

No. 771,046.

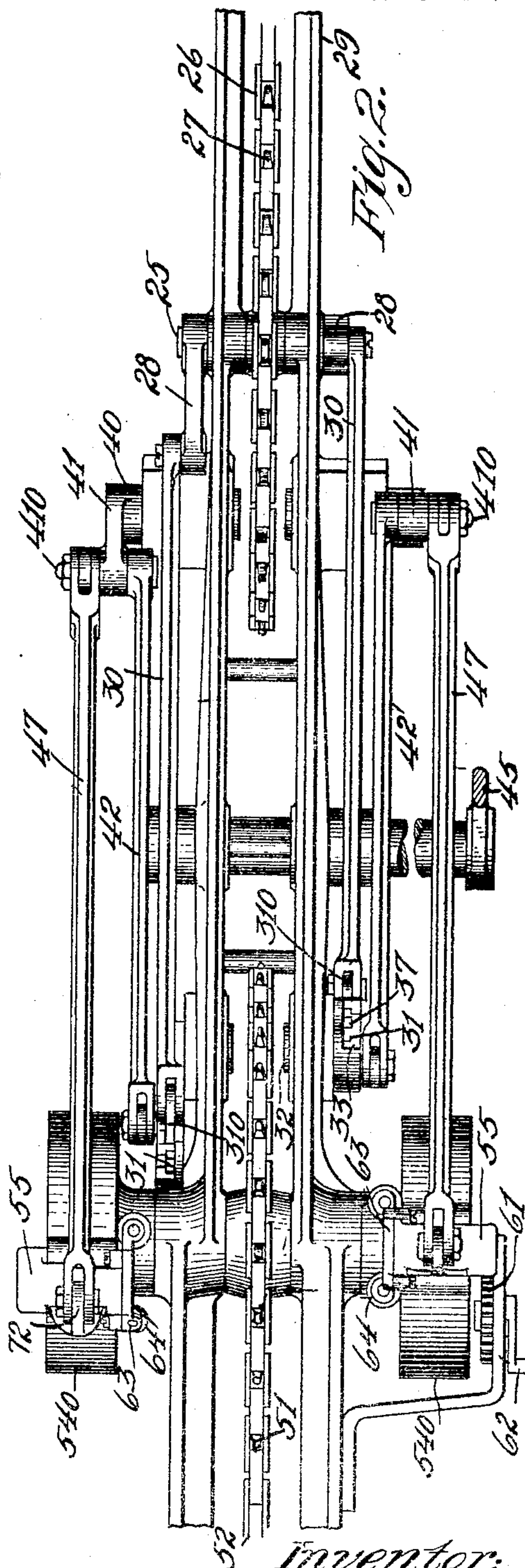
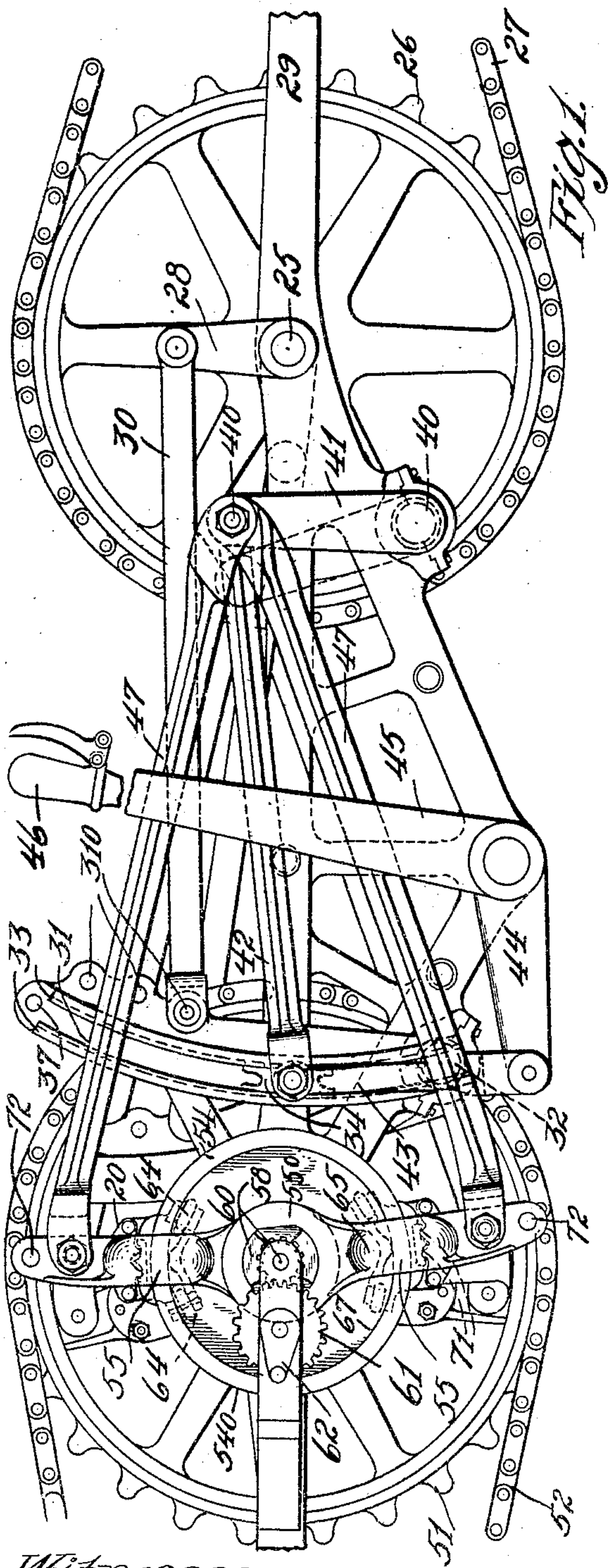
PATENTED SEPT. 27, 1904.

