No. 754,587. PATENTED MAR. 15, 1904.

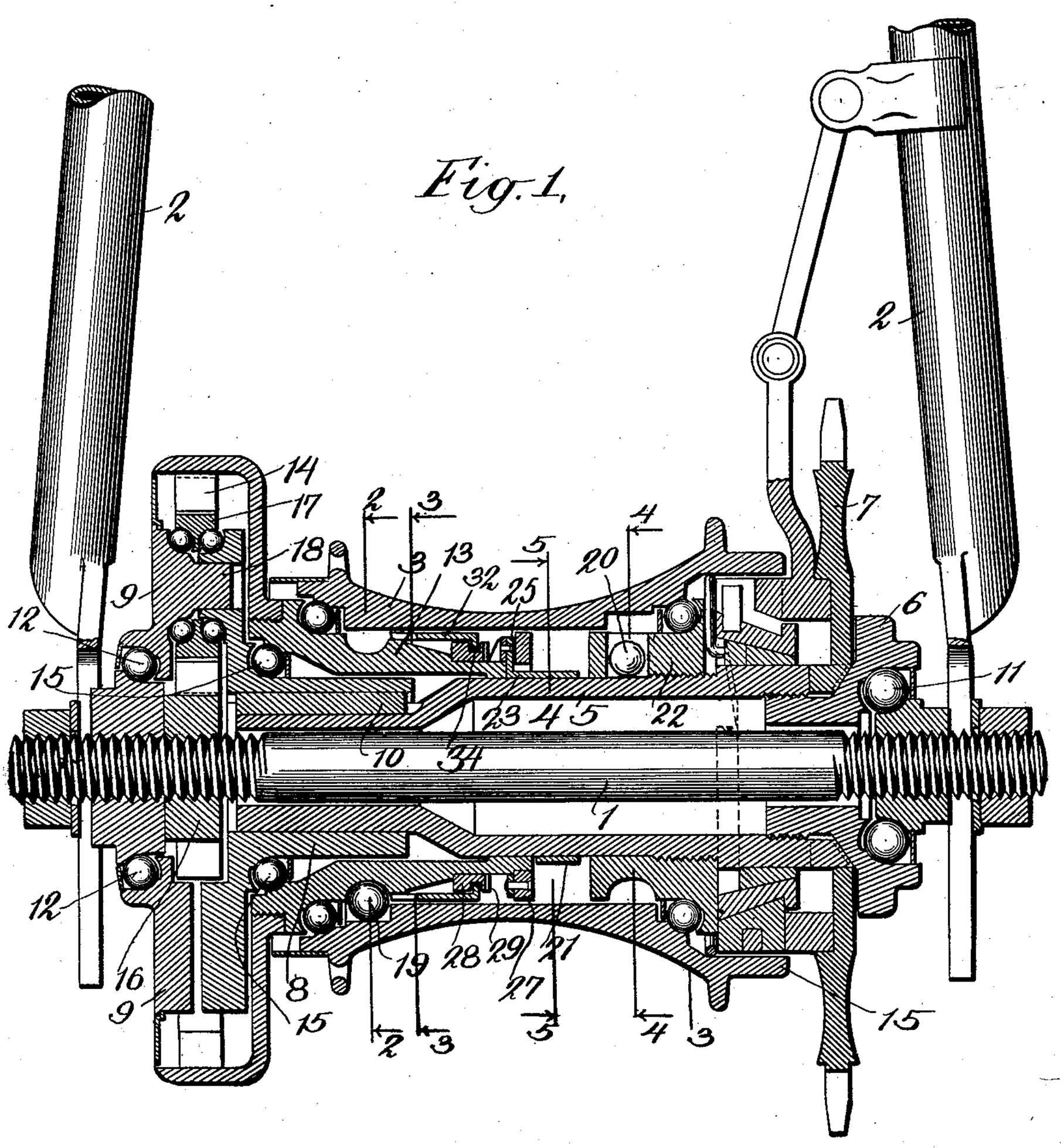
H. F. MAYNES.

BICYCLE GEARING.

