No. 616,269. Patented Dec. 20, 1898.

F. P. SNOW.

BICYCLE GEARING.

(Application filed Mar. 17, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1

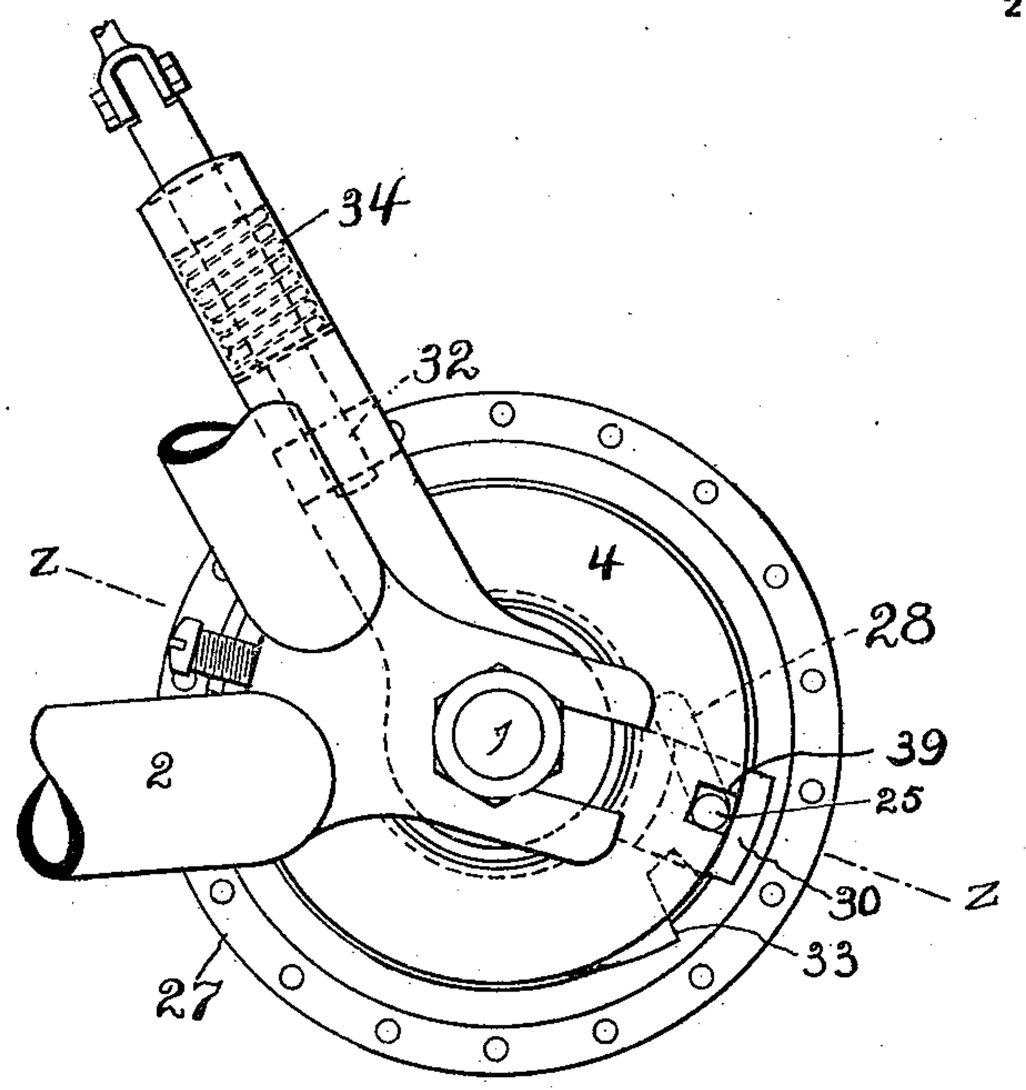
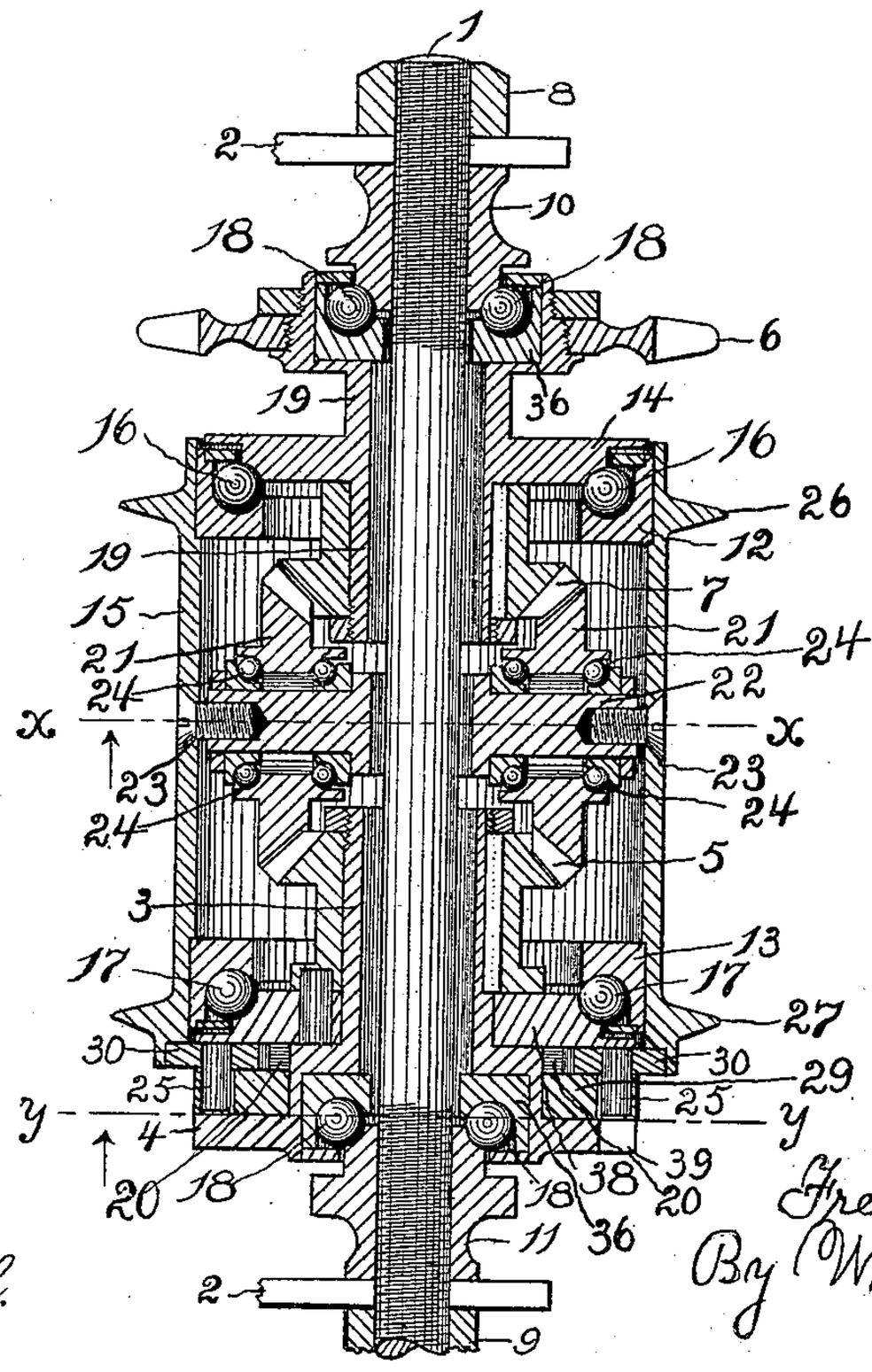