W. D. CUSTEAD.
VARIABLE SPEED MECHANISM.

APPLICATION FILED MAY 19, 1904.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses:

Fred E. Maynard.
Robert Oak

Inventor:
William D. Custead;
By his Attorney,
F. H. Richards.

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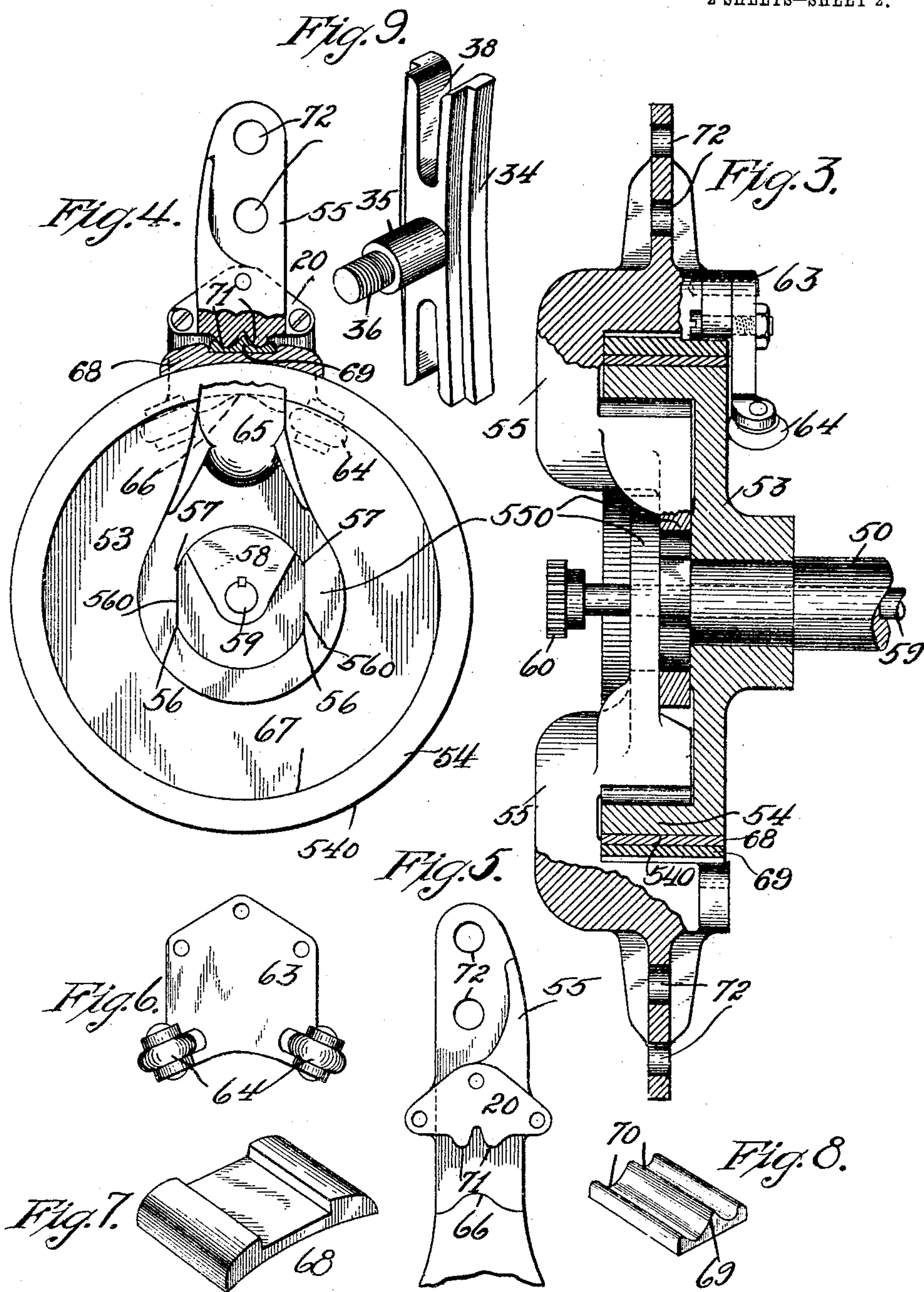
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UNITED STATES PATENT OFFICE.

