(No Model.) 3 Sheets—Sheet 1.

G. BEEKMAN.

DRIVING MECHANISM FOR BICYCLES.

No. 553,826. Patented Feb. 4, 1896.

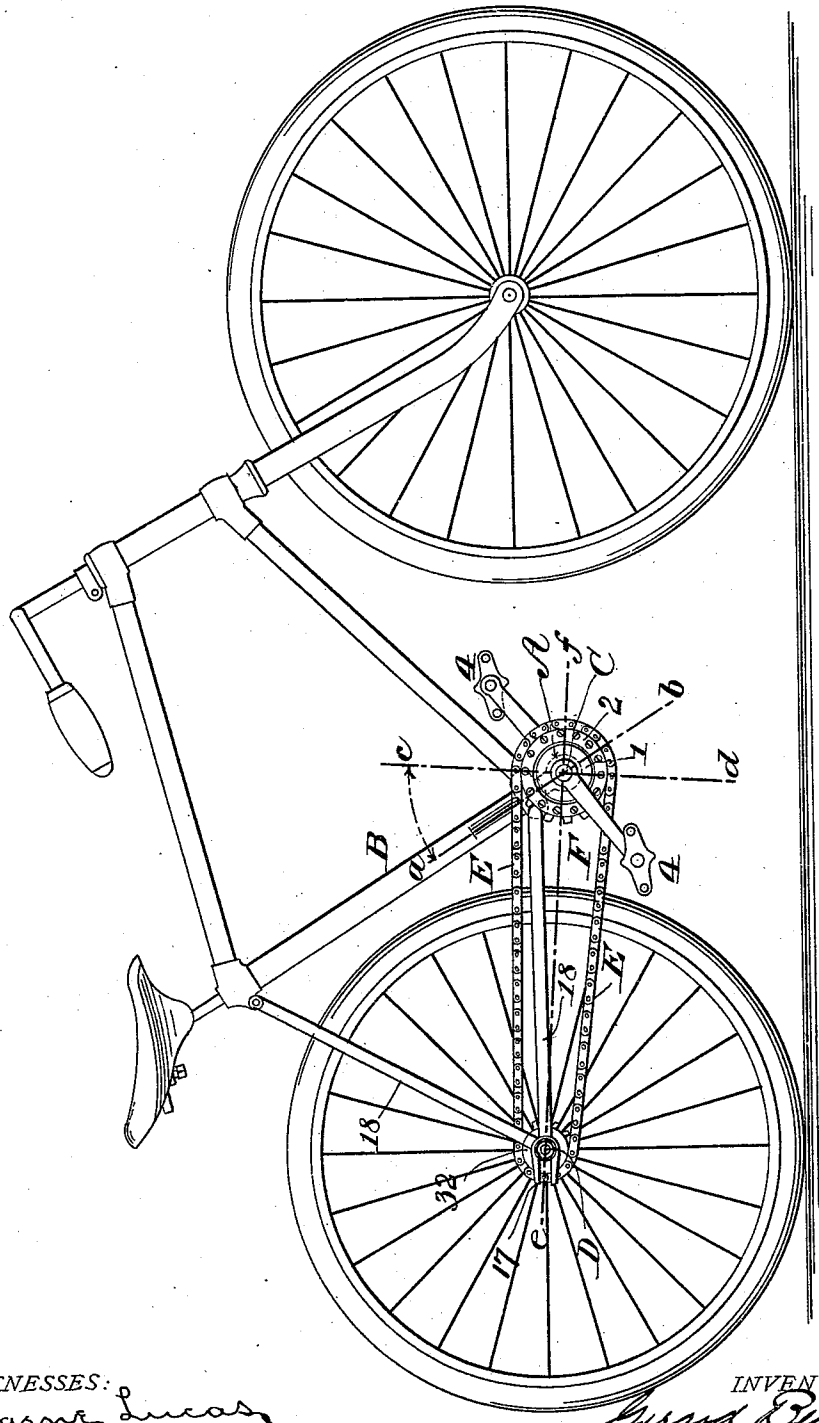

Fig. 1.

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Fig. 2.