Fig. 2



Witnesses
E. J. Hyde.
E. W. Fothergill.

Inventor,
Fred P. Snow;
By Willard Eddy,
Attorney.

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Fig. 3.

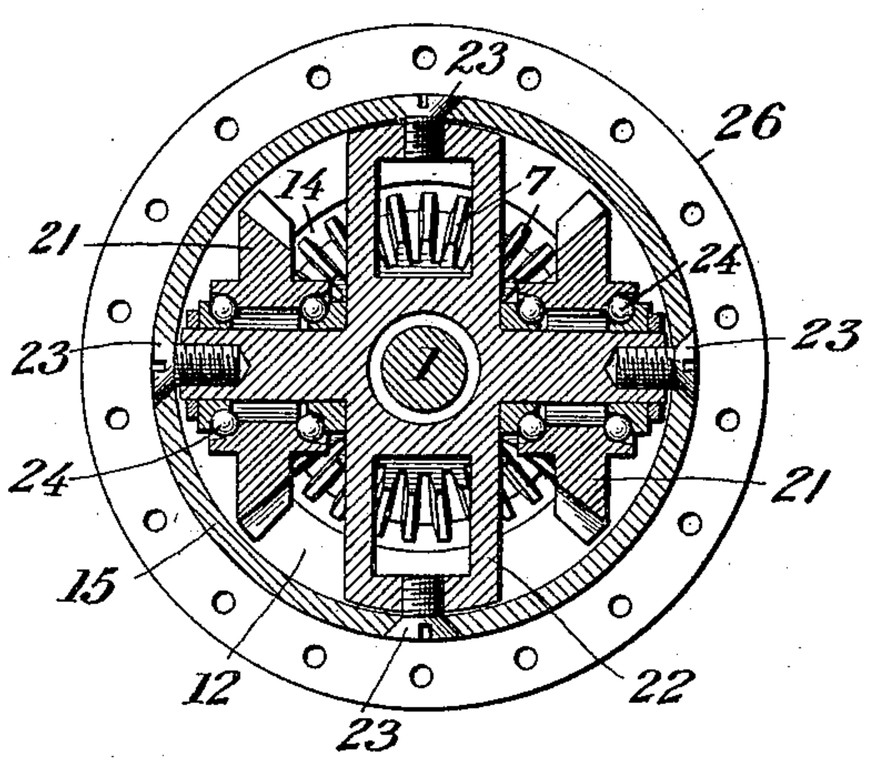


Fig. 4.

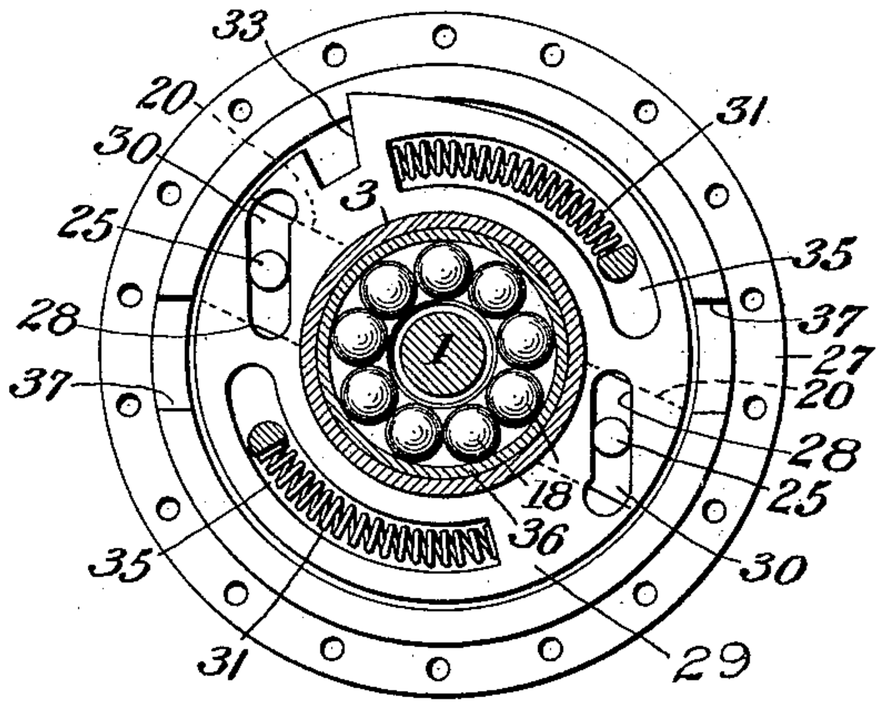
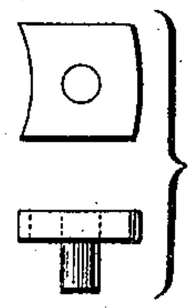


Fig. 5.



Witnesses.

Chas. D. King.

Emma J. Hyde.

Inventor.

Fred P. Snow,

By Willard Eddy

Atty.

UNITED STATES PATENT OFFICE.

FRED P. SNOW, OF LYNN, MASSACHUSETTS, ASSIGNOR TO THE STANTON MANUFACTURING COMPANY, OF BOSTON, MASSACHUSETTS.

BICYCLE-GEARING.

SPECIFICATION forming part of Letters Patent No. 616,269, dated December 20, 1898.

Application filed March 17, 1898. Serial No. 674,171. (No model.)

To all whom it may concern:

Be it known that I, FRED P. SNOW, of Lynn, Essex county, Massachusetts, have invented certain new and useful Improvements in Bicycle-Gearing, which improvements are described in the following specification and are illustrated by the accompanying drawings.

My invention relates in general to that class of bicycle-gearings by which the driving-wheel of the vehicle is rotated variably either at one or the other of two predetermined rates of speed, relative to the rate of pedaling.