APPLICATION FILED OCT. 6, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2,

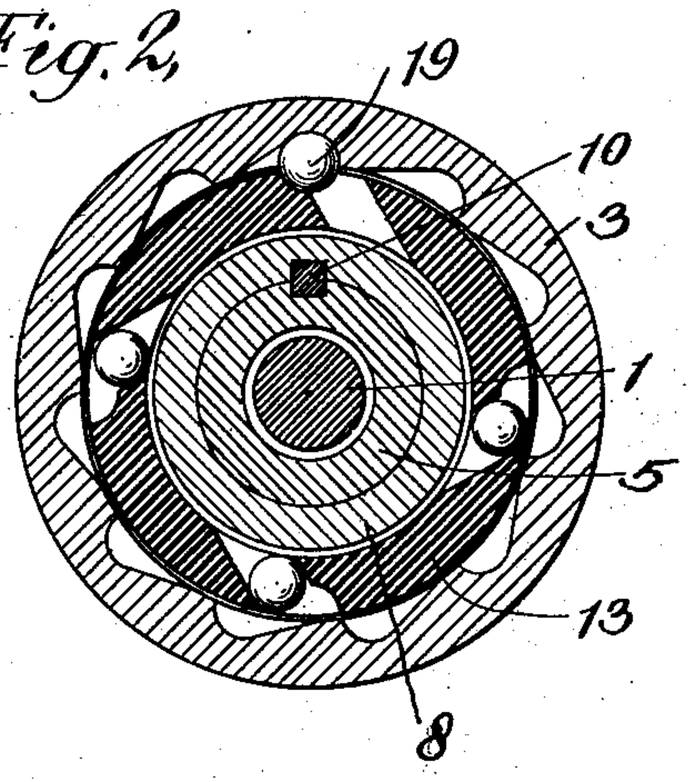


Fig. 4,

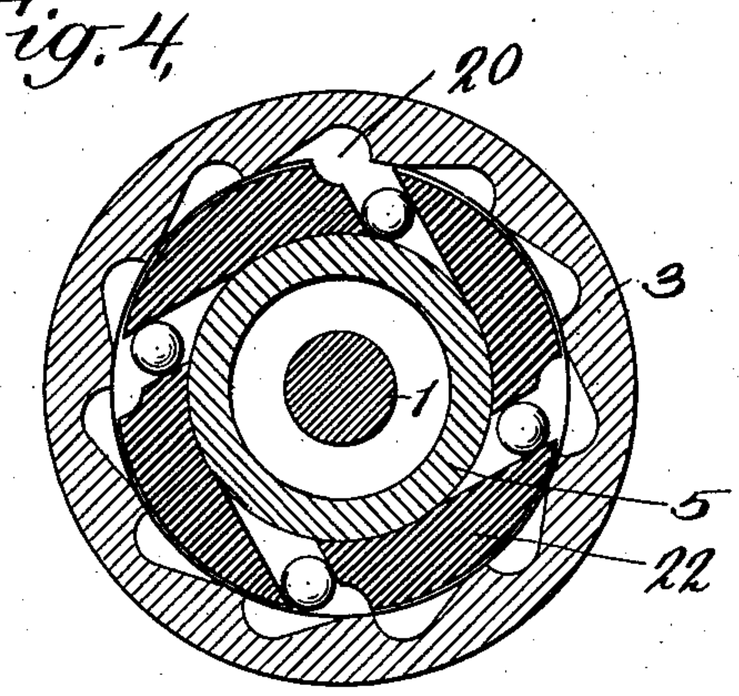


Fig. 3,

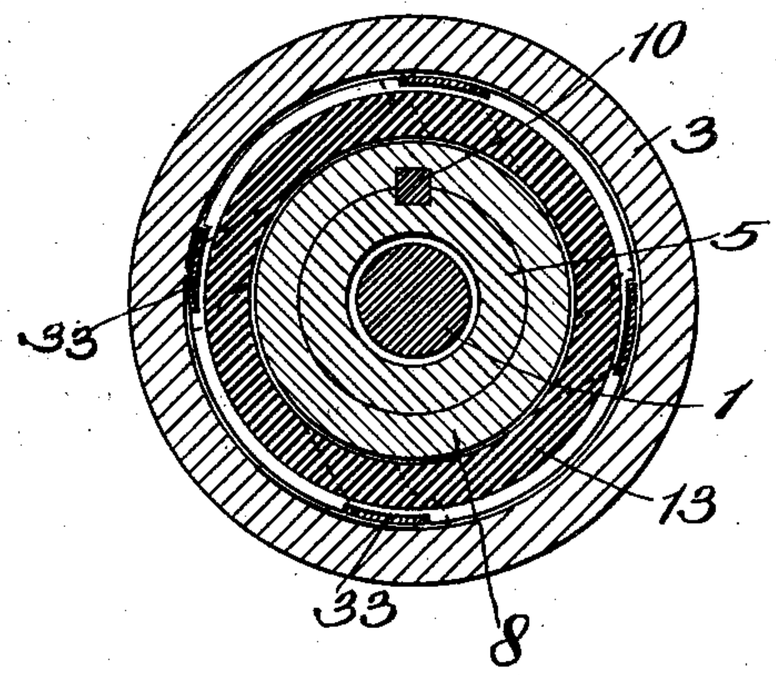


Fig. 6,

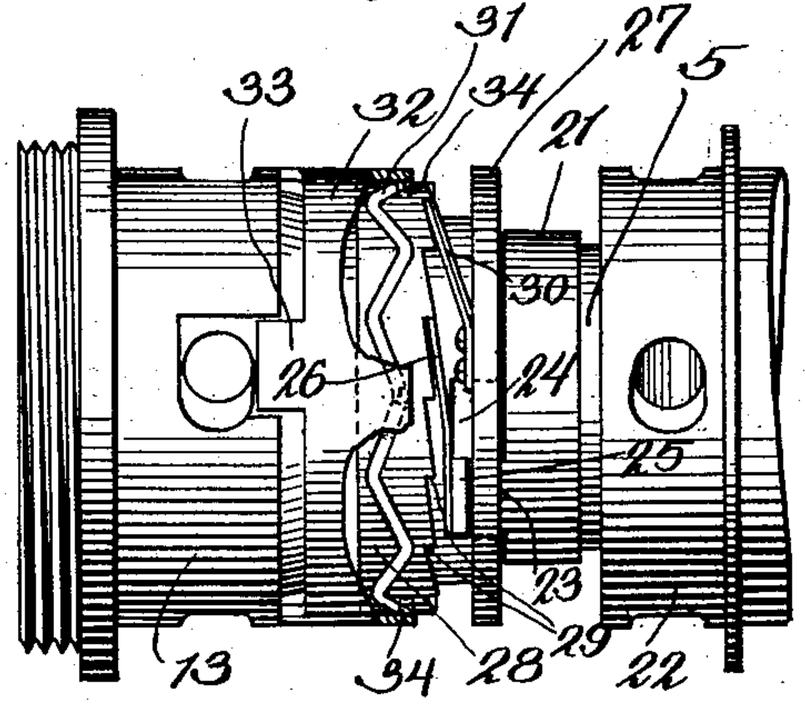
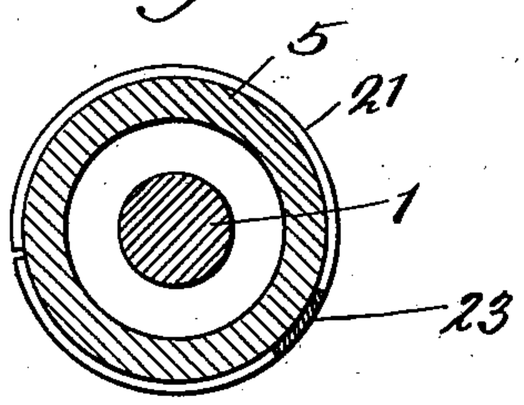


Fig. 5,



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No. 754,587. Patented March 15, 1904.

UNITED STATES PATENT OFFICE.

HYLA F. MAYNES, OF CORNING, NEW YORK.

BICYCLE-GEARING.

SPECIFICATION forming part of Letters Patent No. 754,587, dated March 15, 1904.

Application filed October 6, 1903. Serial No. 175,934. (No model.)

To all whom it may concern:

Be it known that I, HYLA F. MAYNES, a citizen of the United States of America, and a resident of Corning, county of Steuben, State of New York, have invented certain new and useful Improvements in Bicycle-Gearing, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to bicycle-gearing, and particularly to change-speed mechanism operated through the medium of the driving mechanism itself.

