No. 707,944. Patented Aug. 26, 1902.

F. L. SANDERS.

TWO SPEED DRIVING MECHANISM.

(Application filed July 21, 1902.)

(No Model.)

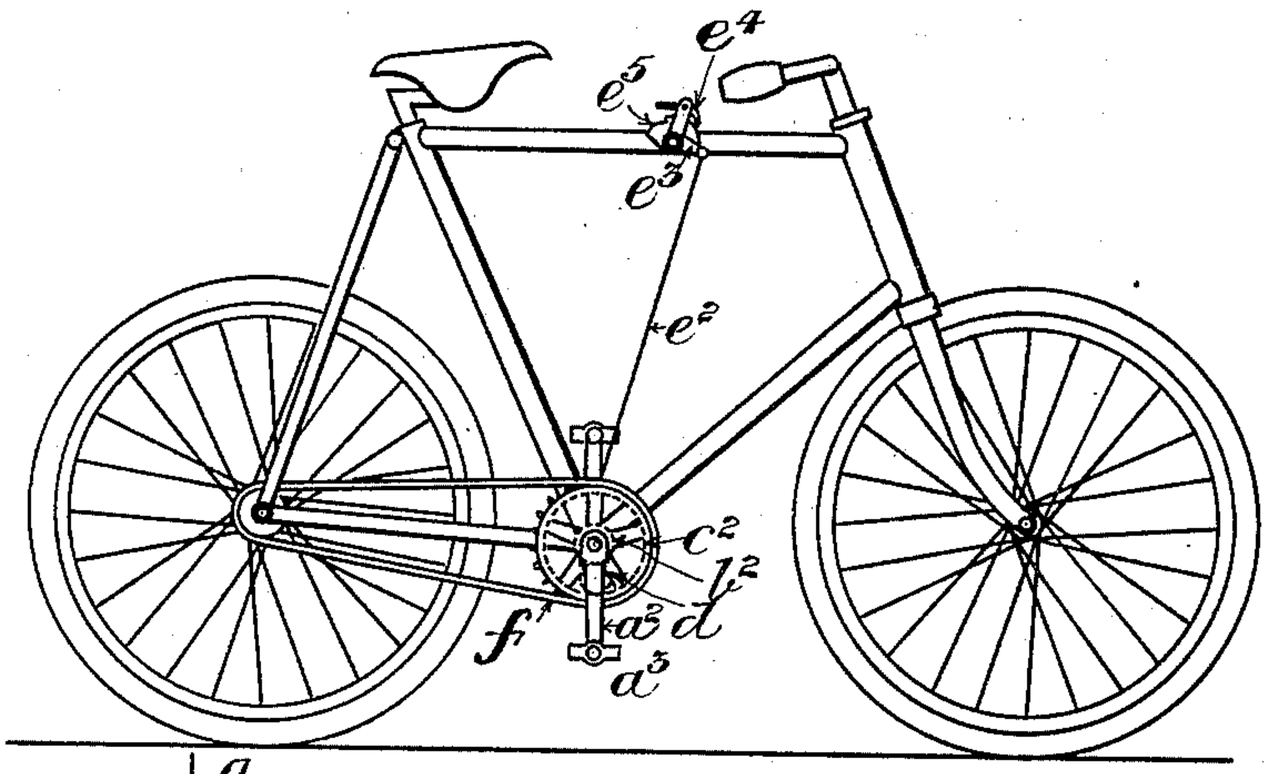

Fig 1.