WILLIAM D. CUSTEAD, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO
EDWARD MANRARA, OF NEW YORK, N. Y.

VARIABLE-SPEED MECHANISM.

SPECIFICATION forming part of Letters Patent No. 771,046, dated September 27, 1904.

Original application filed January 15, 1904, Serial No. 189,098. Divided and this application filed May 19, 1904. Serial No. 208,664. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM D. CUSTEAD, a citizen of the United States, residing in Manhattan borough, New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Variable-Speed Mechanisms, of which the following is a specification.

This invention relates to variable-speed mechanism, and relates to that class of mechanisms in which the speed transmitted by a driver rotating at a uniform speed in one direction may be reversed and varied in either direction.

The mechanism comprises in a general way means—such, for instance, as a crank—for converting rotary motion into reciprocating motion, connected to means—such, for instance, as a crank and link—for varying the amount of such reciprocating motion, and a reversible grip mechanism and drum for converting the reciprocating motion into rotary motion and means for determining the working stroke of the grip to determine the direction of the rotation of the drum.

Certain features of the present improvements are shown in my application for United States Letters Patent, Serial No. 189,098, filed January 15, 1904, and allowed on February 8, 1904, and of which the present application is in the nature of a division.

In the drawings accompanying and forming a part of this specification, Figure 1 is a side view, partly broken away, of a mechanism illustrating the present improvements. Fig. 2 is a top view thereof. Fig. 3 is a central section of a grip mechanism applied to a pulley or drum. Grips are shown situated on opposite sides of the axis of the drum. Fig. 4 is a front view thereof, portions being shown as broken away, and but one grip is shown in this view. Fig. 5 is a detail of a portion of the grip, particularly of the arm or lever and the portion thereof for engaging the shoe. Fig. 6 is a shoe or sheave device for holding the grip in position, and Fig. 7 is a grip-shoe or friction member disassembled and shown in perspective. Fig. 8 is a per-

spective view of a connecting-block for interposition between the grip-shoe-engaging portion of the device—as, for instance, the part 20, shown in Fig. 5—and the shoe—as, for instance, that shown in Fig. 7—and Fig. 9 is a perspective view of a slide suitable for mounting in the links for varying the stroke imparted to the grip.

