(No Model.) 2 Sheets—Sheet 1

A. SEQUEIRA.

VARIABLE SPEED MECHANISM.

No. 521,512. Patented June 19, 1894.

Fig. 1.

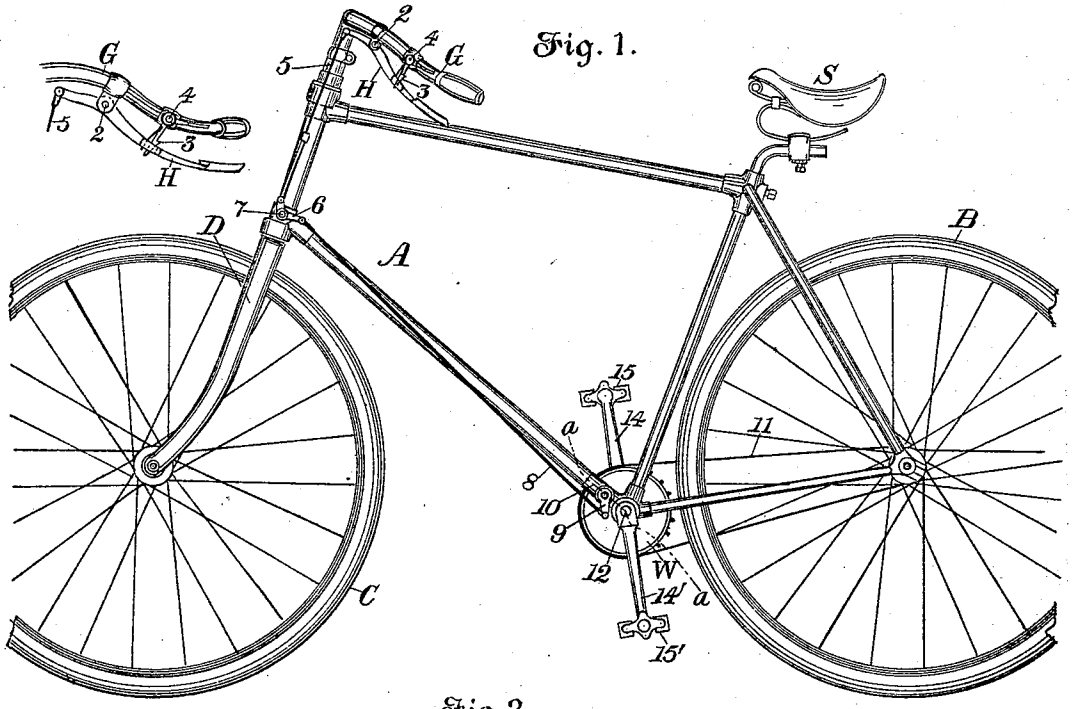
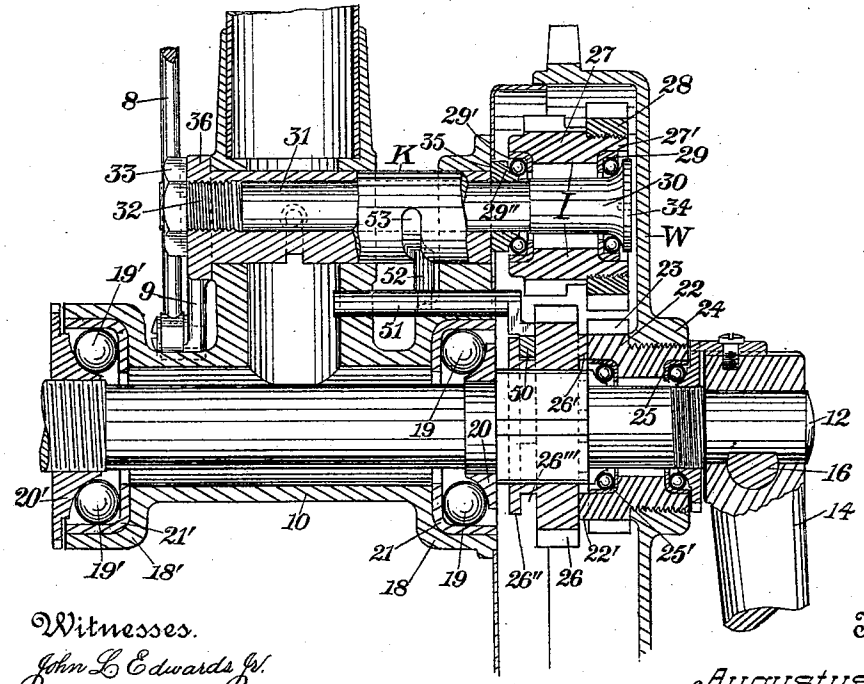