My invention consists in certain improved details of construction and combination of parts, as will hereinafter appear, and particularly in an improved clutch-controlling mechanism by which change is made from one driving speed to another.

The objects of my invention are, first, to simplify the construction of the device, lessen the cost of manufacture, and reduce the number of parts; second, to render the interior of the device easily accessible by providing for the ready removal of the parts from both ends of the hub, and, third, to operate the clutch-controller by connection with the high and low speed sleeves only and without employment of a supplemental clutch mechanism in connection with the stationary axle, as has been employed for this purpose heretofore.

I will now proceed to describe bicycle-gearing embodying my invention and will then point out the novel features in claims.

In the drawings, Figure 1 shows a view in central longitudinal section of a bicycle-gearing embodying my invention. Fig. 2 shows a view in transverse section, the section being taken upon the plane of the line 2 2 of Fig. 1. Fig. 3 shows a view in transverse section, the section being taken upon the plane of the line 3 3 of Fig. 1. Fig. 4 shows a view in transverse section, the section being taken upon the plane of the line 4 4 of Fig. 1. Fig. 5 shows a view in transverse section, the section being taken upon the plane of the line 5 5 of Fig. 1. Fig. 6 is a detail outside view of the clutch-controlling mechanism, together with portions of the high and low speed sleeves.

In the embodiment of my invention herein the usual stationary axle 1 is provided, rigidly secured to the rear stays 2 of the bicycle. The rear or driving wheel of the bicycle is represented by its hub 3, and the said hub is mounted to rotate upon suitable ball-bearings with respect to the stationary axle 1 and intermediate parts.

Interposed between the hub 3 and the axle 1 are two driving-sleeves, one of which for purposes of this specification I designate the "high-speed" sleeve and the other the "low-speed" sleeve. The low-speed sleeve is designated in the drawings as a whole by the reference character 4 and comprises a shell 5, carrying at one end a ball-race 6, between which and the end of the shaft 5 is removably clamped a driving member 7 and supporting at the other end a gear-carrier 8 and an end support and ball-race 9. The gear-carrier 8 is fitted with a sliding fit upon the inner end of the shell 5 and secured thereto against relative rotation by means of a key or feather 10. Ball-bearings 11 support the low-speed sleeve 4 rotatively upon the stationary axle 1 at one end, and ball-bearings 12 support the same at the other end.

The high-speed sleeve comprises a shell or hub 13 and an internal gear-ring 14. The inner end of the high-speed sleeve rests upon and is supported by the low-speed sleeve, while the end nearest the gear-ring is provided with a ball-bearing 15, arranged between it and the low-speed sleeve.

A stationary gear 16 is shrunk upon or otherwise rigidly secured to the stationary spindle 1, and planetary gear-wheels 17, supported upon studs 18, carried by the low-speed sleeve, mesh with the teeth of the said stationary gear 16 and with the teeth of the internal gear-ring 14 of the high-speed ring.

A ball-clutch 19 is arranged between the shell of the high-speed sleeve and the hub 3, and another ball-clutch 20 is arranged between the said hub 3 and the low-speed sleeve. The respective sleeves are provided with pockets into which the balls may be received when not in operative position, such pockets being shown more clearly in Figs. 2 and 4 of the drawings, (and the balls being shown as contained in the pockets in Fig. 4,) while the hub

is provided at its interior with notches to receive the balls when operatively acting as a clutch. The portion of the low-speed sleeve coacting with the clutch-balls is designated in the drawings by the reference-numeral 22.

The clutch 19, operating in connection with the high-speed sleeve, is termed the "high-speed" clutch, and similarly the clutch 20, operating in connection with the low-speed sleeve, is termed the "low-speed" clutch. In the drawings the high-speed clutch is shown operatively connected, while the balls of the low-speed clutch are shown as within the pockets and disconnected from operative engagement. With the parts in this position drive will be effected as follows: Power being applied to the driving member 7 and the low-speed sleeve revolved thereby at the same speed as the driving member, a planetary motion will be imparted to the planetary gears 17 around the stationary gear 16 and a driving movement thus transmitted to the high-speed sleeve by reason of the engagement of the said planetary gears with the internal gear-ring 14. The high-speed clutch 19 at such times locking the high-speed sleeve with the hub 3, the hub will be rotated at the same speed as the high-speed sleeve, and hence at a relatively high speed with respect to the speed of rotation of the driving member and the low-speed sleeve. With the position of the clutches 19 and 20 reversed—that is to say, with the low-speed clutch 20 in operative position and the high-speed clutch held out of operative position—the drive will be direct from the low-speed sleeve to the hub, while the high-speed sleeve will at such time be rotated freely at its high rate of speed, but being out of clutch connection with the hub will not affect it.