The power will in the form illustrated in the present instance be imparted to the shaft 25 by means of a driving-wheel, in the present instance a sprocket-wheel 26, driven by some suitable means—as, for instance, a sprocket-chain 27, which chain will be driven from some suitable source. (Not shown.) The shaft 25 has fast thereon a pair of cranks 28, which are disposed upon the shaft quartering—that is, one having a quarter of a circle angular advance of the other. The shaft 25 is mounted in suitable bearings in the frame 29, which in practice may be the frame of some conveyance—as, for instance, an automobile—to which class of work this device is peculiarly adapted. To each of the cranks 28 is connected a link 30, which is pivoted to a link 31, mounted upon some suitable rock-shaft 32, secured to the frame of the machine, which link 31 is provided with ways 33 and is in the present instance sector-shaped. Several ears or points of connection, as 310, may be provided on the link to permit regulation of the stroke or excursion thereof. A block 34 (see Fig. 9) is shown mounted in such ways on the link and has upon it a wrist 35 and a screw-threaded portion 36 to receive a nut. Each end of the link 31 may be provided with a stop-pin 37 to stop the movement of the slide 34 and which slide to have greater movement than it otherwise would may be cut away, as at 38, at each end to straddle the pins. A stub-shaft 40 is mounted upon each side of the frame and each of which has loose upon it an arm 41, which has a link 42 connecting it with the wrist 35 upon the slide running upon the link 31. For the purpose of shifting the slides in the links 31 to vary the stroke of the movement to be imparted thereby the slides 34 may be connected by links 43 to an arm 44, controlled by

a suitable hand-lever 45, having a grip device 46 upon it, which may control a bolt running upon a sector, as is frequently employed in controlling and locking such an operating-lever in position. Any convenient means, however, may be employed which occasion may require. Each lever 41 has pivoted to its free end and in the showing herein upon the same pins 410, to which the links 42 are pivoted, a pair of links 47, which links will operate the grip mechanism now to be described.

The driven shaft is in the present instance designated by 50 and which shaft is shown as having fast thereon a sprocket-wheel 51, carrying a chain 52, to drive some part of the mechanism and transfer motion received from the driving-chain 27. It will of course be apparent to those skilled in the art that other gearing may be employed than chain and sprocket, the same being here mentioned as a convenient means of illustrating the invention. The driven shaft also has fast upon each end a friction or grip member in the nature of a pulley or a wheel 53, having a friction-driving-drum in the nature of a flange 54, adapted to cooperate with the grip mechanism for imparting rotary motion to the shaft. The grip mechanism in the present instance comprises means for engaging the perimeter 540 of the flange 54, and upon movement of such grip mechanism in one direction to bite the flange and shift the wheel and upon movement in the opposite direction to release its grip and to ride freely back to its initial position.

The grip mechanism operates upon a principle which may briefly be explained for convenience—namely, that if an engaging surface, as a shoe or gripping-block, is run about the perimeter of a wheel moving upon the axis of the wheel very slight play will permit the clearing of the shoe with the wheel and no friction or grip will be had; but if the center of such rotation is eccentric to the perimeter of the wheel then, as is evident by perusal of the drawings, the friction-face will engage the said perimeter and move the wheel with it, the degree of eccentricity determining the strength of the gripping action. There are provided four grips, two for each wheel 53 and so mounted as to act on opposite sides of the axis thereof. The series of grips is so organized in connection with the respective link mechanisms that one grip out of the series will always be at work. Each grip mechanism herein illustrated is carried by an arm 55, having an opening surrounding the shaft. The eyes 550 of such arms overlap, as seen in Fig. 3, and the walls of which openings—as, for instance, between the portions 56 56 and 57 57—are concentric to its center, and between the portions 56 and 57, upon each side, it is substantially flat, making cam-faces 560. The sector 58 is carried by a shaft 59 and is located within the eyes 550. The sector is concentric to the faces 57 and 56, and when

