(No Model.) 2 Sheets—Sheet 1.

W. E. WATKINS.

DEVICE FOR CONVERTING MOTION.

No. 571,296. Patented Nov. 10, 1896.

Fig. 1

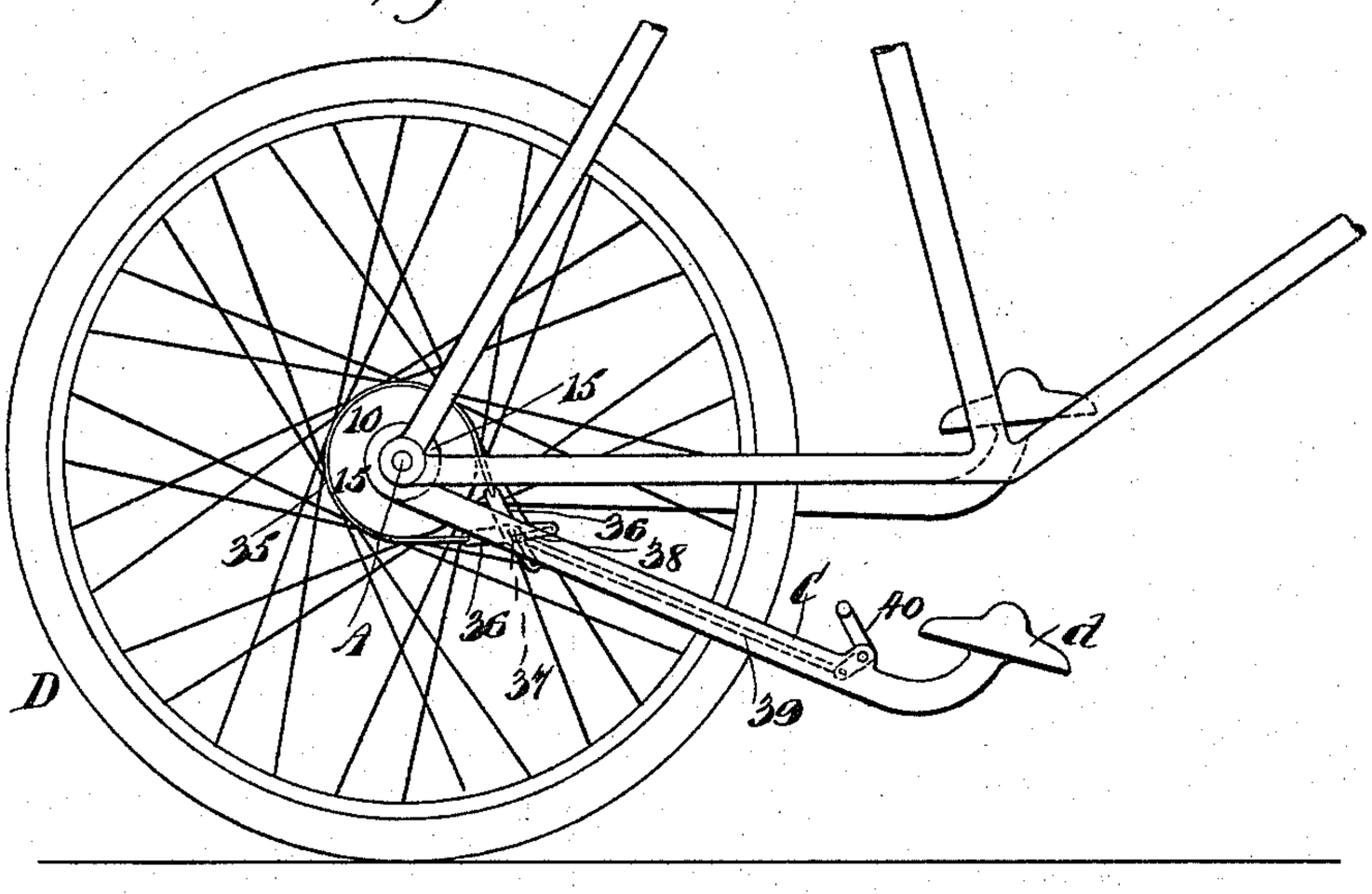
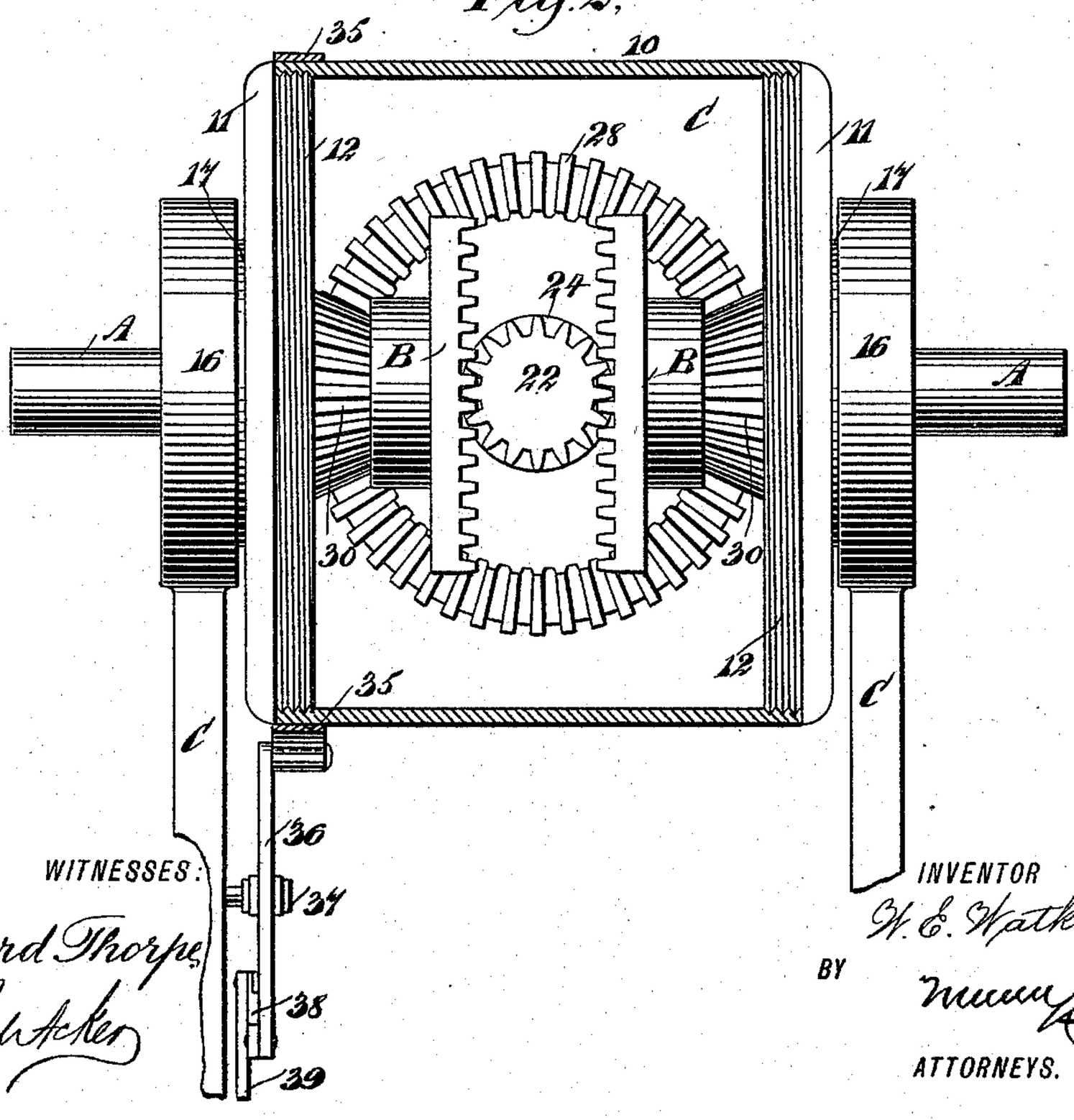


