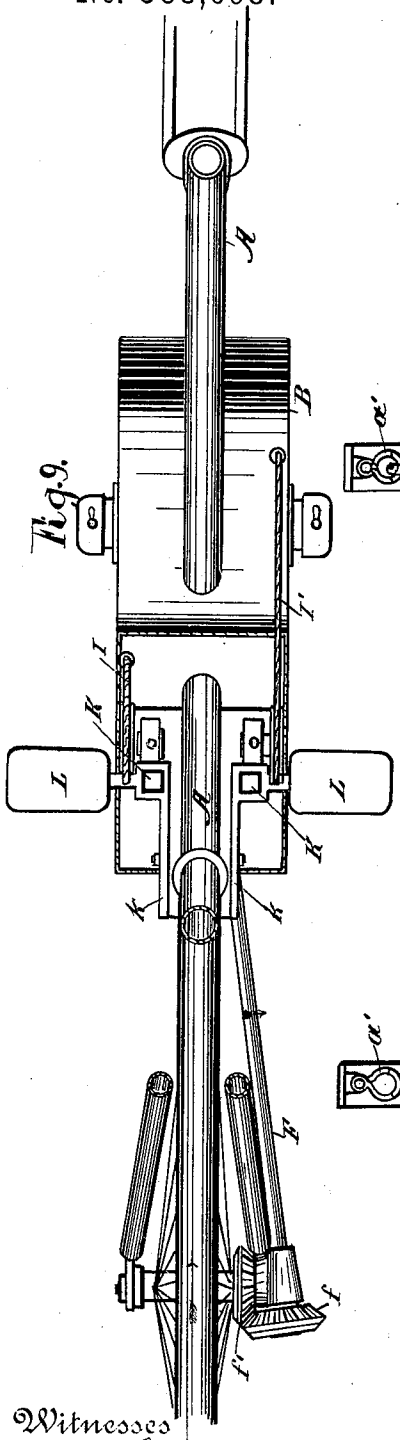


Fig. 11.

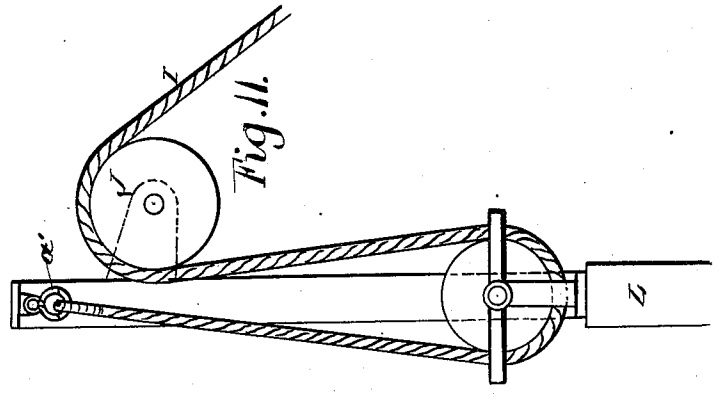
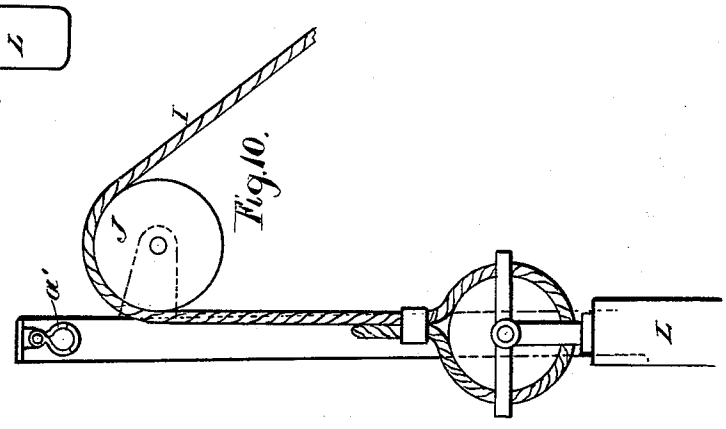


Fig. 10.



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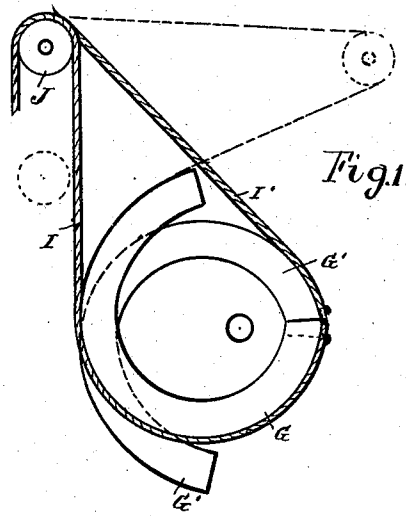


Fig. 12.