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

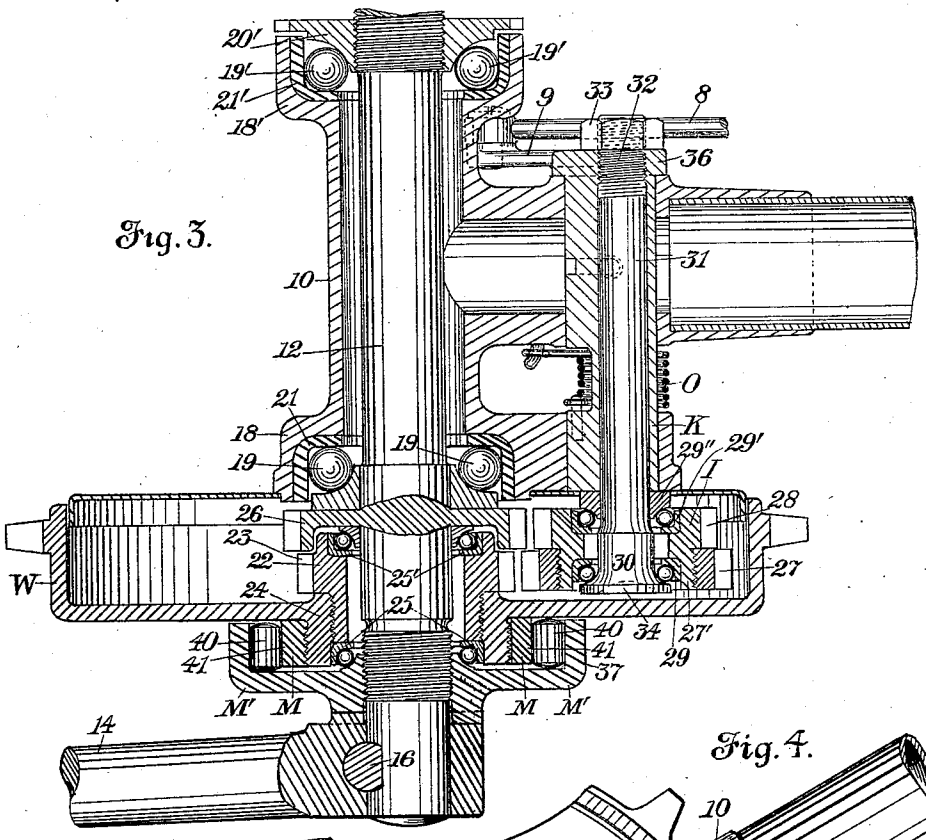
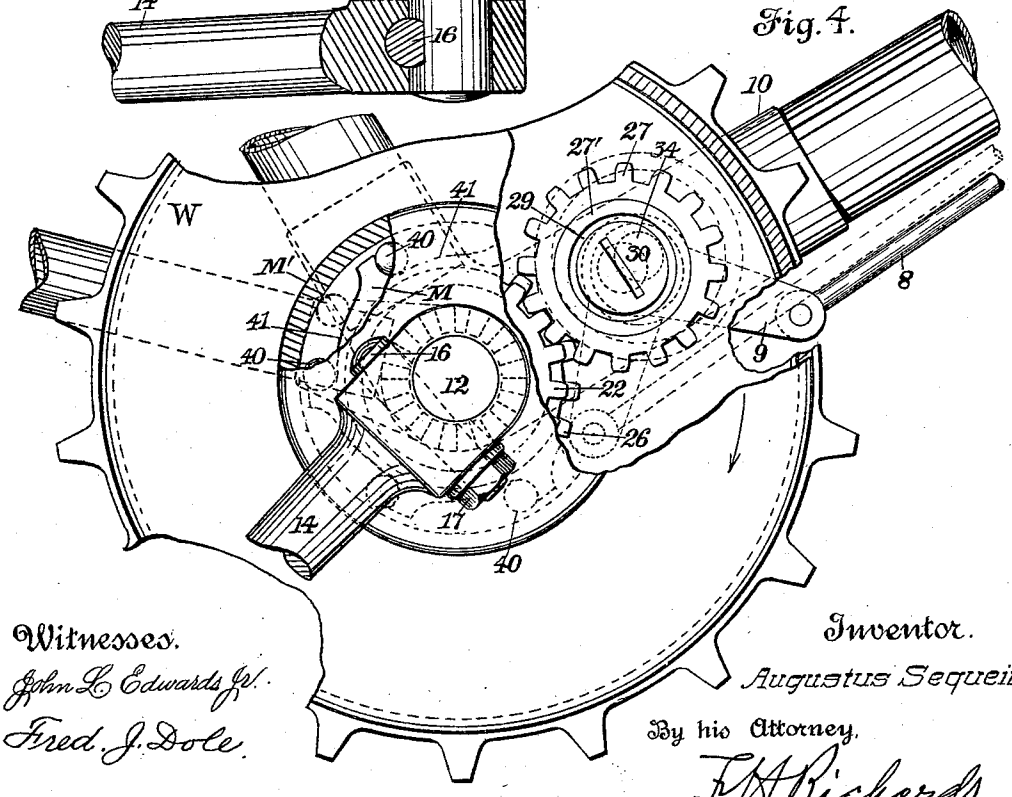