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

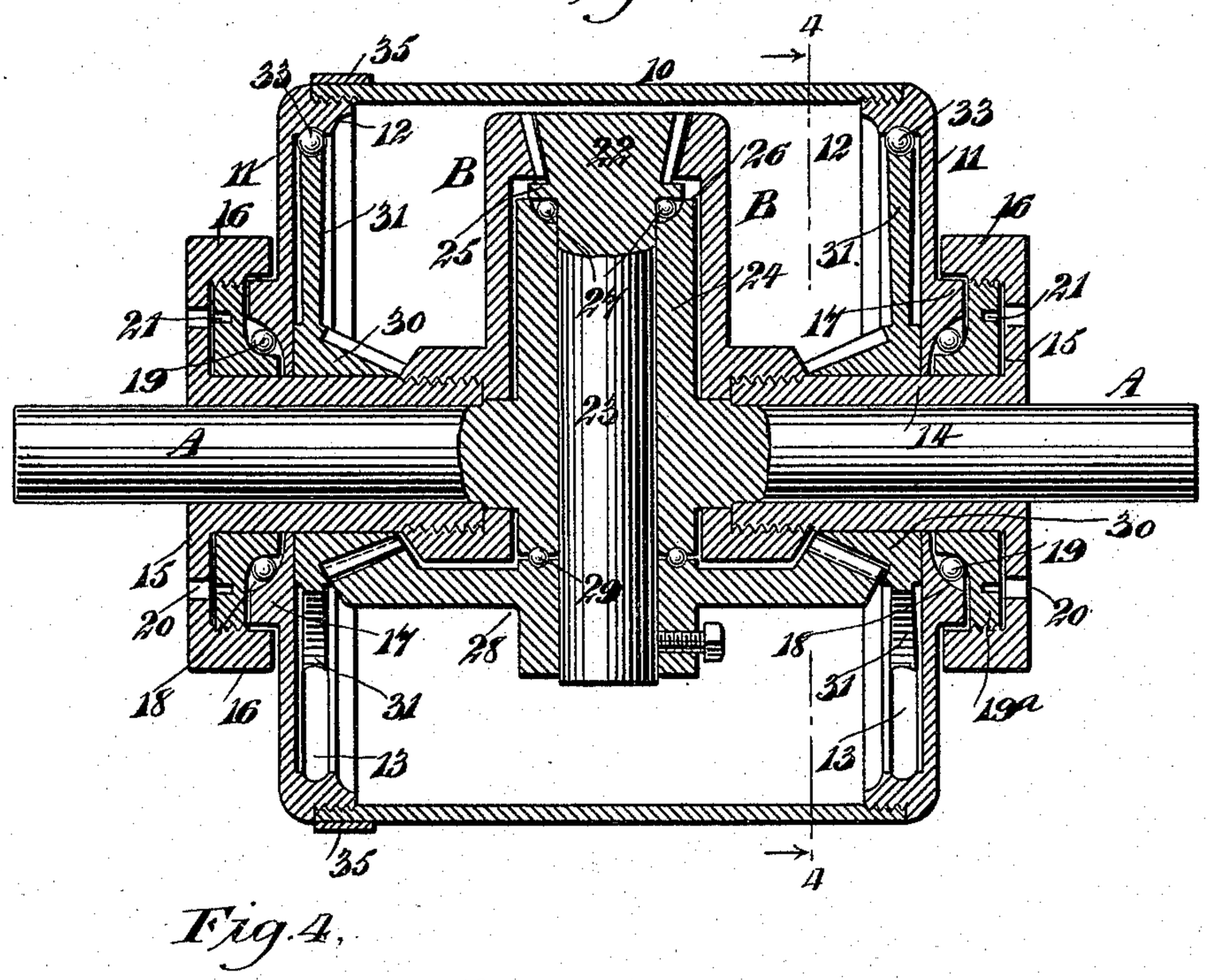


Fig. 4.

