UNITED STATES PATENT OFFICE.

REUBEN HOPKINS Plass, of NEW YORK, N. Y., Assignor, by MESNE ASSIGNMENTS, to JOHN W. MELICK, of same place.

BICYCLE DRIVING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 638,184, dated July 4, 1899.

Application filed January 7, 1897. Serial No. 613,310. (No model.)

To all whom it may concern:

Be it known that I, REUBEN HOPKINS Plass, a citizen of the United States, residing at New York, (Brooklyn,) in the county of Kings and State of New York, have invented certain new and useful Improvements in Bicycle Driving Mechanism; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The object of this invention is to provide a driving mechanism for bicycles or analogous machines by which the "gear" of the machine may be varied or, in other words, by which the speed of the driving-wheel may be changed at will, while the crank-shaft is driven at a uniform constant speed.

To this end the invention consists in combining with driving and driven gear-wheels a series of intermediate gear-wheels sustained in an improved manner to be adjusted to impart to the driven wheels different speeds, according to the position of the movable gears.

The invention also consists in the details of construction and combination of parts hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a side elevation, partly in section, of a bicycle having my invention embodied therein. Fig. 2 is a top plan view of the same with the driving mechanism in section. Fig. 3 is a vertical transverse sectional elevation, on an enlarged scale, through the driving mechanism, showing the parts adjusted for a moderate gear. Fig. 4 is a longitudinal sectional elevation of the same. Fig. 5 is a top plan sectional view with the parts adjusted for a high gear. Fig. 6 is a vertical longitudinal sectional elevation with the parts adjusted for a high gear. Fig. 7 is a side view with the parts adjusted for a low gear.

Reverting to the drawings, A represents the frame of the well-known safety-bicycle, having in the front fork a steering-wheel A' and in the rear of the frame a drive-wheel B.

C represents a casing sustained by the frame between the wheels, in which casing is journaled, near its rear end, a crank-shaft D, provided with the usual cranks d. Near one end, within the casing, this shaft has fixed to it a gear-wheel d', engaging a gear-wheel d'', fixed to a shaft f, mounted in the casing in front of the crank-shaft. The shaft f has fixed to it three drive gear-wheels F, F', and F'', differing in size, which are adapted to be geared, respectively, to driven pinions I, I', I'', and F through the medium of transmitting-gears M M', M'', and M M'', mounted in a frame J, movable vertically in the casing between the crank-shaft and the shaft f. The driven pinions I, I', and I'' are of different sizes and fixed to a sleeve I, mounted loosely on the crank-shaft. At one end this sleeve has fixed to it a bevel gear-wheel G, engaging a bevel-pinion H, fixed to the forward end of a shaft h, extending longitudinally rearward to the drive-wheel, where it is provided with a bevel-gear h', engaging a bevel-pinion h'', fixed to the drive-wheel.

The transmitting-gear-wheels M M', M'', and M M'' are fixed, respectively, to upper, central, and lower shafts L, L', and L'', journaled between two bars J', composing the frame J, the said wheels being adapted by the movement of the frame to be engaged, respectively, with the driving gear-wheels F, F', and F'' 80 and impart motion to the sleeve I by the pinions I, I', and I''.

The transmitting-gears M M on the shaft L are connected together, the gear M being of smaller diameter than the gear M' and smaller than the driving gear F', with which it engages when the frame is lowered, as shown in Fig. 3, in which position the transmitting-gear M will engage the smaller pinion I' on the sleeve. In this position of the parts the sleeve will be driven at a relatively high speed and will impart to the drive-wheel a correspondingly high speed.

The transmitting gear-wheel M on the shaft L' is the same in diameter as the driving gear F' and the driven pinion I' with which it engages when the frame is adjusted to an intermediate position, as shown in Fig. 4, in which position the sleeve will be driven at the same rate of speed as the crank-shaft and will impart to the drive-wheel a moderate rate of speed.
The gears $M^1$ and $M^2$ on the shaft $L^2$ are connected together, the gear $M^1$ being larger than its companion gear and larger than the driving-gear $F^3$, with which it engages when the frame is raised, as shown in Fig. 7, in which position the smaller gear $M^2$ engages with the larger driven pinion $I^1$ on the sleeve $I$. In this position of the parts the sleeve will be driven at a relatively low rate of speed and will impart to the drive-wheel a correspondingly low speed.