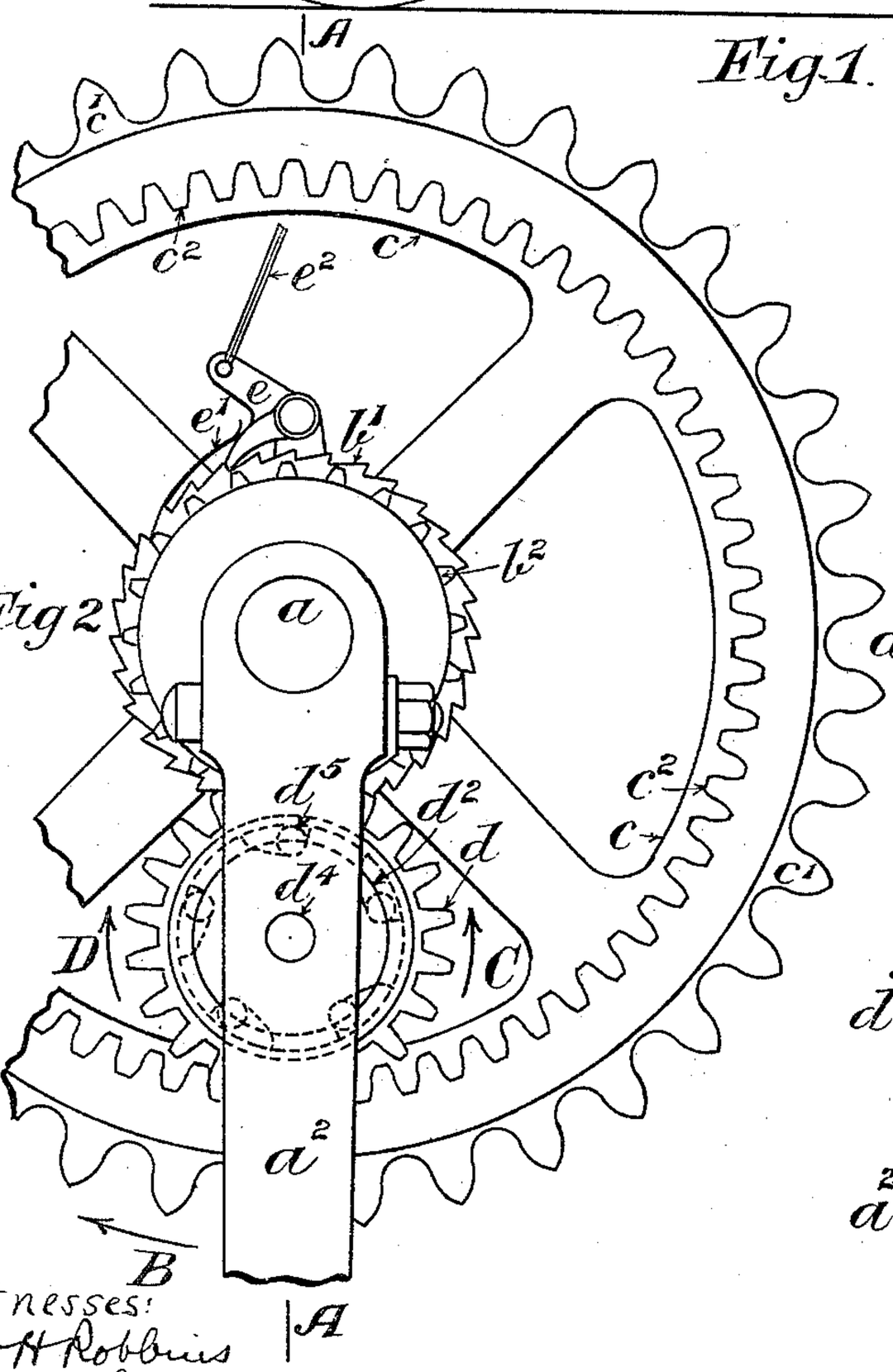

Fig 2

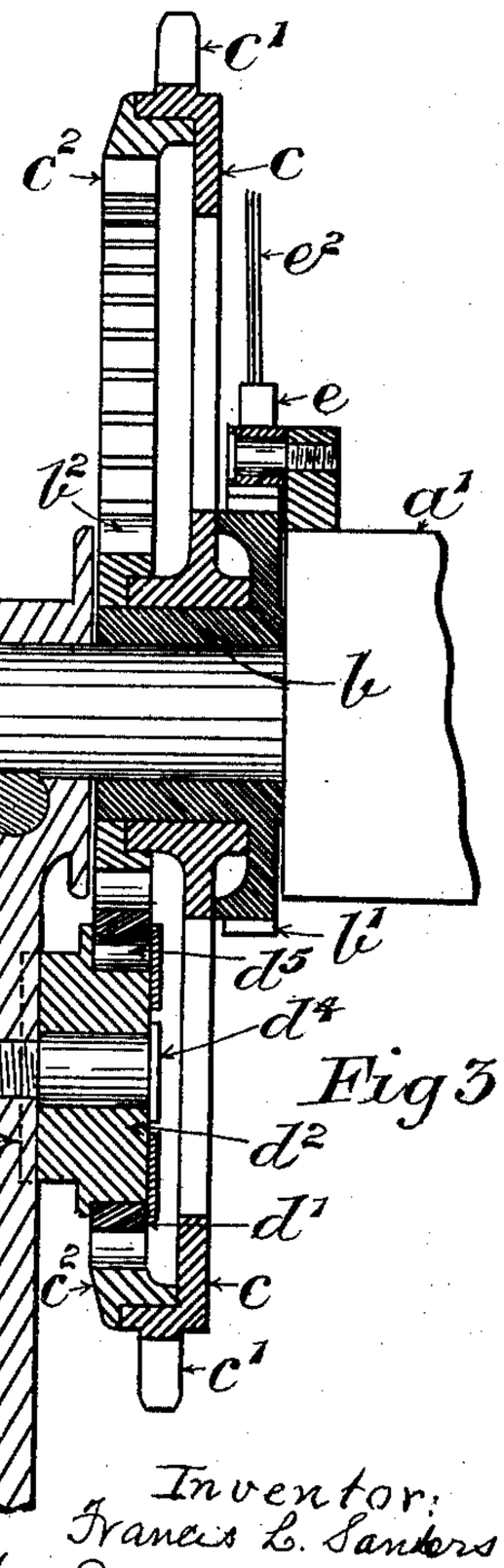

Fig 3

Witnesses:
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UNITED STATES PATENT OFFICE.

FRANCIS LEWIS SANDERS, OF NOTTINGHAM, ENGLAND.

TWO-SPEED DRIVING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 707,944, dated August 26, 1902.

Application filed July 21, 1902. Serial No. 116,407. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS LEWIS SANDERS, a subject of the King of Great Britain, and a resident of the city of Nottingham, England, have invented new and useful Improvements in Two-Speed Driving Mechanism, of which the following is a specification.

The object of this invention is the production of an improved two-speed driving mechanism of simple and novel construction by which a regular and continuous rotative movement of a driving-shaft or its equivalent is enabled to impart a fast or slow rotative movement to a driven shaft or its equivalent and by which the speed of the driven shaft or its equivalent can be changed from one speed to the other without alteration to or change in the position of the means used for transmitting the motion from one shaft to the other, the said improvements being particularly applicable as a two-speed driving mechanism for cycles.

In the accompanying drawings, Figure 1 is an elevation of a bicycle as fitted with the improved two-speed driving mechanism. Fig. 2 is a part front elevation of the two-speed driving mechanism as adapted for a bicycle, and Fig. 3 is a section on the line A A, Fig. 2.