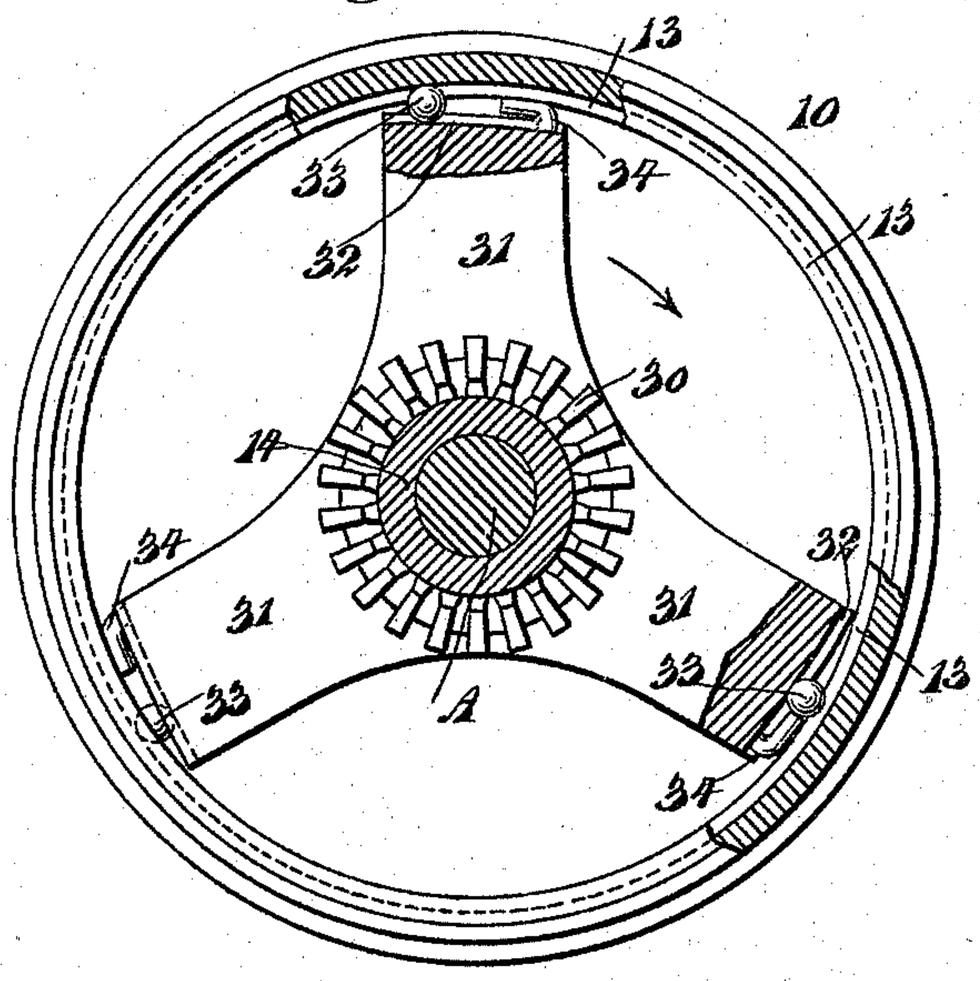
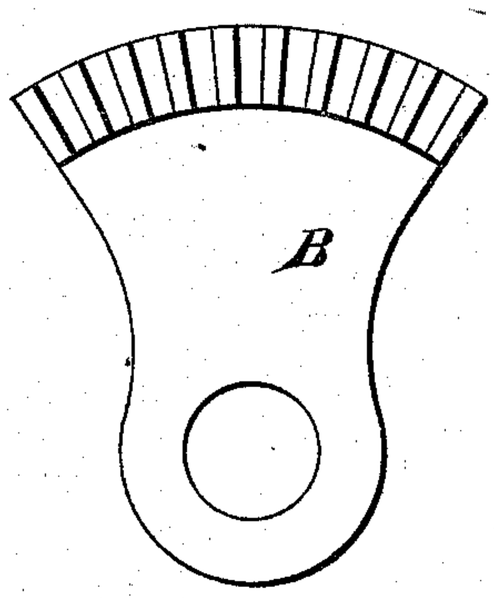


Fig. 5.



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UNITED STATES PATENT OFFICE.

WESTON E. WATKINS, OF PHELPS, NEW YORK, ASSIGNOR TO WILLIAM A. WHITE, OF SAME PLACE.

DEVICE FOR CONVERTING MOTION.

SPECIFICATION forming part of Letters Patent No. 571,296, dated November 10, 1896.

Application filed January 28, 1896. Serial No. 577,168. (No model.)

To all whom it may concern:

Be it known that I, WESTON E. WATKINS, of Phelps, in the county of Ontario and State of New York, have invented a new and Improved Device for Converting Motion, of which the following is a full, clear, and exact description.

The object of the invention is to construct an economical device whereby a vibratory or oscillating foot or hand motion may be converted into a continuous rotary motion, the device being particularly adaptable as a medium in the propulsion of bicycles, tricycles, or other vehicles, or any machinery to which foot or hand power is to be transmitted, without the aid of chains, springs, connecting-rods, or combinations of levers.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is an end view of the device, said device being illustrated as applied to the driving of a bicycle. Fig. 2 is a horizontal section through the casing or hub, illustrating the driving mechanism in plan view. Fig. 3 is a vertical central section through the entire device. Fig. 4 is a vertical section taken practically on the line 4 4 of Fig. 3, and Fig. 5 is a side view of one of the toothed segments detached from the driving mechanism.