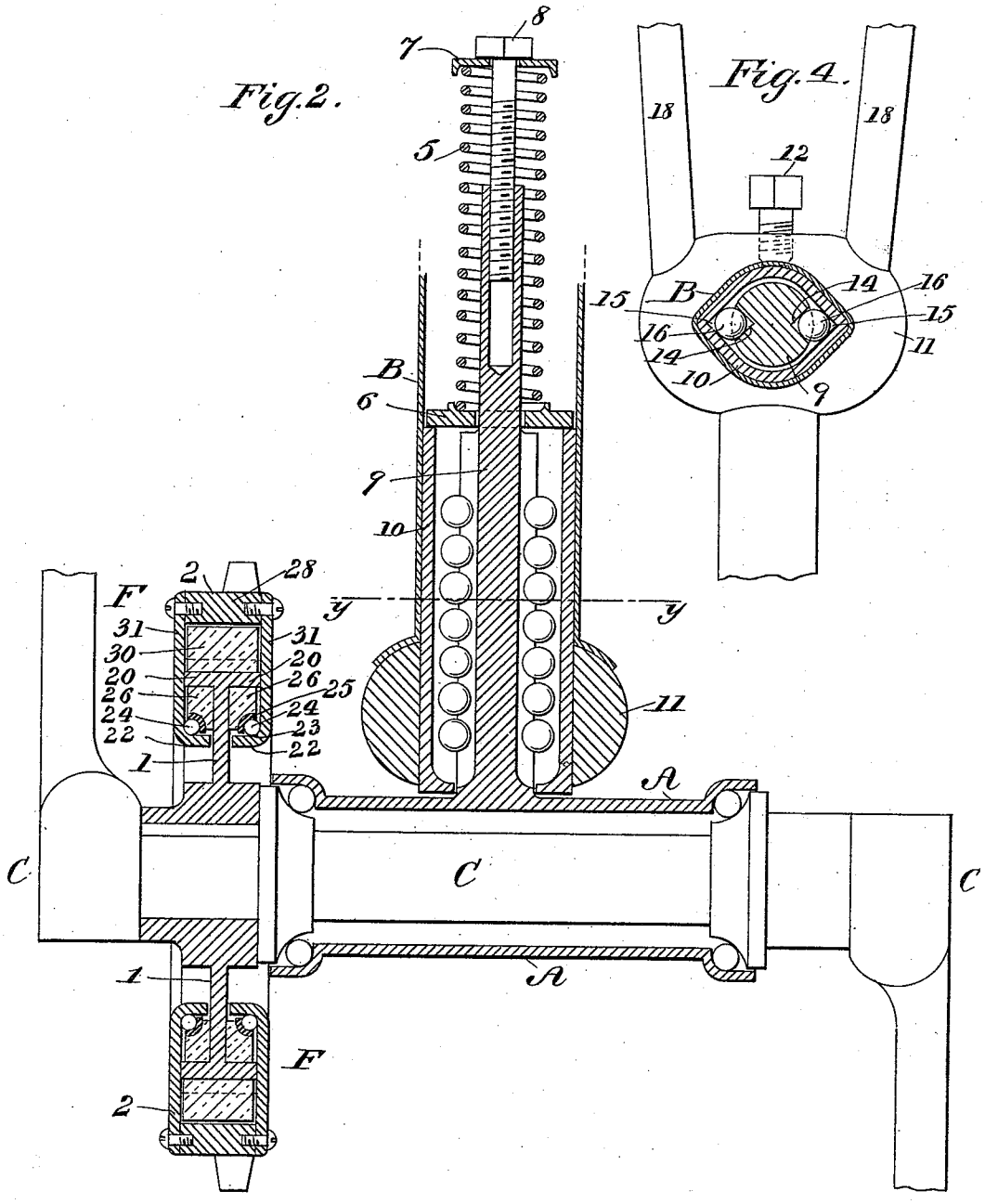

Fig. 4.

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Fig. 3.