I will now proceed to describe the means for changing from one driving speed to the other—that is to say, from a driving connection through one of said sleeves to a driving connection through the other. Such change is effected by a back-pedaling movement of the power-transmitting member and without the employment of any operating devices other than those directly connected to or operated by the power-transmitting means itself. The clutch-controlling mechanism comprises a pawl-carrier 21, fitted to and carried by the shell 5 of the low-speed sleeve. The pawl-carrier 21 frictionally engages the said shell and for this purpose may conveniently be made in the form of a split ring sprung upon the shell 5 and clasping it with a yielding pressure. This split ring is provided with a lateral projection 23, received within a recess 24 in the end of the shell 13 of the high-speed sleeve. The length of the recess in the plane of rotation of the device is greater than the length of the projection 23, so that a limited movement or play is permitted therein. The projection 24 has a radial lug 25, to which is secured a spring-pawl 26. A retaining-ring 27, rigidly secured to the end of the shell 13, maintains the said pawl-carrier in proper relation to the shell 13 of the high-speed sleeve. A cam-ring 28 is rotatably mounted upon the shell 13 of the high-speed sleeve and is provided with laterally-projecting ratchet-teeth 29, arranged to be engaged by the pawl 26. A stop-pawl 30, carried by the ring 27, rigid with the high-speed sleeve, also engages the ratchet-teeth 29 of the ring 28. Upon its outer periphery the ring 28 is provided with a cam-groove 31. A clutch-controlling sleeve 32 is carried by the high-speed sleeve, at one end being supported upon the ring 28 and at its opposite end provided with fingers 33, which rest in recesses in the shell 13, leading to the pockets in the shell for receiving the clutch-balls of the high-speed clutch 19. The connection of the clutch-controlling sleeve 32 with the high-speed sleeve is such as to compel rotative engagement therewith, but to permit limited relative movement longitudinally thereof. At its end opposite to the end having the fingers 33 the said sleeve is provided with one or more inwardly-projecting studs or cam-followers 34, which are received within the cam-groove 31 in the ring 28. The cam-groove 31 follows a zigzag course around the periphery of the ring 28, the angular advance for a period of any continuous longitudinal movement in one direction being equal to the distance between two of the ratchet-teeth.

With the parts in the position in which they are shown in the drawings, and particularly with reference to Fig. 6, it will be seen that when the teeth or projections 34 are in a position in the cam-grooves farthest away from the high-speed clutch the fingers 33 of the said sleeve 32 will be out of the path of the balls of the said high-speed clutch, and hence will not interfere with their operation. A rotation of the ring 28 with respect to the high-speed sleeve, and hence with respect to the clutch-controller sleeve 32, will cause the studs or followers 34 to engage with the cam-groove 31 at points nearest to the high-speed sleeve and in their movement from one position to the other will move the clutch-controlling sleeve 32 longitudinally upon the high-speed shell, so as to bring the fingers 33 into the path of movement of the balls of the high-speed clutch 19, and thus prevent their operation.

To explain the operation of the clutch-controller, the parts may be considered to be in the position in which they are shown in the drawings—that is to say, the clutch-controlling sleeve 32 in its position farthest away from the high-speed clutch and the balls of the high-speed clutch operatively connecting the high-speed sleeve with the hub 3. During this time the balls of the low-speed clutch 20 will be overrun, and so will not prevent free relative rotation of the low-speed sleeve

4 with respect to the hub 3, the low-speed sleeve at such time rotating at a lower rate of speed than the hub 3.