In carrying out the invention a stationary axle A is employed, said axle in the drawings representing the support for the hub of the bicycle-wheel. The hub consists of a circular casing 10, provided with a head 11 at each end, having an interiorly-extending annular flange 12, the flange being preferably exteriorly threaded in order that the said heads may have a screw connection with the body portion of the hub or casing, and each head is provided with an annular groove 13, preferably produced in that portion where the flange connects with the head proper, as shown in Figs. 3 and 4. A sleeve 14 is loosely mounted on the shaft A, one at each side of its center, and each sleeve has a cap 15, preferably of disk-like construction, formed at its outer end, and each cap is provided with an inwardly-extending annular flange 16, which flanges extend over annular bosses 17, formed around the openings in the heads of the hub or casing, through which the sleeves 14 extend outwardly, since the hub or casing revolves loosely and directly upon the aforesaid sleeves.

The interior edges of the bosses 17 are inclined so as to produce pockets 18, and in these pockets balls or rollers 19 are placed in suitable numbers, and a cover-plate 19^a engages with the aforesaid balls or rollers 19 to form a roller-bearing between the caps 15 of the sleeves and the heads of the hub or casing 10. These cover-plates are preferably threaded for engagement with a correspondingly-threaded inner surface of the flanges of the caps, as is best shown in Fig. 3. The cover-plates may be adjusted in any approved manner in direction of the heads of the casing or hub, so as to take up wear, but preferably slots 20 are made in the cap and a number of apertures 21 are produced in the outer face of each cover-plate, so that a suitable instrument may be introduced through the openings in the cap into any of the registering apertures in the cover-plate and the latter turned a desired distance.

A toothed segment B is secured in any suitable or approved manner to the inner end of each sleeve 14, and the toothed faces of these segments face one another and are beveled, preferably, from their lower ends upwardly and outwardly, as shown in Fig. 3, both toothed segments being adapted for engagement with a beveled pinion 22, the engagement of the two segments being at opposite sides of the pinion; and the said pinion is attached to or forms an integral portion of the upper end of a vertical shaft 23, which shaft is journaled in a bushing 24, being preferably an integral portion of the central section of the shaft A, and the plain surfaces of the segment-gears are brought quite close to the upper side surfaces of the aforesaid bushing. The shaft is ordinarily held in its bearings by forming a flange 25 near its upper end below the pinion 22, as shown in Fig. 3, and the said flange turns upon balls or

rollers 27, located in a pocket 26, produced in the upper end of the bushing.

A horizontal gear 28 is secured to the lower end of the vertical shaft 23 below the supporting-shaft A, and a roller-bearing 29 is provided between the hub of this gear and the lower end of the bushing. The teeth of the gear 28 are beveled and are upon its upper surface at the margin, and these teeth are adapted for engagement with beveled pinions 30, one of which is mounted to turn loosely upon each sleeve 14, between a head of the hub or casing and the lower outer surface of the toothed segment B.

Preferably the outer smooth faces of the beveled gears 30 are brought quite close to the heads of the hub or casing, and each of these gears is provided with two or more, ordinarily three, arms 31, which are adapted to serve in the capacity of pawls, and each of these arms 31 is carried quite near to the groove 13 in the head to which the arm belongs, and the outer end of each arm is beveled, as is best shown in Fig. 4, and is provided likewise with a groove 32, extending from side to side, being coincident with the groove in the casing or hub.

Ordinarily a single ball 33 is made to engage with the grooved surface of each arm or pawl 31 and the grooved surface 13 of a head of the hub or casing, and at the lower end of the grooved surface of each arm or pawl 31 a stop 34 is provided, so that when the pawls or arms are rotated in direction of the arrow shown in Fig. 4, or in direction of their shorter grooved ends, the balls 33 will be brought into such close frictional engagement with the head in which the pawls rotate that in a given distance of rotation of the arms or pawls the head of the hub or casing will be compelled to turn with the arm or pawl, and ordinarily at least two of the arms or pawls are thus in clutch connection at the same time with a head of the casing or hub, and when a pawl or arm 31 is brought to such position as to release the ball carried thereby from clutch engagement with the head the stop 34 will prevent the pawl from leaving its track, as shown at the lowermost arm or pawl in Fig. 4.