In particular the invention relates to those gearings of the specified class wherein the lower speed of the driving-wheel is derived from a pinion meshing with a pair of gear-wheels and having an orbital motion between them. Gearings of this description as heretofore constructed and inclosed in the necessary casing have been too little accessible, have been difficult to be taken apart and to be put together, and have not been easily adjustable in respect of their bearings. To obviate these difficulties and at the same time to attain simplicity and strength of mechanism are the objects of this invention. To accomplish these objects, I place in the hub of the driving-wheel and upon the stationary axle of the same two separate rotary sleeves, two bevel gear-wheels which are united with those sleeves, respectively, an intermediate pinion which is journaled to the cylindrical shell of the hub, and two mutually-adjustable bearings which are located between the axle and the sleeves and which hold the gear-wheels and the pinion together.

The best manner in which I have contemplated applying the principles of my invention is shown in said drawings, by which the invention is illustrated.

Figure 1 is a side view of a portion of a bicycle and includes an end view of the hub of the driving-wheel, all constructed in accordance with the requirements of my invention. Fig. 2 is an axial section of Fig. 1 on the broken line *z z*. Fig. 3 is a cross-section of the hub on the broken line *x x* of Fig. 2. Fig. 4 is a cross-section of the hub, taken on the broken line *y y* of Fig. 2 and viewed in the direction of the arrows in that figure. Fig. 5 is a detail showing part of the locking mechanism.

In the views the numeral 1 denotes the axle of the driving-wheel. This axle is rigidly attached to the bicycle-frame 2 by means of the terminal nuts 8 and 9 and the adjustable cone-nuts 10 and 11. On this axle and at one side of its middle is placed a rotary sleeve 3, which is provided at its outer end with a flange 4, having notch 39, and at its inner end with a rigidly-attached bevel gear-wheel 5, as shown in Fig. 2. On the same axle and at the other side of its middle is placed a rotary sleeve 19, which carries the sprocket-wheel 6, a flange 14, and a bevel gear-wheel 7, all rigidly connected. The cylindrical hub-shell 15, which is provided with internal bearing-pieces of hardened steel 12 and 13 and with perforated external ribs or flanges 26 and 27, to which the spokes of the wheel may be attached, is mounted rotarily between flange 14 and the bearing-piece 38 of flange 4 by ball-bearings 16 and 17. Between the gear-wheels 5 and 7 and meshing continually with them is placed a pinion or a pair of pinions 21, duplicates of each other, journaled to a frame or spider 22, which spans the axle 1 and is fastened to shell 15 by screws 23, as shown in Figs. 2 and 3. These pinions, which are preferably equal in size to gear-wheels 5 and 7, are provided with ball-bearings 24 to facilitate their rotation upon the arms of spider 22. The sleeves 3 and 19 are provided at their outer ends with suitable annular bearing-pieces 36 and with ball-bearings 18, whereby the whole structure is held together between said cone-nuts 10 and 11.

The locking mechanism of this gearing may be observed from Figs. 1, 2, 4, and 5. The principal feature of the lock is a pair of flat bolts 30, which are shown in cross-section in Fig. 2. Both a face view and an edge view of one of these bolts is shown in Fig. 5. These bolts are adapted to slide radially in grooves 20, which are formed in bearing-piece 38 and which are shown in Fig. 2 and are indicated by broken lines in Fig. 4. When pushed out, bolts 30 engage hub-shell 15 by means of notches 37 in that shell. Each of these bolts is provided with a pin 25, which

extends into the oblique slot 28 of the annular slotted cam 29. This cam, which is fully shown in Fig. 4, is seated on the inner face of flange 4 and is actuated in one direction by springs 31 and in the opposite direction by engagement with catch 32 by means of the cam-notch 33. In order that catch 32 may be made to engage or disengage the cam, I provide suitable catch-actuating mechanism 34, arranged within easy reach of the rider, as indicated in Fig. 1.

