(No Model.)

S. K. SEELYE.

CHANGE SPEED GEARING.

No. 594,567. Patented Nov. 30, 1897.

Fig. 1.

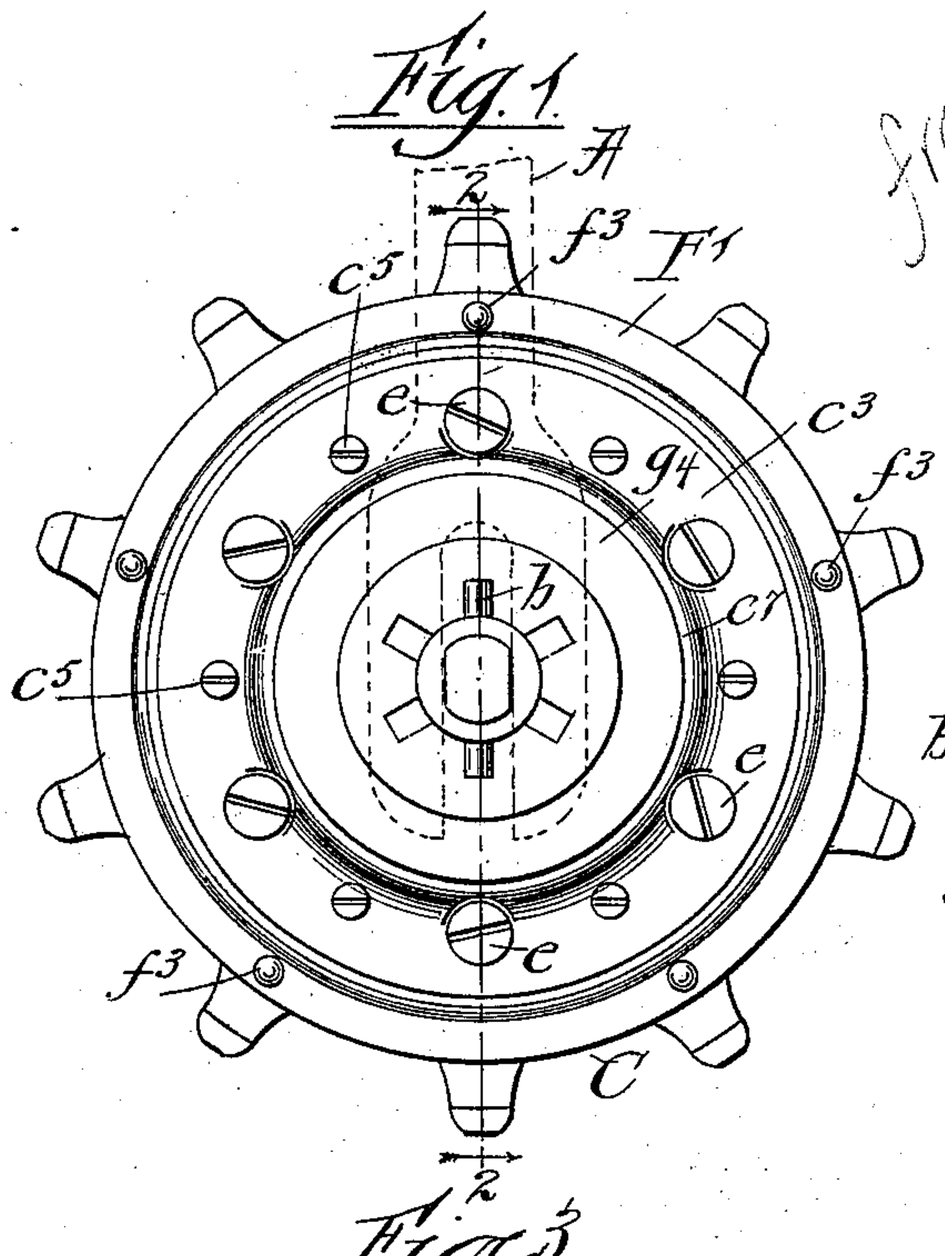


Fig. 2.