A lever C is secured to the cap 15 of each sleeve 14, and each lever is made of any desired length. When the device is applied to a bicycle, the forward end of the lever will be carried to such a point that treadles attached to the forward ends of the levers may be readily engaged by the feet of the rider, as shown in Fig. 1.

In the operation of the device as applied to a bicycle the levers are alternately worked up and down with a vertical movement on the part of the operator's foot, for example, and this vertical movement produces a rocking movement on the part of the sleeves 14, and the said sleeves transmit this rocking or reciprocating movement to the toothed segments B, which work alternately in opposite directions, and both being in engagement with the pinion 22 constantly oscillate said pinion, transmitting an oscillatory movement to the lower gear 28, from whence it is transmitted to the pinions 30 of the heads of the hub or casing, and transmitted from the said pinions directly to the said heads of the clutch mechanism described, namely, the pawls or arms 31 and the balls 33 carried thereby.

It is evident from the foregoing construction that the oscillation of the shaft 23 may be effected no matter whether the levers C make a complete or a partial stroke. The bicycle-wheel D may be of any approved construction and the spokes are secured in any desired way to the hub or casing 10.

When the device is used for driving a bicycle, it is necessary that a brake should be employed, since the hub or casing will turn in one direction only, namely, in a forwardly direction, and to that end a strap-brake 35 is carried around the exterior of the hub or casing, preferably near one end, and the ends of this strap-brake are attached to arms 36, which cross one another and are pivoted at their centers by a single pivot-pin 37 to one of the levers C. The forward or free ends of these arms 36 are connected by toggle-levers 38, and the said toggle-levers are connected to a rod 39, the said rod being also preferably attached to a foot-lever 40, located on the lever C and preferably of angular construction. The foot-lever 40 is arranged convenient to the outer ends of the treadle portion *d* of the lever, so that the brake may be quickly applied by the operator's foot whenever necessary.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a device for converting motion, the combination, with two levers, a sleeve secured to each lever, a stationary axis upon which the sleeves turn, and a toothed segment secured to each sleeve, of a hub or casing mounted to revolve, converting-gearing operated by the said segments, and clutch devices operated by the said gearing and arranged to operate upon the hub or casing and revolve the same, as and for the purpose specified.

2. In a device for converting motion, the combination, with two levers, a sleeve secured to each lever, a stationary axis upon which the sleeves turn, and a toothed segment secured to each sleeve, of a shaft mounted in stationary bearings, being at an angle to the aforesaid stationary axis, a beveled gear secured to the upper end of the said shaft, engaging with each of the said toothed segments, a gear secured to the lower end of the oscillating gear-carrying shaft, and pinions mounted to oscillate upon the said sleeves, engaged by the said lower gear, each pinion having a clutch connection with the interior of the hub or casing, substantially as described.

3. The combination, with two levers, a sleeve secured to each lever, a stationary shaft or axis upon which the sleeves turn, and a toothed segment secured to each sleeve, of a hub or casing provided with annular grooves near its ends, a bushing formed upon the said stationary shaft or axis and extending through the same, a shaft mounted to oscillate in the said bushing, a pinion located at the upper portion of the shaft and engaged by both toothed segments, a gear located upon the lower end of the said oscillating shaft, pinions mounted to oscillate one upon each sleeve, being actuated from the said lower gear, arms projected from the said pinions, having their outer ends beveled, and balls engaging with the outer ends of the arms and the grooved portions of the hub or casing, as and for the purpose set forth.

4. The combination with two levers, a sleeve secured to each lever, a stationary shaft or axis upon which the sleeves turn, and a toothed segment secured to each sleeve, of a hub or casing provided with annular grooves near its ends, a bushing formed upon said stationary shaft or axis and extending through the same, a shaft mounted to oscillate in the said bushing, a pinion located at the upper portion of the shaft, engaged by both toothed segments, a gear located upon the lower end of the said oscillating shaft, pinions mounted to oscillate one upon each sleeve, being actuated from the said lower gear, arms projected from the said pinions, the outer ends of which arms are beveled and the beveled surfaces grooved, the grooves in the said beveled surfaces being coincident with a groove in the hub or casing, a ball carried by the grooved portion of each arm and adapted for frictional engagement with the grooved portion of the said hub, and a stop formed at the lower portion of the beveled end of each arm, preventing the balls from leaving the said arms, as and for the purpose specified.

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Witnesses:
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L. H. SMITH.