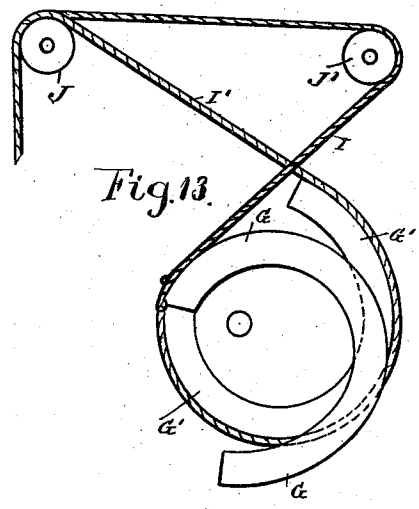


Fig. 13.

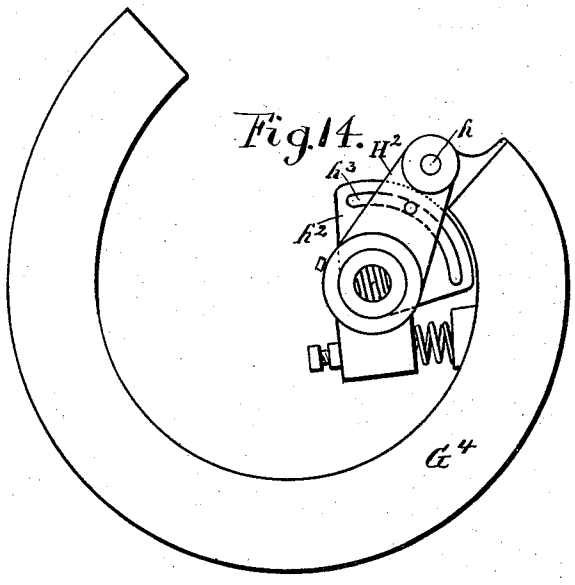


Fig. 14.

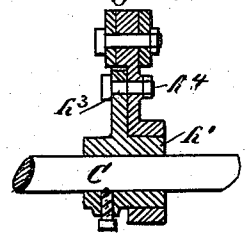


Fig. 15.

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UNITED STATES PATENT OFFICE.

JOHN HENRY EICKERSHOFF, OF CINCINNATI, OHIO.

BICYCLE.

SPECIFICATION forming part of Letters Patent No. 588,698, dated August 24, 1897.

Application filed December 26, 1896. Serial No. 617,058. (No model.)

To all whom it may concern:

Be it known that I, JOHN HENRY EICKERSHOFF, a citizen of the United States of America, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Bicycles, of which the following is a specification.

The object of my invention is to provide an improved bicycle; and my invention consists in mechanism for driving a bicycle in which the longest leverage is obtained when the leg is in its least effective position, thereby securing greater speed and a more uniform movement; in a combination and arrangeof parts whereby the driving mechanism may be instantaneously transformed into braking mechanism without removing the feet from the pedals or the hands from the handle-bar, and which does not affect the tire; in mechanism normally dormant, which will be automatically thrown into engagement and act as a brake in case the driving mechanism gives way; in a connection of the pedals with the driving mechanism whereby the disadvantages of dead-centers are overcome; in mechanism whereby the path of movement of the pedals may be adjusted to any desired inclination; in mechanism which permits a short or long operative stroke of the pedals, thereby adapting the bicycle for use, without adjustment, by persons of different length of limb; in mechanism whereby the pedals may be used as coaster-bars without interfering with the running of the bicycle and whereby the wheel is under full control when coasting; in mechanism for keeping the pedals under uniform tension; in mechanism for varying the speed of the wheel relatively to the movement of the pedals; in means for rendering the operation noiseless, and in the combination and arrangements of parts hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation, partially in section, of a bicycle equipped with my improved mechanism; Fig. 2, an elevation of one of the sheaves with its connections; Fig. 3, a horizontal section on line 3 3 of Fig. 2; Fig. 4, a detail of one of the pawls and its connection to the sheaves; Fig. 5, a diagram of one of the sheaves, showing the position of parts when driving power is applied; Fig. 6, a similar view showing braking power applied; Fig. 7, a side elevation of a device for maintaining uniform tension on the driving-cords; Fig. 8, an elevation of the same; Fig. 9, a top plan, partially in section, of a bicycle equipped with my mechanism; Fig. 10, a detail showing the method of connecting a pedal directly to a driving-cord; Fig. 11, a detail showing a method of connecting a pedal indirectly with the cord; Fig. 12, a diagram showing the sheaves and cords in position to drive the bicycle at one speed; Fig. 13, a similar view showing the parts arranged to drive at another speed; Fig. 14, a descriptive view showing an adjustable sheave; Fig. 15, a cross-section of the same, omitting the sheave.