Fig. 4.



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THE NATIONAL LITHOGRAPHING COMPANY,
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UNITED STATES PATENT OFFICE.

AUGUSTUS SEQUEIRA, OF HARTFORD, CONNECTICUT.

VARIABLE-SPEED MECHANISM.

SPECIFICATION forming part of Letters Patent No. 521,512, dated June 19, 1894.

Application filed December 27, 1893. Serial No. 494,836. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTUS SEQUEIRA, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Variable-Speed Mechanisms, of which the following is a specification.

This invention relates to variable-speed mechanisms especially applicable to bicycles; the object being to furnish improved driving-mechanism for bicycles, comprising gearing adapted, when thrown into action, to increase the speed of the wheels relatively to the speed of the crank-shaft; also to provide for the disconnection of the pedal-shaft with relation to the driving mechanism to allow the same to remain idle during rotation of the sprocket-wheel when coasting.

In the drawings accompanying and forming a part of this specification, Figure 1 is a side elevation of a bicycle furnished with my present improvements, the front end of the bicycle being at the left-hand in the drawing. Fig. 2 is an enlarged sectional plan view, taken in about the line *a*—*a*, Fig. 1, through the driving-mechanism. Fig. 3 is a similar view illustrating a modification of certain features of the mechanism. Fig. 4 is a side elevation of the parts shown in Fig. 3, as seen from below in said figure, with some of the details broken away for more clearly illustrating the construction and arrangement of the details.

Similar characters designate like parts in all the figures.