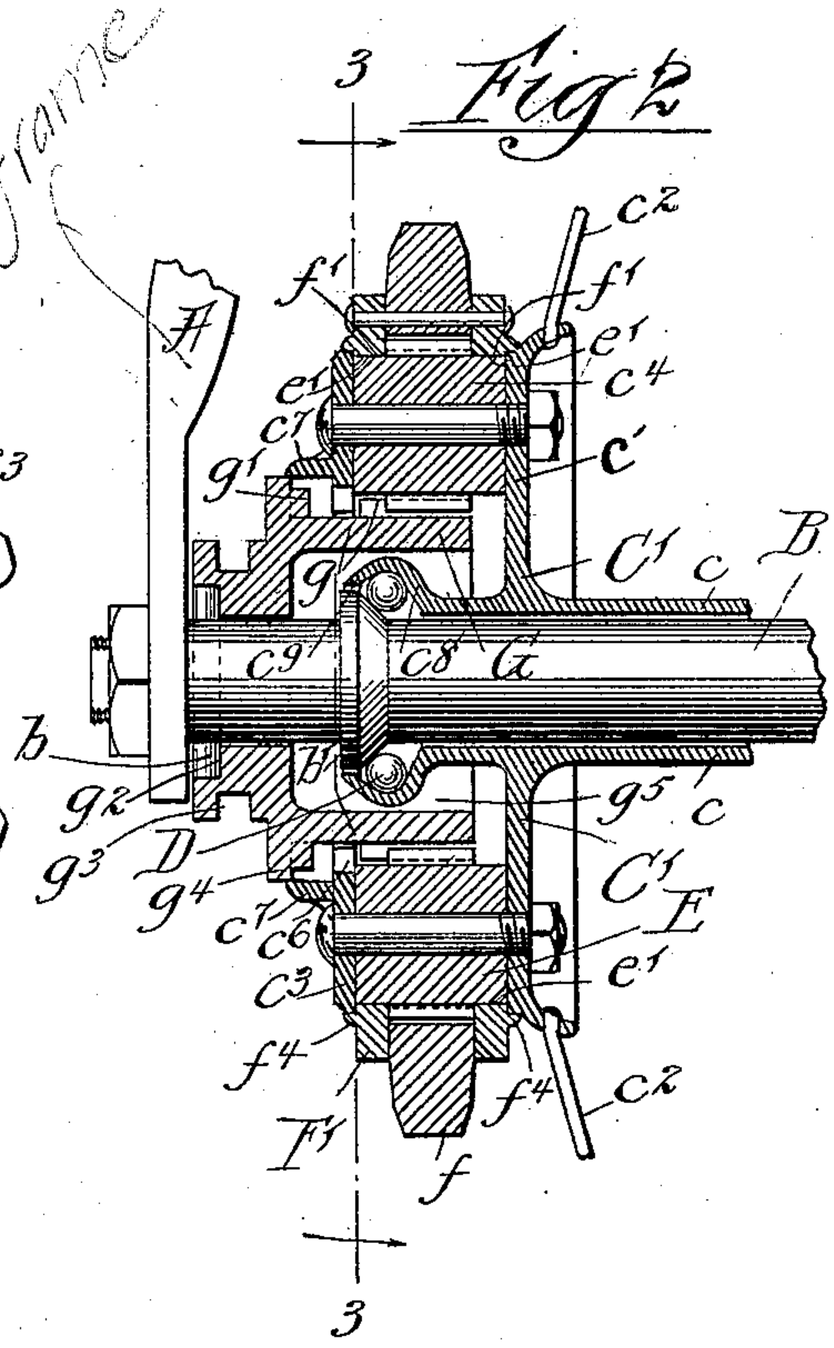
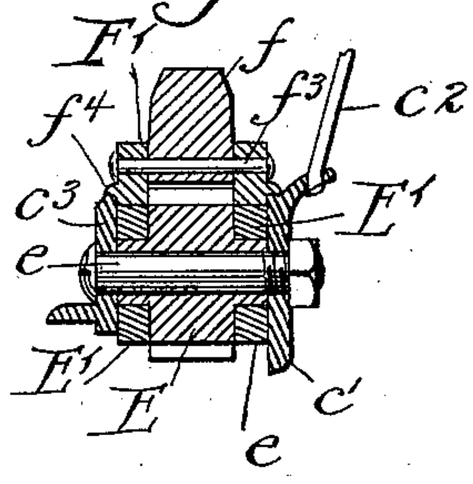


Fig. 3.