A represents an ordinary bicycle; B, a housing mounted on the frame between the front and rear wheels of the bicycle; C, a rock-shaft mounted in the housing at right angles to the frame; D D′, ratchets loosely mounted upon roller-bearings *a*, carried by shaft C. The ratchets carry on their opposing faces bevel-gears *d d′*, adapted to mesh with a bevel-gear *e* on a stud E at right angles to shaft C, and carrying at its outer end a yoke *e′*, forming part of a universal coupling e^2, connected with a shaft F, extending rearwardly and carrying at its rear end a bevel-gear *f*, adapted to mesh with a bevel-gear *f′* on the axle of the rear bicycle-wheel. Stud E and shaft F are preferably carried by roller-bearings e^3 f^2, adapted to reduce friction between the parts to a minimum.

It will be seen that power applied to the ratchets will be transmitted through stud E, universal coupling e^2, and shaft F to the rear wheel of the bicycle.

G G′ are sheave-segments preferably mounted eccentrically to shaft C and pivoted at *h* to arms H H′, fixed to the shaft. These sheave-segments are adapted to actuate the shaft in different directions, imparting a rocking movement thereto. The sheaves are preferably made in two parts G^2 G^3, pressed from sheet metal into the desired shape and riveted together to form a V-shaped sheave. The construction makes a very light but rigid segment and is adapted to transmit a large amount of power.

Mounted on the sheaves G G′ are pawls *g*,

adapted to actuate corresponding ratchets D D'. These pawls are so arranged that when the speed of the ratchets is greater than the speed of the sheaves they will be raised out of engagement therewith and held against a pin carried by the segment, thereby preventing the pawls from riding the ratchets.

When the speed of the sheaves is greater than the ratchets, the pawls will engage therewith and actuate the ratchets. In the form shown this is accomplished by pivoting the pawl on a stud g', carried by the sheave, and providing each pawl with an arm g^4, adapted to contact with the smooth side of its ratchet-wheel. This arm is held against the ratchet by a spring g^5, mounted on the stud g between it and nut g^6. So long as the ratchet travels faster than the sheave the frictional engagement of the arm g^4 of the pawl tends to carry it forward and hold the pawl out of engagement, but as soon as the sheave attains a greater speed than the ratchet the retarding effect of the frictional engagement automatically throws the pawl into engagement with the ratchet. The pawl is thus kept free from the ratchet when not in driving connection therewith, thereby reducing the wear and noise to a minimum. A stop-pin g^7 prevents the pawl from rising too high, so that arm g^4 is always held against the smooth face of the ratchet.

I I' are cords, preferably non-stretchable, secured to the rear end of and passing around the segments. The cords are then passed over adjustable guide-sheaves J, carried by pedal-guides K, preferably pivoted to swing toward or from a perpendicular position. The cords are attached at their free ends to sliding pedals L, mounted on pedal-guides K and adapted to reciprocate thereon. Power applied to either pedal will tend to actuate the driving mechanism, and the pedals are reciprocated upon their respective guides simultaneously but in opposite direction. If the angle at which the pedals slide is fixed, it may not suit every rider. I therefore prefer to make the pedal-guides adjustable, so that they can be tilted at any desired angle and locked in position. In the form shown the pedal-guides are pivoted to the housing at b and provided at the top with an arm k, having a segmental slot k', adapted to receive a bolt k^2, projecting from the frame and provided with a nut adapted to lock the arm to the frame in any desired position.

For the purpose of providing effective braking mechanism the sheave-segments are pivotally mounted upon the arms H H'. Springs m are interposed between hubs h', extending from the arms H H' and the sheave-segments normally pressing the lug and segment apart. A bolt h^2, adapted to slide in one of its bearings, limits the relative movement of the lug and segment. The sheave-segments are provided with brake-shoes i, adapted to engage with the ratchets. By exerting sufficient pressure upon both pedals to overcome the tension of the springs m the sheaves are pressed toward the arms H H', thereby bringing the brake-shoes into contact with the ratchets. When the pressure is released, the segments resume their normal position. The tension of the springs may be adjusted as desired.

To prevent the wheel from getting beyond control in case any of the driving mechanism breaks or becomes disabled, I provide a safety-brake adapted to be operated by an abnormal movement of the pedals, due to giving way of the cord or other part of the driving mechanism or to other cause, but which remains dormant so long as the travel of the pedals is confined to the normal limits.

In the form shown N is a brake-shoe adapted to engage with the tire of the rear wheel. This brake-shoe is carried by a lever-arm n, pivoted at n' and connected at the end away from the brake-shoe with a rod n^2, extending between and in the direction of the pedal-guides. A spring n^3 presses the rod n^2 upward and holds the brake out of contact with the tire.