The bicycle shown in Fig. 1 comprises the usual frame-work, A, consisting of several tubes and rods jointed together into a rigid frame in the usual manner, and furnished with the usual bearings at the rearward end for carrying the rearward driving-wheel, B, and at the forward end with the fork, D, for carrying a leading- or steering-wheel, C. On the upper end of the shank of said fork is the usual handle-bar G, and this is shown furnished with the hand-lever, H, pivoted thereto at 2, and adapted to be held in its working-position by a spring-catch, 3, pivoted to the handle-bar at 4. One end of the hand-lever H is connected by a rod, 5, with an angle-lever, 6, which is pivoted at 7, to the front end of the frame of the machine, and is connected by another rod, 8, with a shifting-arm, 9, journaled in the bearing-bracket, 10, of the machine, as hereinafter more fully described in connection with the driving-gearing. The framework A is also shown, in Fig. 1, provided with the usual saddle, S; and the sprocket-wheel, W, of the drive-gear is shown connected by the usual chain, 11, (indicated in Fig. 1 by a solid line only,) with the usual small sprocket-wheel (not shown) on the hub of the driving-wheel B.

The several features here described, with the exception of the shifting-arm 9, are similar, in a general way, to features already found in bicycles as heretofore sometimes made, the hand-lever H corresponding substantially with the usual brake-handle of the ordinary bicycles, with the exception of the holding-catch 3. The sprocket-wheel W is carried upon a driving-shaft, 12, which is journaled in the bracket 10 and is provided, at the respective ends thereof, with the usual oppositely-disposed treadle-arms, 14 and 14′, in a well-known manner. These treadle-arms are shown, in Fig. 1, provided with the usual pedals, 15 and 15′; and the arms are or may be held in place on the shaft by means of the key, 16, this being held by means of a nut, 17, after the usual manner indicated in Fig. 4. The treadle-shaft 12 is shown mounted in ball-bearings, 18 and 18′, whose series of balls, respectively, are indicated by 19 and 19′, these balls being arranged between the usual single-track bearing-pieces, 20 and 20′, and the double-track bearing-pieces, 21 and 21′, arranged oppositely thereto, respectively, as will be understood from the drawings. Instead of said ball-bearings, of course, the shaft may be supported by a cylindrical journal running in an ordinary cylindrical bearing in the bracket; in which case not only the balls but the tracks therefor may, of course, be dispensed with.

According to my present invention, the power-wheel W (hereinafter designated as a sprocket-wheel) which is adapted for connection by the usual driving-chain with the driving-wheel of the bicycle, is not rigidly fixed on the driving or pedal-shaft 12, but is loosely supported thereon and is provided with a clutch whereby (except when a speed gear-

ing hereinafter described is brought into use) power is transmitted from the pedal-shaft to the sprocket-wheel and thence to the driving-wheel of the bicycle. Two forms of this clutch are shown in the present case, one form being a sliding clutch shown in Fig. 2, and the other form being a rolling ball clutch shown in Figs. 3 and 4. Each of these forms of clutch will be hereinafter more fully described. The sprocket-wheel W is, in some cases, actuated, as hereinbefore mentioned, from the pedal-shaft through a forwardly-acting clutch. But when the speed-gearing is brought into action, said sprocket-wheel is actuated through the gear-wheel, 22, which may be formed integral with said sprocket-wheel W, or may, as herein shown, consist of a separate part, provided with the gear-teeth, 23, and rigidly fixed in or to the hub, 24, of the sprocket-wheel. These two parts 22 and W constituting the sprocket-wheel as a whole, are shown supported upon the pedal-shaft by two roller-bearings, indicated in a general way by 25 and 25′, respectively.