in the position shown in Fig. 4 the grip will operate idly in both directions; but when the sector is turned so that its face comes into engagement with one of the faces 560 then the movement of the arm will be off the center of the wheel 53 in one excursion and will be active, and in the reverse movement it will be on the center and be idle. The shaft upon which the sector is mounted has a bearing in the hollow interior of the shaft 50 and carries a pinion 60 to mesh with a gear 61, controlled by a crank 62. If two sets of grips are employed, two sectors may be mounted on the shaft 59, each sector affording the variable eccentric bearing for both the arms on one wheel. One of the clutch-arms is shown as carrying a removable plate 63, removably attached to it and in which rollers 64 are mounted to run upon the back of the wheel 53 and hold the grip mechanism in position. The grip-arm carries a block, designated in a general way by 65, and which has a bearing-face 66 to engage the inner face 67 of the flange upon the wheel. A shoe (designated in a general way by 68) may be mounted upon the perimeter of the wheel and caused to move with the arm for actuating the grip. In the present instance a block 69 will be interposed between the shoe and the actuating part 20 of the arm, and the block has a pair of transverse grooves 70, in which the engaging faces 71 of such portion 20 may be received, such faces 71 in the illustration engaging the grooves by contact with the bottoms of the same only. The leverage for gripping as distinguished from the leverage for rotating the shaft 50 will be between one of the points 71, the point 66, and the pivotal connection at 72, between the arm 55 with its link 47. The direction will be determined by the position of the cam or sector 58, and when it is desired to change the speed the blocks 34 will be shifted in the ways upon the links 31. The crank 28 will impart motion to the link 31, and it through the link 42 will impart motion to the arm 41, from which motion will be imparted by the links 47 to the respective arms carrying the grips. It will be seen that when the grip at the top of the drum is operative the grip at the other side will be inoperative and going in a reverse direction, and the cranks 28 being quartered one grip only will be in full operation at a time, although one will be working while another is returning from its work.

When the device is working at comparatively high rates of speed, the time within which the friction-face is operating will be comparatively small, so that there must be as little lost motion as possible and that one of the engaging faces 71 on the side toward which the arm 55 is moving will press upon its socket 70 with a tendency to force the forward end of the shoe or segment 68 down against the perimeter of the friction-wheel, and such shoe or interposed block and contact-points will

have a tendency to alter the application of force considerably from what it would be without such construction. When it is desired to reverse the direction of rotation of the shaft 50, it will merely be necessary to shift the part 58 to a new position for holding the parts off center, as desired, and the speed is changed by shifting the slides 34 in a well-known manner. The device may also be used as a brake, in which event the shoe will be locked from movement by the slide 34 being shifted in concentricity with the link 31 and the shaft 59 turned sufficiently to keep the shoe-engaging wheel in such a position that continuous friction will be applied, the friction being regulated by the amount of turn of the sector 58. If it is desired that the driving power shall continue and the device be permitted to run free, the sector 58 may be turned to its position shown in Fig. 4, when no motion will be imparted.

Having thus described my invention, I claim—

1. The oppositely-disposed cranks set substantially quartering to each other and suitably mounted for rotation; two links mounted for oscillation; connecting-rods connecting the cranks and links respectively; pivot-blocks adapted to be moved lengthwise of said links and means for such movement; two drums fixed to a revoluble shaft and each having outside and inside friction-faces; four reversible friction-grips mounted for oscillation and adapted for engagement in pairs with each of the drums respectively and each grip having faces for engaging the respective friction-faces on the drum; four connecting-links, operatively connecting each pivot-block with each two of the friction-grips respectively; and shiftable means to cause the friction-grips to engage their respective friction-drums to impel the same in one direction or the other direction.

2. The combination with driving means, of a driven shaft, a wheel fast thereon and having friction-faces directed in opposite radial directions, an arm mounted upon said shaft, a friction-shoe carried by the arm to engage one of said faces and means also carried by said arm to engage the other of said faces, connections between the driving means and such arm to oscillate the same, the excursions of such oscillation being normally concentric with the axis of the wheel and means to cause one of the excursions of the oscillation to be eccentric to the wheel.

3. The combination with the driven shaft of a pair of wheels mounted thereon each having a flange presenting internal and external friction-faces concentric to the axis of the shaft, a pair of arms mounted upon the shaft adjacent to each wheel and each arm carrying means to engage both friction-faces of the flange and adapted when moved upon an axis concentric with the axis of the shaft to freely traverse said flange and when oscillated upon

a center eccentric thereto to grip the flange and rotate the wheel and means to permit the excursions of oscillation in one direction to be concentric to such shaft and the excursions in the opposite directions to be eccentric thereto and means to positively oscillate the arms.