One or both the pedals are provided with an offset l', adapted when the pedal descends below its normal limit to contact with a collar n^4 or other projection from the rod n^2 and force the brake against the tire.

In Figs. 12 and 13 I have shown a method of varying the speed of the wheel relatively to that of the pedal movement. In Fig. 12 the driving-cords extend practically one-half way around the segment-sheaves, but in Fig. 13 they extend practically three-fourths around. This is effected by passing the driving-cords or one of the driving-cords around an additional sheave so located as to wind the cord around so much greater portion of the periphery as may be desired.

To enable the sheave-segments to be rotated through a greater portion of a revolution without making longer strokes of the pedals, the driving-cord is shifted from its direct connection with the pedal, (shown in Fig. 10,) passed around a sheave connected with the pedal, and secured to a fixed part a of the frame, as shown in Fig. 11. By this arrangement the same stroke of the pedal takes up more of the driving-cord than when the connection is direct, and the segments may be actuated through a larger portion of a revolution.

In Fig. 14 I have shown means for adjusting the position of the eccentric sheaves for the purpose of increasing or decreasing their leverage. G^4 represents an eccentric sheave pivoted to an arm H^2, which is made adjustable on a hub H', fixed to the shaft C. The hub carries an arm h^2, provided with a segmental slot h^3, adapted to receive a bolt h^4. It will be seen that an eccentric sheave can thus be adjusted to any desired position relatively to the other and locked in its new position, thus increasing or decreasing the portion of a revolution through which the sheaves are driven by a stroke of the pedal.

The speed-varying mechanism first de-

scribed is primarily intended for radical changes in speed, while the last-described mechanism is designed for less radical changes.

In Figs. 7 and 8 I have shown side and end elevations of a device for maintaining a uniform tension on the driving-cord. For this purpose a continuous cord I^2, connected with both pedals and with both eccentric sheaves, is used. Beneath the pedals is a bracket O, carrying two sheaves P and P′ and held yieldingly in position by spring Q Q′. The cords pass from one of the pedals under the sheaves to the other pedal. By this means a tension is maintained which obviates danger of losing the foothold on the pedal by reason of slack in the cord.

I claim—

1. The combination of a shaft; ratchets loosely mounted thereon; mechanism connecting the ratchets and the shaft of the driving-wheel; sheave-segments adapted to actuate the shaft; means for actuating the segments, and pawls carried by the segments adapted to engage with the ratchets, when the speed of the segments is greater than that of the ratchets, and to be released when the speed of the ratchets is greater than that of the segments, substantially as and for the purpose specified.

2. The combination of a shaft; ratchets loosely mounted thereon; mechanism connecting the ratchets and the shaft of the driving-wheel: sheave-segments adapted to actuate the shaft; pawls pivotally secured to the segments, and adapted to engage with the ratchet-wheels; and arms carried by the pawls adapted to contact with the ratchet-wheels and hold the pawls out of engagement with the ratchet, when the movement of the latter is faster than that of the segments, and throw the pawls into engagement when the movement of the segments is faster than that of the ratchets, substantially as and for the purpose specified.

3. The combination of a shaft; ratchets loosely mounted thereon; mechanism connecting the ratchets and the shaft of the driving-wheel; sheave-segments adapted to actuate the ratchets and carrying brake-shoes adapted to engage with the ratchet-wheels; means for actuating the sheave-segments; and springs adapted to hold the brake-shoes out of contact with the ratchet-wheels until pressure is applied to the pedals concurrently; substantially as and for the purpose specified.

4. The combination of a shaft; ratchets loosely mounted thereon; mechanism connecting the ratchets and the shaft of the driving-wheels; sheave-segments adapted to actuate the ratchets; a cord, or cords, connecting the sheave-segments and the pedals; contact parts adapted to be actuated by the pedals, but out of reach of their normal travel; a brake-shoe, and mechanism connecting the contact parts and the brake-shoe whereby the brake may be applied, substantially as and for the purpose set forth.

5. The combination of a shaft; ratchets loosely mounted thereon; mechanism connecting the ratchets and wheel-shaft, sheave-segments carrying pawls adapted to actuate the ratchets; a cord or cords connected with the sheave-segments and the pedals; and guide-sheaves mounted in different positions, whereby the cord may be caused to actuate the sheaves through different arcs thereby varying the speed, substantially as and for the purpose specified.

6. The combination of a shaft; ratchets loosely mounted thereon; mechanism connecting the ratchets and the shaft of the driving-wheel; sheave-segments adapted to actuate the ratchets; a cord or cords connecting the sheave-segments and the pedals; guide-sheaves for the cord, and mechanism for adjusting the position of the sheave-segments relatively to the guide-sheaves thereby varying the speed, substantially as and for the purpose specified.

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