Fig. 4.



Witnesses-
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John W. Adams.

Inventor-
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by Dayton, Poole & Brown
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UNITED STATES PATENT OFFICE.

SEYMOUR K. SEELYE, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-THIRD TO POOLE & BROWN, OF SAME PLACE.

CHANGE-SPEED GEARING.

SPECIFICATION forming part of Letters Patent No. 594,567, dated November 30, 1897.

Application filed May 1, 1895. Serial No. 547,739. (No model.)

To all whom it may concern:

Be it known that I, SEYMOUR K. SEELYE, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Change-Speed Gearing; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in change-speed gearing for use on bicycles or other velocipedes, or in any other connection to which it may be found adapted.

The object of the invention is to provide an improved construction in devices of the character referred to; and it consists in the matters hereinafter set forth, and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a side elevation of a change-speed gearing constructed in accordance with my invention. Fig. 2 is a transverse section taken on line 2 2 of Fig. 1. Fig. 3 is a sectional side elevation taken on line 3 3 of Fig. 2. Fig. 4 is a sectional detail of a construction somewhat modified from that previously shown.

In said drawings, A designates one of the bars of the framework of a bicycle or other velocipede or machine to which my improvements are in this instance applied, and B is a short transverse shaft mounted in the frame A in the usual manner and constituting the axle of the driving-wheel C. The hub C′ of the latter comprises a cylindric portion *c*, surrounding the shaft B and bearing thereon through the medium of interposed antifriction-balls D, so that the wheel rotates freely about said shaft. An integral annular flange *c*′ is provided on said cylindric portion *c*, near each end thereof, and to the outer edges of said flanges the spokes c^2 of the wheel may be attached, said spokes converging from the flanges *c*′ to the rim of the wheel (not herein illustrated) in the usual manner.

E designates a plurality of small planet-gears arranged concentrically about the axle B and journaled upon pins or bolts *e* between the outer face of one of the end flanges *c*′ of the wheel-hub and the inner face of a removable annular ring c^3. The latter is fastened rigidly to the flange *c*′, so as to rotate therewith, by means of laterally-projecting studs c^4, formed integral with the flange *c*′ and located between the gears E, said ring being secured to the outer ends of the studs by screws c^5. Surrounding the planet-gears E and intermeshing therewith is an internally-toothed gear-ring F, which is provided on its outer periphery with sprocket-teeth *f* and constitutes the driving-sprocket of the wheel. Said ring is supported by smooth inwardly-facing annular bearing-surfaces *f*′, provided on each side of its gear-teeth f^2 and engaging corresponding smooth annular bearing-surfaces *e*′ on the ends of the gears E, the latter thus serving in themselves to form a simple and effective antifriction-roller bearing for the sprocket-ring F.

G designates an inner annular gear or toothed sleeve surrounding the shaft B within the annular ring c^3 and circular series of planet-gears E and provided at its inner end with external gear-teeth *g*, which intermesh with the teeth e^2 of said gears E. Said sleeve is arranged to have a limited movement endwise of the shaft B and is adapted to be alternately interlocked with the shaft B or wheel C, according to the position on the shaft occupied by the said sleeve. To this end the sleeve G is herein shown as provided between its ends with clutch-teeth *g*′, which are adapted to engage corresponding teeth c^6 on the adjacent edge of the flange c^3 when the sleeve is pushed in, and is further provided at its outer end with one or more transverse grooves or recesses g^2, either of which is adapted to engage a transverse pin *b* of the shaft B when the sleeve is pulled out. An annular groove g^3 in the outer end of the sleeve enables the latter to be engaged and reciprocated, as desired, by any suitable form of shipping-gear, (not herein illustrated,) which in the case of a bicycle or other velocipede will ordinarily be carried up to within convenient reach of the rider. When the sleeve is pushed in so as to be rigidly locked to the hub of the wheel, it will obviously lock the planet-gears E and sprocket-ring F against relative rotation, and the wheel C will be driven at whatever rate of rotation is imparted by the

sprocket-chain, (not shown,) which engages the sprocket-ring in the same manner as if said ring were rigidly secured to the hub. When, however, the sleeve is pulled out so as to be held against rotation by its engagement with the shaft B, the rotative velocity of the wheel C will obviously be as much less proportionately than that of the sprocket-ring as the number of teeth on the sleeve G is less than the number of teeth of said ring.