The pedal-shaft carries a driving-gear, 26, which will, in some cases, be rigidly fixed or formed thereon as indicated in Figs. 3 and 4, and which, in other cases, will be fitted to slide thereon (but in non-rotative engagement therewith) as indicated in Fig. 2. This driving-gear 26 is of larger diameter than the driven-gear 22 of the sprocket-wheel. Adjacent to said driving and driven gears 26 and 22, respectively, are mounted a pair of intermediate gears 27 and 28, respectively, which are so mounted as to be shiftable from and into engagement with said wheels 26 and 22, respectively. Said intermediate gears may be formed integral or one of them, 28, may, as herein shown, be fixed upon the projecting end of the hub, 27′, of the other intermediate gear 27 (see Figs. 2 and 3). Said intermediate gear-wheel, designated in a general way by I, is shown mounted, by means of two ordinary roller-bearings designated by 29 and 29′, upon a stud or journal, 30, whose stem, 31, is fitted in a bore formed in the eccentric sleeve or shifter, designated in a general way by K. This sleeve is mounted in bearings formed in the bracket 10, and has at one end thereof the aforesaid arm 9, whereby the shifter may be turned for throwing the intermediate gear-wheel I from and into engagement with the aforesaid driving and driven gears 26 and 22. As a means for adjusting said bearing-stud 30, the end of its stem 31 is threaded at 32, and screwed into a corresponding thread formed in said shifter; a check-nut, 33, being provided for rigidly or adjustably fixing said stud in place. By means of this construction of the several details, the roller-bearings 29 and 29′ of said intermediate gear-wheel may be accurately adjusted.

The shiftable carrier or eccentric K is held in place longitudinally thereof in the bracket by means of the head, 34, of said bearing-stud, the roller-bearings 29 and 29′ having between them the intermediate gear-wheel I and the inner track 29″ of said roller-bearing 29, which track, by extending outward beyond the smallest radius of said eccentric, bears against the side of the frame or bracket at 35 (see Figs. 2 and 3), thereby holding all of the parts together. Longitudinal displacement of said shifter K in the opposite direction is prevented by the collar or head, 36, formed thereon and bearing against the opposite side of the bracket, as also clearly indicated in Figs. 2 and 3 of the drawings.

The clutch shown in Figs. 3 and 4 comprises two members, M and M′, respectively, the member M being in the nature of a ratchet-wheel herein shown as fixed upon the hub 24 of the sprocket-wheel W, and the member M′ being in the nature of a friction-drum having the flanged rim, 37, incasing the toothed rim of the member M as clearly shown in Fig. 3, which member M′ is adjustably fixed to the driving-shaft 12. The clutch-member M has a series of notches formed in its periphery, as shown at 41, to form carrying-pockets for a series of balls or rollers, 40, interposed between the member M and rim 37 of the member M′ of the clutch. The run or track, 41′, for the rollers 40 are, as in friction-clutches of this description, eccentric to the axis of the clutch member M′ and inner face of the rim thereof. These balls or rollers 40 serve to transmit power, in a well-known manner, from the pedal-shaft to the sprocket-wheel whenever the shaft is driven faster than said wheel. It will be understood that the clutch is only intended for practical use when it is desired to drive the shaft 12 and sprocket-wheel W at a uniform speed, or when the speed-gearing consisting of the intermediate gear-wheel I and driving and driven gears 26 and 22, respectively, are thrown out of operative engagement. In this construction of the clutch-mechanism, in coasting, the intermediate speed-gear I may be thrown out of engagement with the driving and driven gears 26 and 22, respectively, by means of the shifter K as shown in Fig. 3, in which case the treadle-shaft may remain idle during the continued revolution of the sprocket-wheel W which will permit the rider of the bicycle to keep his feet upon the treadles without movement thereof. By reference to the drawings, Figs. 3 and 4, it will be seen that when the speed-gearing is inactive, a continued movement of the sprocket-wheel in the direction of the arrow shown in Fig. 4, will tend to carry the friction-rollers 40 backward to the rear end of the pockets 41, where, owing to the velocity of the member M of the clutch, they are retained out of engagement with the friction-rim 37 of the clutch-member M′. By swinging the shifter-arm 9, through the medium of the hand-lever H, rods 5 and 8, and angle-lever 6, the eccentric or shifter K may be turned or swung in its bearing from the position shown in Fig. 3 to the position shown in Fig. 4 to carry the intermediate