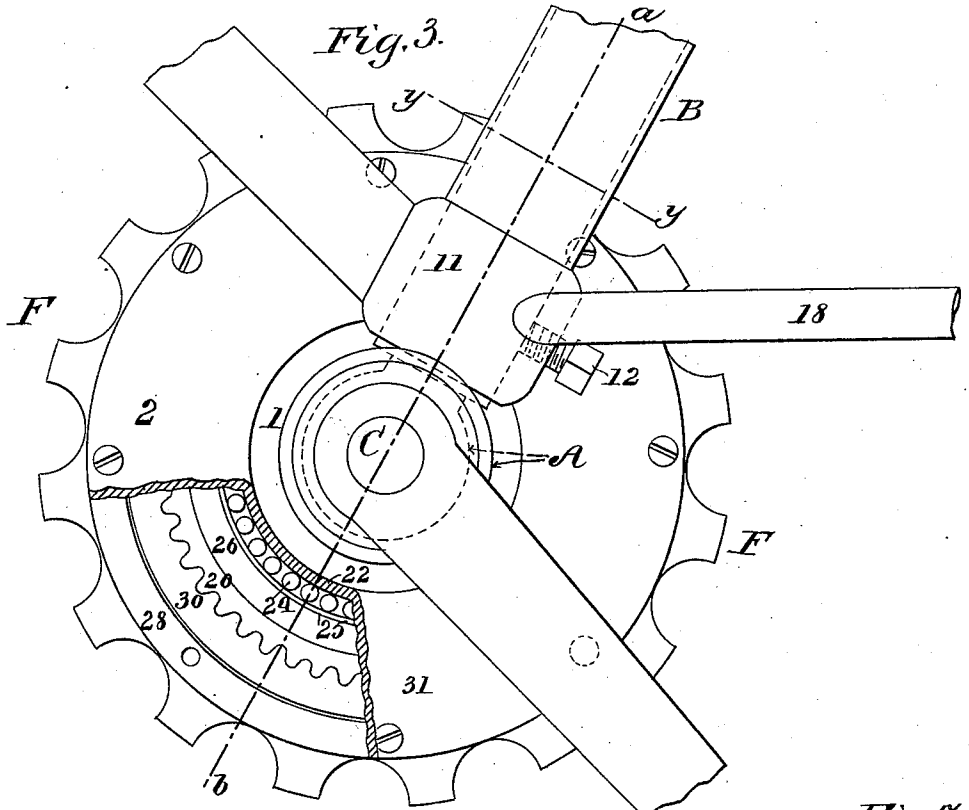


Fig. 5.

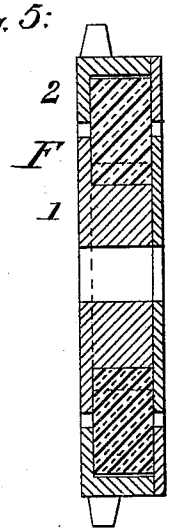


Fig. 6.

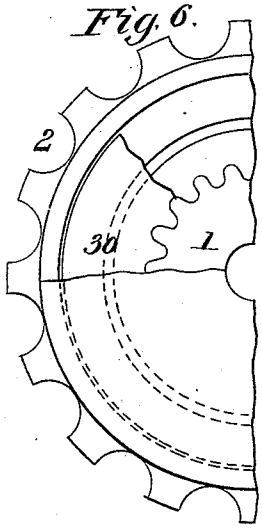
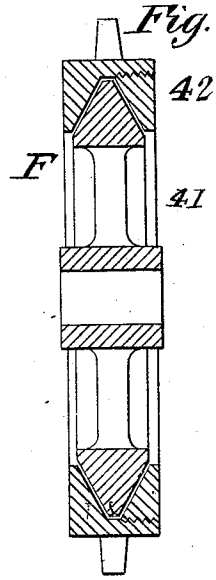


Fig. 7.



WITNESSES:
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UNITED STATES PATENT OFFICE.

GERARD BEEKMAN, OF NEW YORK, N. Y.

DRIVING MECHANISM FOR BICYCLES.

SPECIFICATION forming part of Letters Patent No. 553,826, dated February 4, 1896.

Application filed March 9, 1895. Serial No. 541,153. (No model.)

To all whom it may concern:

Be it known that I, GERARD BEEKMAN, a citizen of the United States, and a resident of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Driving Mechanism for Bicycles, of which the following is a specification.

My invention relates to means of changing the relative number of revolutions of the driving and driven parts of a bicycle by varying the pressure of the feet on the pedals; and the object of my invention is to utilize the drive-chain in a rear-driven bicycle as the means of effecting the said change when the feet are depressed, and the object is also to concentrate certain parts within the sprocket-wheel of the crank-shaft.

My invention consists in certain novel features hereinafter fully described and claimed.

Referring to the accompanying drawings, Figure 1 is a side elevation of a bicycle embodying my invention. Fig. 2 is an enlarged detail sectional view, taken transversely to the machine, on the line *a b*, Fig. 1. Fig. 3 is a side elevation of Fig. 2, partly in section, and taken at the side opposite that seen in Fig. 1. Fig. 4 is a horizontal section at *y y*, Figs. 2 and 3. Fig. 5 is a cross-section of a sprocket-wheel, showing a modification of the two-part friction device. Fig. 6 is a side view, partly in section, of Fig. 5. Fig. 7 is a cross-section of a sprocket-wheel, showing another modification of the two-part friction device.