In order that the teeth of the sleeve G and gears E may always be in mesh with each other throughout their entire length, the teeth of said sleeve are herein shown as made longer than the teeth e^2 of the gears by an amount equal to the longitudinal movement of the sleeve, and to prevent interference between said teeth and the annular bearing-surfaces e' of the gears E said surfaces e' are made of a diameter only equal to the diameter of the gears E at the bottom of their gear-teeth e^2. The bearing-surface f' of the sprocket-ring F is consequently required to be made of a diameter not greater, or slightly less, than the diameter of the toothed surface of said ring at the points of its teeth f^2, in order that it may rest upon said bearing-surfaces e', and for convenience in the construction and assembling of the parts said surfaces f' are provided by separate annular collars F′, which are rigidly secured to the ring F by rivets f^3. The width of the sprocket-ring F when its collars F′ are in place is just equal to the distance between the flanges c' and c^3, and the latter are made of sufficient external diameter to overlap the collars F′ and form a close joint therewith, said collars being herein shown as further provided with annular ribs or flanges f^4, which inclose the adjacent edges of the flanges c' and c^3, so as to more perfectly insure against the admission of dust or dirt at this point. To prevent the entrance of dust or dirt between the inner edge of the flange c^3 and the sleeve G, the latter is herein shown as provided just outside of the clutch-teeth g' with an annular flange g^4, which is inclosed by an annular rib c^7 on said ring c^3, said flange g^4 thus serving both to exclude dust and to strengthen and support said adjacent clutch-teeth g'.

Obviously when the bearing-surfaces f' and e' are made of the diameter above stated the contact between them will lack a trifle of being a perfect rolling contact, as the latter can only exist when the points of contact lie in the pitch-circles of the intermeshing gear-surfaces. The slight slipping which will occur between the surfaces, however, will not add perceptibly to the friction of the gearing. Moreover, if deemed at all objectionable, it may be obviated by the modified construction shown in Fig. 4, in which the bearing-surfaces e' of the gears E are provided by separate collars E′, that are free to rotate independently of said gears E, so as to compensate for the slight difference in the rotative speeds of the contacting surfaces.

For the purpose of enabling the ball-bearings between the hub C′ and shaft B to be placed as far apart as possible, the inner gear or toothed sleeve G is herein shown as formed at its inner end with an enlarged annular recess g^5, into which the end c^8 of the cylindric portion c of the hub C′ is extended, the annular seat c^9 for the balls D of the bearing at this end of the shaft being formed at the extremity of said extension c^8 within the recess g^5 and in position to hold said balls against a suitable cone b' on the shaft B. As shown in this instance, the sleeve G is designed to be supported by the intermeshing of its inner end with the gears E, and as said sleeve is subjected only to torsional strains or a slight endwise pressure such support will ordinarily be amply sufficient.

I claim as my invention—

1. A change-speed gear comprising a fixed shaft, an internally-toothed gear-ring, a central gear-pinion mounted to turn and slide longitudinally on said shaft, a rotative annular part provided with intermediate gear-wheels intermeshing with said internal gear-teeth and central gear-pinion and means for locking said central gear-pinion to the shaft.

2. A change-speed gear comprising a fixed shaft, an internally-toothed gear-ring, a central gear-pinion mounted to turn and slide longitudinally on said shaft, a rotative annular part provided with intermediate gear-wheels intermeshing with said internal gear-teeth and central gear-pinion and means for locking said central gear-pinion to the shaft or to the rotative annular part as desired.