The two side bars $J$ of the frame have each two rods $J^1$, $J^2$ at their lower ends, extending downward through the bottom of the casing, and have on their lower ends heads $J^3$, and between these heads and the under side of the casing the rods are encircled by spiral springs $J^4$, which tend to hold the frame yieldingly in its lower position, as shown in Fig. 6. At their upper ends the side bars are extended through the top of the casing, when they are jointed to the lower end of an operating-rod $K$, Fig. 1, whose upper end is provided with an eccentric-strap $k^2$, encircling an eccentric $k^3$, mounted on a pin $k^4$ on the side of the horizontal bar of the frame. The eccentric has fixed to it an operating-handle $k^5$, by means of which the operating-rod may be raised or lowered to adjust the frame to the required position.

In the drawings I have shown elliptical gears connecting the crank-shaft with the shaft $f$, but circular gears may be employed as well and without in any manner modifying the action of the mechanism or changing the speed of the driving parts. The elliptical gears form no part of the present invention, but are the subject of an application filed on the 27th day of May, 1898, Serial No. 681,659.

While I have shown the driven sleeve connected with the drive-wheel by a longitudinal shaft and bevel-gears, it will be understood that other connecting devices may be employed as well—such, for instance, as the well-known sprocket-chain—for imparting motion to the drive-wheel.

The vertical distance between the transmitting gear-wheels is such that in adjusting the frame to change the gear of the machinery from high to low or from medium to high or low the transmitting gear-wheels will be disengaged from both the driving-gears and driven pinions, the result being that the crank-shaft may be held stationary by the pedals, as in "coasting," without interfering with the rotation of the drive-wheel.

Having thus described my invention, what I claim is:

1. The combination with the crank-shaft and gear-wheel thereon, of a sleeve mounted loosely on the shaft and operatively connected with the drive-wheel, a series of driven pinions fixed to said sleeve, a shaft $f$ in front of the crank-shaft, a pinion $d^2$ thereon meshing with the gear-wheel on the crank-shaft, a series of driving gear-wheels on the shaft $f$, a vertically-movable frame between the shafts, and a series of independent transmitting gear-wheels mounted in said movable frame one above the other and adapted by the movement of the frame to be successively engaged with the driving gear-wheels and the driven pinions.

2. The combination with the crank-shaft, of the shaft $f$ driven thereby, a sleeve mounted loosely on the crank-shaft and operatively connected with the drive-wheel, three driven pinions $I$, $I^1$ and $I^2$ fixed to the sleeve, three driving-gear-wheels $F^3$, $F^4$ and $F^5$ on the shaft $f$, a frame movable vertically between the shafts and transmitting gear-wheels $M^3$, $M^4$, and $M^5$ mounted in said frame one above the other, the gear-wheel $M$ being smaller than the gears $F^3$, $F^4$ and $F^5$ and connected with the latter and adapted to be engaged with the gear $F^3$, and the gear $M^5$ being larger than the pinion $I^1$ and adapted to be engaged with the same; the gear $M^4$ being adapted to be engaged with the gear $F^1$ and pinion $I^2$; and the gear $M^3$ being connected with gear $M$ and larger than the one and also larger than the gear $F^4$ and adapted to be engaged with the same, and the gear $M^2$ being smaller than the pinion $I$ and adapted to be engaged therewith.

3. The combination with the bicycle-frame, of a casing sustained thereby, a driving-gear and driven pinion mounted in the casing with the pinion operatively connected with the drive-wheel, a vertically-movable frame mounted in said casing between the gear-wheel and pinion, depending rods on said frame extending through the bottom of the casing, spiral springs encircling the rods between their lower ends and the casing and tending to hold the frame yieldingly downward, transmitting gear-wheels mounted in the frame, and an operating device connected with the frame.

4. In a bicycle driving mechanism for giving a high, low and medium "gear," the combination with the crank-shaft, of a shaft $f$ in front of the same and driven thereby, a sleeve on the crank-shaft operatively connected with the drive-wheel, three driven pinions fixed to the sleeve, three driving gear-wheels on the shaft $f$, a vertically-movable frame between the shafts, and three sets of transmitting gear-wheels mounted in said frame in upper, lower and central positions and adapted by the movement of the frame to engage respectively and successively the driving gear-wheels and driven pinions.

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

WITNESSES:

HARRY Y. DAVIS,
H. A. KELLY.

REUBEN HOPKINS PLASS.