The crank-shaft hanger A is made movable in the frame B, and is movable in a direction angular to the perpendicular of a line intersecting the shaft-centers C D. Hence the elevation or depression of the crank-shaft hanger A will vary the tension of the drive-chain E. The sprocket-wheel F is in two parts 1 2. The part 1 is fast to the crank-shaft C, and the part 2 is movable on the part 1, but when the shaft-hanger A is depressed by the pressure of the feet on the pedals 4 4 the part 2 is brought into tractional frictional contact with the part 1 by reason of the tension on the drive-chain E, and is carried in revolution by the part 1 at a speed which is variable at will, according to the foot-pressure exerted.

The spring 5 serves to raise the shaft-hanger A when the foot-pressure is relieved or reduced, allowing the parts 1 and 2 to slip the one with relation to the other. The spring 5 is compressed under the washer 7, connected by the tension-adjusting screw 8 to the shank 9 of the movable shaft-hanger A, and said spring 5 abuts on the washer 6 resting on the bushing 10 fixed to the frame B. The lower end of the bushing 10 is secured to the frame-union 11 by a removable screw 12, and may be readily removed, together with the shaft-hanger A and connections.

In order to promote easy working, I provide ball-channels 14 14 on each side of the shank 9 and channels 15 15 in each side of the bushing 10 to receive steel balls 16, which serve both to facilitate longitudinal motion and to prevent rotary displacement of the shank 9 in the frame-bushing 10. The axis of the crank-shaft C is thereby maintained in parallel relation to the shaft D of the rear wheel.

The tension of the drive-chain E may be regulated by the usual adjustment of the shaft D in the slots 17 at each side of the rear frame-fork 18.

Referring now to the more particular details of construction of the two-part friction device in the sprocket-wheel F, I have shown in Figs. 2 and 3 my preferred form. The part 1 is fixed to the shaft C and has flanges 20, under which the removable flanges 22 of the part 2 project and form ways 23 for bearing-balls 24, which are also supported on ways 25 on the elastic india-rubber spring-rings 26 inside of the flange 20. The rubber rings 26 give clearance to the part 2 to allow lateral expansion when vertically compressed, and these spring-rings tend to center the two parts 1 and 2, and when the said parts are centered they will be permitted to revolve freely with reference to one another on the ball-bearings 24.

The frictional engaging surfaces are composed of the smooth inner surface of the rim 28 of the part 2 and the outer surface of the india-rubber ring 30, which is corrugated at its inner surface to fit upon the corrugated periphery of the part 1 to hold it firmly thereto, as seen in Fig. 3.

The ring 30 is slightly smaller in external diameter than the internal diameter of the rim 28, giving clearance when the drive-chain E is free from tension—that is to say, when

the pressure of the feet is insufficient to overcome the spring 5.

In addition to the feature of ball-bearings shown in Fig. 2 the construction therein affords the advantage of lateral support of the sprocket-rim 28 of the part 2 by the contact of its plates 31 with the flange 20 of the part 1 in case of lateral displacement of the part 2.

In Figs. 5 and 6 the ball-bearings and spring-rings are dispensed with and the india-rubber friction-ring 30 is employed exclusively, being fixed to the part 1 by a corrugated fit, as before, and having its slipping contact within the part 2.

In Fig. 7 the part 41 is provided with a convex friction-rim of V-shaped cross-section, and the part 42 is provided with a separable concave groove of corresponding shape, the use of rubber being dispensed with.

It is of course to be understood that the frictional surfaces of the parts 1 and 2 may be of any suitable material—such as india-rubber, leather, rawhide, or metal upon metal.

The operation is as follows: The crank-shaft hanger A is movable in a line *a b*, which is at an angle *a c* to a line *c d*, perpendicular to line *e f*, intersecting the shaft-centers C D. During the act of mounting the cranks are idle, making it easy to at once place the feet on the pedals. As soon as a downthrust is made on either of the pedals the crank-shaft hanger A is forced downward on the line *a b*, compressing the spring 5, and the distance between centers C D being therefore increased the drive-chain E is made taut to its limit, and thenceforth the outer part 2 of the sprocket-wheel F is diametrically moved with relation to the part 1 and drawn to a position slightly eccentric to the crank-shaft center or axis C. The two-part friction device is thus brought into engagement during each downward thrust of the feet of the rider and during the passage of each pedal in that portion of its orbit most effective between the dead-centers. Intervening said downthrusts, and during the passage of the pedals in the portion of their orbits least effective and including the dead-centers, the cranks and crank-shaft and part 1 of the sprocket-wheel F may revolve independently of the part 2, either faster or slower, thereby changing the relative number of revolutions. According as the run is on a level or on a grade, up or down, the periods of the engagements between parts 1 and 2 are varied by the natural change in action of the feet of the rider. On a level the periods are repeated in a slow or fast series at will, according to speed desired. On an ascending grade the periods are repeated in rapid series, and loss of headway is avoided by reducing or practically eliminating the dwell and interruption of work between the ascendant and descendant motions of the pedals at the dead-centers of the cranks and the attendant loss of stored momentum, as in the case when a fixed rotative relation of the driving and driven parts is maintained throughout the entire revolution. On a descending grade the periods of engagement of the parts 1 and 2 are repeated in a slow series, saving fatigue, and at any part of the revolution the pedals may be allowed to rest and support the feet in coasting. In all cases the pedals when depressed while at rest will cause the two friction parts 1 and 2 to act as a brake and stop or regulate the speed of the machine at pleasure.