3. A change-speed gear comprising a fixed shaft, an internally-toothed gear-ring, a central gear-pinion mounted to turn and slide longitudinally on said shaft, a rotative annular part provided with intermediate gear-wheels intermeshing with said internal gear-teeth and central gear-pinion and means for locking said central gear-pinion to the shaft comprising interlocking clutch projections on said central gear-pinion and shaft.

4. A change-speed gear comprising a fixed shaft, an internally-toothed gear-ring, a central gear-pinion mounted to turn and slide longitudinally on said shaft, a rotative annular part provided with intermediate gear-wheels intermeshing with said internal gear-teeth and central gear-pinion and means for engaging said central gear-pinion with the shaft and with said rotative annular part comprising clutch members on said central pinion and on the shaft and rotative annular part.

5. A change-speed gear comprising a fixed shaft, an internally-toothed gear-ring, a central gear-pinion mounted to turn and slide longitudinally on said shaft, a rotative annular part provided with intermediate gear-wheels intermeshing with said internal gear-teeth and central gear-pinion, and oppositely-facing clutch projections on said central gear and corresponding clutch projections on the shaft and rotative annular part whereby said cen-

tral gear may be locked to either the shaft or rotative part as desired.

6. A change-speed gear comprising a fixed shaft, an internally-toothed gear-ring, a central gear-pinion mounted to slide and turn longitudinally on said shaft, a rotative annular part mounted on the shaft and provided with annularly-arranged bearing-studs, a detachable annular flange rigidly secured to the said bearing-studs, a plurality of intermediate gears journaled upon said studs and intermeshing with the toothed gear-ring and with the central gear-pinion, oppositely-facing clutch projections on the said central gear-pinion, clutch projections on the rotative part adapted to interlock with one set of clutch projections on the said pinion and clutch projections on the said shaft adapted to interlock with the other set of clutch projections on said central pinion.

7. A change-speed gearing, comprising a fixed shaft, a rotative part journaled on said shaft, planet-gears arranged concentrically about the shaft on said rotative part, an internally-toothed gear-ring surrounding said planet-gears and intermeshing therewith, smooth annular bearing-surfaces on said gears and gear-ring affording a roller-bearing for the latter; an inner sleeve surrounding the shaft and provided with exterior teeth intermeshing with the planet-gears, said sleeve being movable endwise of the shaft, and means for alternately interlocking said sleeve with the rotative part or shaft according to the position of the sleeve on the latter, substantially as described.

8. In a change-speed gearing for vehicle-wheels, the combination with the shaft or axle, and the wheel-hub, of a plurality of planet-gears journaled on said hub concentrically about the shaft; an internally-toothed gear-ring surrounding said planet-gears and intermeshing therewith, smooth annular bearing-surfaces on said gears and gear-ring affording a roller-bearing for the latter; an inner sleeve surrounding the shaft and provided with exterior gear-teeth intermeshing with the planet-gears, said sleeve being movable endwise of the shaft; interlocking recesses and projections on said hub and sleeve, other interlocking recesses and projections on said shaft and sleeve, and means for moving the sleeve endwise of the shaft to alternately interlock with the axle or shaft, substantially as described.

9. In a change-speed gearing for vehicle-wheels, the combination with the axle or shaft and the wheel-hub journaled thereon of an integral annular flange on said hub; a detachable annular flange rigidly secured to the integral flange, a plurality of planet-gears journaled between said flanges concentrically about the shaft; an interiorly-toothed sprocket-ring surrounding said gears and intermeshing therewith; an inner sleeve provided with exterior teeth intermeshing with said gears; clutch-teeth on said sleeve adapted to interlock with corresponding teeth rigid with said hub; interlocking recesses and projections on the sleeve and shaft; and means for moving the sleeve endwise on the shaft to alternately interlock the same with the hub or shaft, said sleeve being provided at its inner end with an annular recess of larger diameter than the shaft; a tubular extension on the wheel-hub projecting into the said recess; bearing-balls seated in the end of said tubular extension, and a cone on the shaft within the recess adapted to engage said balls, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 27th day of April, A. D. 1895.

SEYMOUR K. SEELYE.

Witnesses:

C. CLARENCE POOLE,

ALEX. H. SEELYE.