The accompanying drawings illustrate the adaptation of this invention to a bicycle, the crank-axle a being mounted to run in ball-bearings in the bottom bracket a' and fitted with cranks a^2 and pedals a^3 in the usual manner. One of the cranks and its pedal may be exactly as in an ordinary machine, but on the chain-wheel side of the axle there is a collar b between the crank and bottom bracket. This collar, which is free to rotate on the axle, is fitted at its inner end with a ratchet-wheel b' and at its outer end with a central toothed pinion b^2, these parts being so attached that they are compelled to rotate as a single piece. The chain-wheel c is fitted to rotate on the collar b, the ratchet-wheel b' and gear-wheel b^2 being recessed, as shown, to give an increased bearing for the chain-wheel. This wheel is provided with chain-teeth c' and an internal toothed ring c^2, which is geared to the central toothed pinion b^2 by an intermediate toothed wheel d, which is carried by the crank and moves with it. In the arrangement shown the teeth of the wheel d are formed on a ring d', which is fitted to rotate on a central block d^2, the boss of which is recessed at d^3 to fit the sides of the crank and prevent it rotating on the screw d^4, by which the block is held in position on the crank. The edge of the block has a number of cam-shaped recesses, which are provided with rollers d^5, the whole constituting a roller-clutch by which the toothed ring is held from rotation in one direction, while free to rotate in the opposite direction. In connection with the ratchet-wheel b' there is a pawl e, which is pivoted on an arm attached to the bottom bracket a', and there is a spring e', also attached to the bottom bracket and designed to hold the pawl in gear with the ratchet-wheel. This pawl is connected by a wire or other suitable connection e^2 to a lever e^3, which is in a convenient position on the cycle-frame and is provided with a catch e^4, which works in connection with a fixed quadrant e^5 to hold the pawl e clear of the ratchet-wheel b' when moved to that position by the rider. When the pawl e is clear of the ratchet-wheel b' and the crank is rotated in direction of the arrow B, the wheel d tends to rotate in direction of the arrow C, but is held from rotation by the action of the roller-clutch. The three wheels c^2, d, and b^2 are thus locked together, and the chain-wheel makes the same revolutions as the crank. When, however, the ratchet-wheel, and consequently the wheel b^2, is held from rotation and the crank rotated in the direction of the arrow B, the wheel d rotates in the direction of the arrow D, and the chain-wheel then rotates under the combined action of the rotation of the crank and the wheel d and is thereby driven at a greater speed than the crank, such increased speed depending upon the relative sizes of the wheels b^2 and c^2.

In the arrangement shown the crank-axle is the driving-shaft and imparts motion to the back wheel, which is the equivalent of the driven shaft, through a chain f; but other known means of transmitting the motion may be used, and the crank-axle or its equivalent may be the driven shaft. When fitted to a cycle as shown, the improved two-speed gear acts automatically as a free-wheel mechanism, but may be used in connection with a free wheel on the hub of the back wheel, and the

various rotating parts may be fitted with ball-bearings, if desired.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination with a driving-axle and a crank fixed thereon, of a clyindrical journal-block grooved on one end to straddle the crank eccentrically to the axle and secured to the crank, a roller-clutch on the periphery of the journal-block, a collar rotatable on the axle, a ratchet-wheel and gear-wheel rigid on the collar, a sprocket-wheel rotatable on the collar and provided with an internal gear, an intermediate gear-wheel rotatably mounted on the journal-block and held against rotation thereon in one direction by said clutch, a pawl arranged to normally hold said ratchet-wheel against rotation, and means under the control of the operator for throwing and holding the pawl out of engagement with the ratchet-wheel, substantially as described.

2. The combination with a driving-axle and a crank fixed thereon, of a collar rotatable on the axle, a sprocket-wheel rotatable on the collar and provided with an internal gear, a ratchet-wheel and a gear-wheel fixed on the collar on opposite sides of the sprocket-wheel, an intermediate gear-wheel rotatably mounted on the crank eccentrically to the axle and gearing with said internal gear and the gear-wheel on the collar, means for preventing the rotation of the intermediate gear-wheel about its axis in one direction, and means under the control of the operator for holding the ratchet-wheel against rotation, substantially as described.

3. The combination with a driving-axle and a crank fixed thereon, of a collar rotatable on the axle, a sprocket-wheel rotatable on the collar and provided with an internal gear, a ratchet-wheel and a gear-wheel fixed on the collar on the opposite sides of the collar, said ratchet-wheel and gear-wheel being recessed on their adjacent faces for the reception of the hub of the sprocket-wheel to give a broad bearing to the latter, an intermediate gear rotatably mounted on the crank eccentrically to the axle and gearing with said internal gear and the gear-wheel on the collar, means for preventing rotation of the intermediate gear-wheel about its axis in one direction, and means under the control of the operator for holding the ratchet-wheel against rotation, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANCIS LEWIS SANDERS.

Witnesses:
H. D. JAMESON,
A. NUTTING.