gear-wheel I into engagement with the gears 26 and 22, respectively, and when so engaged movement of the pedal-shaft 12 through the driving-gear 26 to the intermediate gear I, and through the intermediate gear I to the speed driven gear 22 secured to or formed upon the sprocket-wheel W, which, owing to the sizes of said wheels, rotates the sprocket-wheel at a speed in excess of the speed of the shaft 12. This increased speed of the sprocket-wheel over the shaft 12 to which the member M′ of the clutch is fixed, results in the releasing of the rollers 40 from between the member M secured to the sprocket-wheel, and the rim 37 of the member M′ of the clutch, rendering said clutch idle, the rollers being carried back, as before described, by the momentum of the member M to the rear end of the pockets 41 out of engagement with the rim of the member M′. By a reverse movement of the shifter K from that hereinbefore described, the intermediate gear-wheel I will be thrown out of engagement with the gear-wheels 26 and 22, and the clutch will become automatically operative when power is applied to the pedal-shaft for revolving it at a greater speed than the sprocket-wheel. A spring, O, is shown placed around said eccentric or shifter and suitably connected at one end thereof with the shifter and at the other end thereof with the frame, for the purpose of holding the shifter in position for normally retaining the intermediate gear-wheel I out of engagement with the driving and driven gear-wheels 26 and 22, respectively, or in its inoperative position.

In the modification or form of mechanism illustrated in Fig. 2, the driving and driven gear-wheels 26 and 22 constitute the two essential members of the clutch-device, the driving-gear 26 or clutch-member being fitted for sliding movement upon the shaft 12 and being provided at one side thereof with clutch-teeth 26′ adapted for engagement with similar clutch-teeth, 22′, on the inner side of the driving gear 22; said driving-gear is shown provided with a flange, 26″, and having a peripheral groove, 26‴, in which is fitted the fork, 50, formed upon a sliding shaft or shifter-rod, 51, supported for longitudinal movement in bearings formed in the bracket 10. This shifter-rod has a projecting-pin, 52, engaging in a cam-groove, 53, formed in the shifter K, which cam-groove is so constructed and arranged that when the shifter is turned in its bearings to throw the intermediate gear I out of engagement with the gears 26 and 22, it will immediately after the teeth of said gear are thrown out of engagement, shift the member 26 toward the right-hand as shown in Fig. 2 with its side teeth in engagement with the side teeth of the member 22 to thus allow the sprocket-wheel and shaft 12 to be driven at a uniform speed. Upon the reverse movement of the shifter K, the member 26 is first thrown out of engagement with the member 22 of the clutch, and the continued movement of the shifter will throw the intermediate gear into engagement with the driving and driven gear-wheels 26 and 22 (or clutch members) whereupon the rotation of the shaft 12 will rotate the sprocket-wheel at an increased speed.

Having thus described my invention, I claim—

1. The combination with the driving-wheel of a bicycle, of the driving-shaft 12 revolubly carried at one side of said wheel and operatively connected therewith, a fast and a loose gear-wheel on said shaft, a clutch-device connected therewith, a speeding-gear shiftably supported at one side of the fast and loose gear-wheels and having teeth in position to mesh with the teeth of said wheels, an eccentric-shifter connected with said feeding-gear and comprising an eccentrically-bored sleeve and a gear-supporting stud secured in the bore of said sleeve and an actuator-arm fixed to said sleeve for actuating said shifter to throw the speeding-gear into and out from engagement with the fast and loose gear-wheels, substantially as described.

2. In a bicycle, the driving-wheel B, the driving-shaft carried in a bracket located at one side of and operatively connected with said wheel, the driving and driven gears on said shaft in combination with speeding-gears revolubly mounted upon a stud fixed in a shiftable eccentrically-bored sleeve journaled in said bracket at one side of the driving and driven gears, said operating gear being in position for engagement with and disengagement from the driving and driven gears, an actuator fixed to said sleeve for operating the same to shift the speeding-gears toward and from the driving and driven gears, and a clutch for connecting and disconnecting the driving and driven gears, substantially as and for the purpose described.

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