It is to be understood that I do not confine my invention of utilizing the drive-chain in the manner set forth to the control of a two-part engaging device of the character shown, but that I intend to cover broadly the use of such chain in a bicycle to operate any diametrically-movable speed-changing part.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a velocipede, the combination with a frame and traction-wheel, of a two-part rotary device consisting in a driving part connected to the pedal-shaft and a driven part connected by suitable means to impart motion to said traction-wheel, both said parts being yieldingly mounted and diametrically movable with reference to said frame, and means for limiting the diametric movement of said driven part whereby the same is engaged by the diametric movement of the driving part produced by the foot-pressure of the rider.

2. In a velocipede, the combination with a frame and traction-wheel, of a propelling device comprising sprocket-wheels, a drive-chain, and a pedal-shaft carrying one of said sprocket-wheels and diametrically movable with reference to said frame in a direction whereby said chain is drawn taut by each impulse in the driving action of the rider; one of said sprocket-wheels being constructed of two engaging parts of which one part is revolubly and diametrically movable with reference to the other part, to effect their engagement when the said chain is drawn taut.

3. In a rear-driven bicycle, the combination with a frame and traction-wheel, and a rear sprocket-wheel attached to the traction-wheel, and a drive-chain, of a pedal-shaft and front sprocket-wheel thereon yieldingly mounted on said frame so as to move in a direction oblique to the length of said chain and produce tension of the same when the foot-pressure of the rider is applied to the pedals; said front sprocket-wheel being constructed of two parts revolubly and diametrically movable with reference to each other, the one part connected to said pedal-shaft, and the other part carrying said drive-chain and having its diametric movement limited thereby, said parts having suitable frictional engaging surfaces adapted to engage and bind the one with the other, when the said chain is drawn taut.

4. In a rear-driven bicycle, the combination with a frame and traction-wheel, and a rear sprocket-wheel attached to the traction-wheel, and a drive-chain, of a pedal-shaft, and a front

sprocket-wheel constructed of two frictionally-engaging parts revolubly and diametrically movable with reference to each other, the one part connected to said pedal-shaft and the other part carrying said drive-chain and having its diametric movement limited thereby, and a shaft-hanger yieldingly attached to said frame and carrying said pedal-shaft and front sprocket-wheel, and rendering the same diametrically movable in a direction oblique to the length of said chain so as to draw the same taut when the pedal-shaft is depressed, substantially as and for the purpose described.

5. In a rear-driven bicycle, the combination with a frame and traction-wheel, and a rear sprocket-wheel attached to the traction-wheel, and a drive-chain, of a pedal-shaft and a front sprocket-wheel constructed of two frictionally-engaging parts revolubly and diametrically movable with reference to each other, the one part connected to said pedal-shaft and the other part carrying said drive-chain and having its diametric movement limited thereby, and a shaft-hanger yieldingly attached to said frame and carrying said pedal-shaft and front sprocket-wheel, and rendering the same diametrically movable in a direction oblique to the length of said chain so as to draw the same taut when the pedal-shaft is depressed, and a spring for raising the said hanger, substantially as and for the purpose described.

6. In a velocipede, the combination of a frame and wheels, a yieldingly-mounted hanger on the frame, a drive-shaft mounted in the hanger, a drive-chain, a clutch part fast upon the shaft, a second clutch part yieldingly mounted upon said first clutch part and carrying said chain which limits the movement of said second clutch part so as to engage the same by the driving action of the rider.

7. In a bicycle, a two-part sprocket-wheel, the one member diametrically movable with reference to the other to effect transmission, and elastically-supported annular guides upon the one said part tending to center and serving to guide the other said part, substantially as set forth.

Signed at New York city, in the county of New York and State of New York, this 8th day of March, A. D. 1895.

GERARD BEEKMAN.

Witnesses:

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HENRY F. PARKER.