4. The combination with the driven shaft of a pair of wheels mounted thereon each having a flange presenting internal and external friction-faces concentric to the axis of the shaft, a pair of arms mounted upon the shaft adjacent to each wheel and each arm carrying means to engage both friction-faces of the flange and adapted when moved upon an axis concentric with the axis of the shaft to freely traverse said flange and when oscillated upon a center eccentric thereto to grip the flange and rotate the wheel and means to permit the excursions of oscillation in one direction to be concentric to such shaft and the excursions in the opposite directions to be eccentric thereto, and means comprising a pair of cranks substantially quartering each other to positively oscillate the respective sets of arms.

5. The combination with a shaft having a wheel fast thereon said wheel being provided with internal and external friction-faces concentric to the shaft, an arm surrounding the shaft and carrying fast upon it a face to engage the inner perimeter of the wheel and carrying a shoe to engage the outer perimeter thereof, means to oscillate such arm, means to throw the center of oscillation out of concentricity with the shaft upon the excursions of the arm in one direction.

6. The combination with a shaft of a friction-face concentric thereto and carried thereby, an arm having a friction-clamp to engage the same, such arm having an eye provided with diametrically opposite concentric faces and diametrically opposite and interposed straight faces, a sector therein having a face to mate with the concentric face and also to engage with when turned one of said straight faces whereby to change the center of oscillation of said arm and to determine which excursion shall be concentric and which eccentric to the shaft.

7. A friction-grip comprising a hollow cylinder, an arm having a face to engage the inside perimeter of said hollow cylinder, a shoe to ride upon the outside perimeter thereof, the shoe having a pair of channels disposed midward of its ends there being engaging faces upon the arm to enter such channels whereby the leverage will be computed from such face upon the inside to one of the faces engaging the shoe, and means pivoted to said arm to oscillate the same and constituting the power-receiving end of such lever.

8. The combination with a shaft, of a wheel mounted thereon and having a flange, a sector carried by the shaft and rotatable independently thereof, a pair of arms each having an

eye entering the chamber formed by such flange and having the said sector passing through such eyes, portions of the walls of which eyes are concentric and portions of which constitute cam-faces, means to oscillate the arms in unison, and means to shift said sector.

9. The combination of a wheel having a flange and fast upon a shaft; said shaft; an arm having an eye surrounding the shaft, the walls of which eye have upon diametrically opposite sides concentric faces and upon the sides quartering therewith straight faces; a sector shiftable in said eye and having a face concentric to such concentric faces; means for engaging said arm to oscillate the same, said arm having a fixed engaging face for engagement with the inside of said flange; a shoe mounted upon the outside of the flange and having channels parallel with the axis of the wheel and the arm having a pair of engaging faces comparatively near each other and in engagement with said channels; the organization being such that when the sector is placed in engagement with one of the cam-faces and the arm is oscillated the shoe and inside engaging face will be caused to act, and upon the further oscillation of the arm the sector will come into engagement with one of the circular faces, the channels upon the shoe engaged by the faces upon the arm, the engaging face toward the direction in which the arm is moving constituting the point of pressure and the leverage of grip being regarded as from the inside engaging face to the active engaging face upon the arm whereby the leverage of gripping exceeds the leverage of oscillation.

10. In a device of the character specified the combination with a driven member having

substantially cylindrical outside and inside friction-faces, of means to drive the same and embodying means to engage the inside friction-face, a shoe riding upon the outside friction-face and extending circumferentially in both directions past the radial line on which said inside engaging face engages said cylindrical inside face, means to oscillate said inside engaging member and shoe in unison, means to press the said shoe against the outside friction-face during the excursions of oscillations in one direction at the side of said line toward which the driven member is to be rotated, and means to determine at which excursion it shall be so pressed.

11. In a device of the character specified, the combination of a driven member having upon it concentric inside and outside friction-faces, and means to drive the same, comprising a member oscillatory from a center at the region of the center of said friction-faces and having a face to engage said inside face at a relatively narrow circumferential area, means to oscillate said member, a shoe having an engaging face extending over a relatively wider circumferential area of the said outside face, means carried by said oscillatory member and engaging the shoe at the respective sides of its center for forcing the face of said shoe against said outside engaging face, and means to change the center of oscillation of said member to determine at which side of the center the said shoe shall be engaged by said engaging means.

Signed at Nos. 9 to 15 Murray street, New York, N. Y., this 18th day of May, 1904.

WILLIAM D. CUSTEAD.

Witnesses:

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