The high-speed sleeve 13, which rotates at a higher rate of speed than the low-speed sleeve, will carry the pawl-carrier 21 around with it at its rate of speed; but the said pawl-carrier will hang back against the rear shoulder of the recess 24 because of its frictional engagement with the low-speed sleeve. If the power-transmitting member 7 be held stationary, both ball-clutches 19 and 20 will be overrun and the wheel will run free. A back-pedaling movement of the power-transmitting member will rotate both the high-speed and the low-speed sleeves rearwardly, the high-speed sleeve, however, rotating at a higher rate of the speed than the low-speed sleeve. The result of this will be, first, that the pawl-carrier will hang back with the low-speed sleeve until the projection 23 is picked up by the front shoulder of the recess 24. Further movement in the same direction will cause the high-speed sleeve and the pawl-carrier to move together; but during the relative movement, as just explained, the ring 28 will have been moved with the pawl-carrier, by reason of the pawl connection therewith, a distance equal to the free play of the projection 23 within the recess 24. This is also a distance between two of the ratchet-teeth 29 and a distance between one of the inner points and one of the outer points of the cam-groove 31. This relative movement therefore will have forced the clutch-controlling sleeve 32 toward the high-speed clutch 19, so that the fingers 33 will be in the path of movement of the balls thereof, whereby upon forward driving movement of the parts the balls will be prevented from operatively engaging the hub. When the forward driving movement takes place, a relative movement of the pawl-carrier and the high-speed sleeve will again be effected, but in the opposite direction to the previous movement, and at this time no relative movement of the cam-ring 28 will take place, the said cam-ring being held stationary by the stop-pawl 30, while the pawl 26 upon the carrier 21 will be moved a distance between two of the ratchet-teeth 29, so as to pick up a new tooth ready for the next operation. The high-speed clutch being now out of operative engagement, the balls of the low-speed clutch 20 will engage the hub 3, and the wheel will then be rotated at the lower speed. The high-speed sleeve will at this time rotate freely. The next back-pedaling movement, similar to the foregoing, will shift the controlling-sleeve back to the position in which it is shown in the drawings, whereby the device will be again driven at the highest speed, and similar subsequent movements will change from one speed to the other, as will be readily understood.

It will be obvious that the foregoing is but one embodiment of my invention and that the same is capable of many and varied modifications within the spirit and scope of my invention and, further, that certain parts may be employed in connection with other parts of different construction. Hence I do not desire to be limited only to the precise details of construction and combination of parts herein.

What I claim is—

1. In bicycle-gearing, the combination with a wheel-hub and a stationary axle therefor, of a driving-sleeve rotatably mounted between the axle and the hub, said sleeve composed of two parts, one telescoped upon the other, and provided with a key locking the two parts together against relative rotation, but permitting relative longitudinal movement, one portion of said sleeve at one end supporting a power-transmitting member, and the other portion of said sleeve at the other end carrying a gear.

2. In bicycle-gearing, the combination with a wheel-hub and a stationary axle, of two driving-sleeves concentrically mounted between the hub and the axle, gearing connecting the sleeves together to rotate at different speeds, and clutch mechanism between the sleeves and the hub operatively connecting the hub with one or other of the said sleeves, and a power-transmitting member secured to one of the said sleeves at the end opposite to the end at which the gearing is arranged, the said sleeve carrying the power-transmitting member composed of two parts slidably connected together but locked against relative rotation.

3. In bicycle-gearing, the combination with a wheel-hub, a stationary axle, two concentric driving-sleeves arranged between the hub and the axle, and gearing connecting the sleeves together to rotate at different relative speeds, of a clutch-controlling sleeve carried by the high-speed sleeve and locked thereon against relative rotary movement, a clutch controlled by said clutch-controlling sleeve, and means for shifting the said clutch-controlling sleeve longitudinally with respect to the sleeve on which it is mounted.

4. In bicycle-gearing, the combination with a wheel-hub, a stationary axle, two concentric driving-sleeves arranged between the hub and the axle, and gearing connecting the sleeves together to rotate at different relative speeds, of a clutch-controlling sleeve carried by the high-speed sleeve and locked thereon against relative rotary movement, a clutch controlled by said clutch-controlling sleeve, and means controlled by a back-pedaling movement for shifting the clutch-controlling sleeve longitudinally with respect to the sleeve on which it is mounted.