The operation of the invention requires but little description. When catch 32 occupies a position of disengagement, as shown in Fig. 1, cam 29, being actuated solely by springs 31, operates by pins 25 to force bolts 30 radially outward into notches 37 of shell 15, as shown in Figs. 1 and 2. Then sprocket-wheel 6, being locked to shell 15 by the intervening mechanism, drives the hub in unison with itself; but whenever catch 32 is advanced to its position of engagement (not shown in the drawings) it first enters notch 33 and so stops the cam 29. By the consequent drawing of bolts 30 radially inward out of notches 37 in shell 15 the described engagement between that shell and the bearing-piece 38 in flange 4 is released, and then catch 32 enters notch 39 at the periphery of flange 4, and so stops the rotation of gear-wheel 5. As the pedaling continues the consequent rotation of the driving gear-wheel 7 relatively to the stationary gear-wheel 5 imparts to pinions 21, which roll between them, both a rotary and an orbital motion about the axle 1. This orbital motion, being communicated to shell 15 through the journals of pinions 21, drives the hub in unison with those pinions at an angular velocity equal to one-half that of the sprocket-wheel, so that by the mere manipulation of mechanism 34 the rider causes the driving-wheel of the bicycle to take either the full rate of rotation of the sprocket-wheel or one-half that rate, as he may please or as the conditions of travel may require, and changes either of those rates for the other without dismounting. Operating in this general manner the invention is distinguished from all others of the specified class in respect of the adjustment and accessibility of the bearings. The main bearings 17 and 18, being the only bearings between the axle and the hub, are but two in number. By them alone the whole intermediate mechanism is held together and is so held with a degree of closeness which is dependent upon the relative positions of adjustment of the cone-nuts 10 and 11. A slight turning of either of those nuts affects in an equal degree both of those bearings and likewise affects in a uniform manner not only the ball-bearings 16 and 17, but also the engagement of the pinions with the gear-wheels. To this feature of my invention, therefore, it is due that all the bearings of the device may be adjusted by the turning of a single nut and that the wear may be taken up without opening the hub. At the same time the interior mechanism of the hub may be conveniently dissected and from both ends of the shell 15 for the purposes of cleaning and repairs. Sleeve 19, with its flange 14, its gear-wheel 7, and its sprocket-wheel 6, may be removed from the axle and from the shell 15 by simply taking off the cone-nut 10, and in like manner sleeve 3, with its flange 4, its cam 29, and its gear-wheel 5, may be similarly removed at the other end of the shell by taking off the cone-nut 11.

Such being the construction and operation of my improved gearing for bicycles, I claim as my invention—

1. In the hub of a driving-wheel, two separate rotary sleeves, confined on the axle by two mutually-adjustable bearings, and provided each with a fixed bevel gear-wheel, in combination with an intermediate bevel-pinion, attached to the hub-shell, and continually engaging said gear-wheels, substantially as and for the purpose specified.

2. A stationary axle, two rotary sleeves thereon, two bevel gear-wheels, united with said sleeves respectively, and an intermediate bevel-pinion, which is attached to a hub-shell, and which continually engages both said gear-wheels, in combination with two ball-bearings, which hold said sleeves and intermediate pinion between them, and are mutually adjustable on said axle, substantially as and for the purpose specified.

3. A stationary axle, two rotary sleeves thereon, two bevel gear-wheels, united with said sleeves respectively, an intermediate bevel-pinion, a hub-shell, attached to the journal of said pinion, and two mutually-adjustable bearings, which are located between said axle and said sleeves respectively, and are adapted to hold said gear-wheels continually in mesh with said pinion, in combination with alternate locking mechanism, substantially as and for the purpose specified.

4. A stationary axle, two rotary sleeves thereon, two bevel gear-wheels, united with said sleeves respectively, a sprocket-wheel, united with one of said sleeves, a hub-shell, a bevel-pinion, which is attached to said shell and continually engages both said gear-wheels, and two mutually-adjustable bearings on said axle, which hold said sleeves, gear-wheels and pinion between them, in combination with alternate locking mechanism whereby all the rotary parts of the hub may be fastened to rotate in unison with the sprocket-wheel, and whereby one of said gear-wheels may be locked so as not to rotate at all, substantially as and for the purpose specified.

5. In the hub of a driving-wheel, two rotary sleeves, two bevel gear-wheels, united with said sleeves respectively, and two intermediate beveled pinions, which are attached to the hub-shell, in combination with two ball-bearings, which hold the gear-wheels and pinions in continual engagement, and which

are mutually adjustable on the axle of the wheel, substantially as and for the purpose specified.

6. In the driving-wheel of a bicycle, or other like vehicle, a stationary axle, two rotary sleeves thereon, two bevel gear-wheels, united with said sleeves respectively, a pair of pinions which are journaled to a spider, spanning said axle, and which continually engage both said gear-wheels, in combination with a rotary cylindrical hub-shell, made fast to said spider, and mechanism for locking one of said gear-wheels alternately to the frame of the vehicle and to the hub-shell, substantially as and for the purpose specified.

7. In the hub of a driving-wheel, an axle, two separable sleeves, which are rotary thereon, and are provided each with a fixed bevel gear-wheel, in combination with an intermediate bevel-pinion, all held together with variable closeness of engagement by and between two cone-nuts upon the axle, substantially as and for the purpose specified.

In testimony whereof I hereunto set my name in the presence of two witnesses.

FRED P. SNOW.

Witnesses:
CATHARINE L. GUINEY,
WILLARD EDDY.