5. In bicycle-gearing, the combination with a wheel-hub, a stationary axle, two driving-sleeves concentrically arranged between the stationary axle and the wheel-hub, and gearing connecting the two sleeves together to rotate at different relative speeds, of a clutch-

controlling sleeve carried by one of said driving-sleeves, clutch mechanism controlled thereby, and operating means for said clutch-controlling sleeve engaged by the other said driving-sleeve.

6. In bicycle-gearing, the combination with a wheel-hub, a stationary axle, two driving-sleeves concentrically arranged between the stationary axle and the wheel-hub, gearing connecting the two sleeves together to rotate at different relative speeds, and a power-transmitting member rigidly secured to one of the said sleeves, of a clutch-controlling sleeve carried by one of said driving-sleeves, clutch mechanism controlled thereby, and operating means for said clutch-controlling sleeve engaged by the other said driving-sleeve, the latter said driving-sleeve being the sleeve to which is secured the power-transmitting member.

7. In bicycle-gearing, the combination with a wheel-hub and a stationary axle, two driving-sleeves concentrically arranged between the stationary axle and the wheel-hub, and gearing connecting the two sleeves together to rotate at different relative speeds, of a clutch-controlling sleeve carried by one of said driving-sleeves and locked thereto against relative rotation, clutch mechanism controlled thereby, a cam for shifting the clutch-controlling sleeve longitudinally with respect to the sleeve carrying it, and means engaged by the other said driving-sleeve for rotatively shifting the cam.

8. In bicycle-gearing, the combination with a wheel-hub and a stationary axle, two driving-sleeves concentrically arranged between the stationary axle and the wheel-hub, and gearing connecting the two sleeves together to rotate at different relative speeds, of a clutch-controlling sleeve carried by one of said driving-sleeves and locked thereto against relative rotation, clutch mechanism controlled thereby, a cam for shifting the clutch-controlling sleeve longitudinally with respect to the sleeve carrying it, and operating means therefor frictionally engaged by the other said sleeve, but having a limited rotative movement with respect to the sleeve carrying the clutch-controlling sleeve.

9. In bicycle-gearing, the combination with a wheel-hub and a stationary axle, two driving-sleeves concentrically arranged between the stationary axle and the wheel-hub, and gearing connecting the two sleeves together to rotate at different relative speeds, of a clutch-controlling sleeve carried by one of said driving-sleeves and locked thereto against relative rotation, clutch mechanism controlled thereby, a cam for shifting the clutch-controlling sleeve longitudinally with respect to the sleeve carrying it, a pawl-carrier frictionally engaged by the other said sleeve, but having a limited rotative movement with respect to the sleeve carrying the clutch-controlling sleeve, and a pawl carried by the pawl-carrier and arranged to engage the said cam.

10. In bicycle-gearing, the combination with a wheel-hub and a stationary axle, two driving-sleeves concentrically arranged between the stationary axle and the wheel-hub, and gearing connecting the two sleeves together to rotate at different relative speeds, of a clutch-controlling sleeve carried by one of said driving-sleeves and locked thereto against relative rotation, clutch mechanism controlled thereby, a cam-ring carried by the said driving-sleeve and engaging the clutch-controlling sleeve, said cam-ring having ratchet-teeth, a stop-pawl carried by the same, said driving-sleeve engaging said ratchet-teeth, a pawl-carrier frictionally engaged by the other said drive-sleeve, but arranged to have a limited rotative movement with respect to the first said driving-sleeve, and a pawl carried by said pawl-carrier and engaging the ratchet-teeth of said cam-ring.

11. In bicycle-gearing, the combination with two members geared together to rotate at different relative speeds, of a clutch-controller comprising two portions, one carried by one of said members and locked against relative rotation with respect thereto, and the other arranged to have a limited rotative movement with respect to the same said member, but frictionally engaged by the other said member.

12. In bicycle-gearing, the combination with two members geared together to rotate at different relative speeds, and a clutch, of a clutch-controller carried by, and rotating with, the said members and engaging both said members, said clutch-controller operated by relative movements of one said member with respect to the other.

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

HYLA F. MAYNES.

Witnesses:
C. F. CARRINGTON,
MINERVA PAPE.