No. 735,068. PATENTED AUG. 4, 1903.

J. D. CURTIS.

SPEED CHANGING MECHANISM.

APPLICATION FILED JAN. 12, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

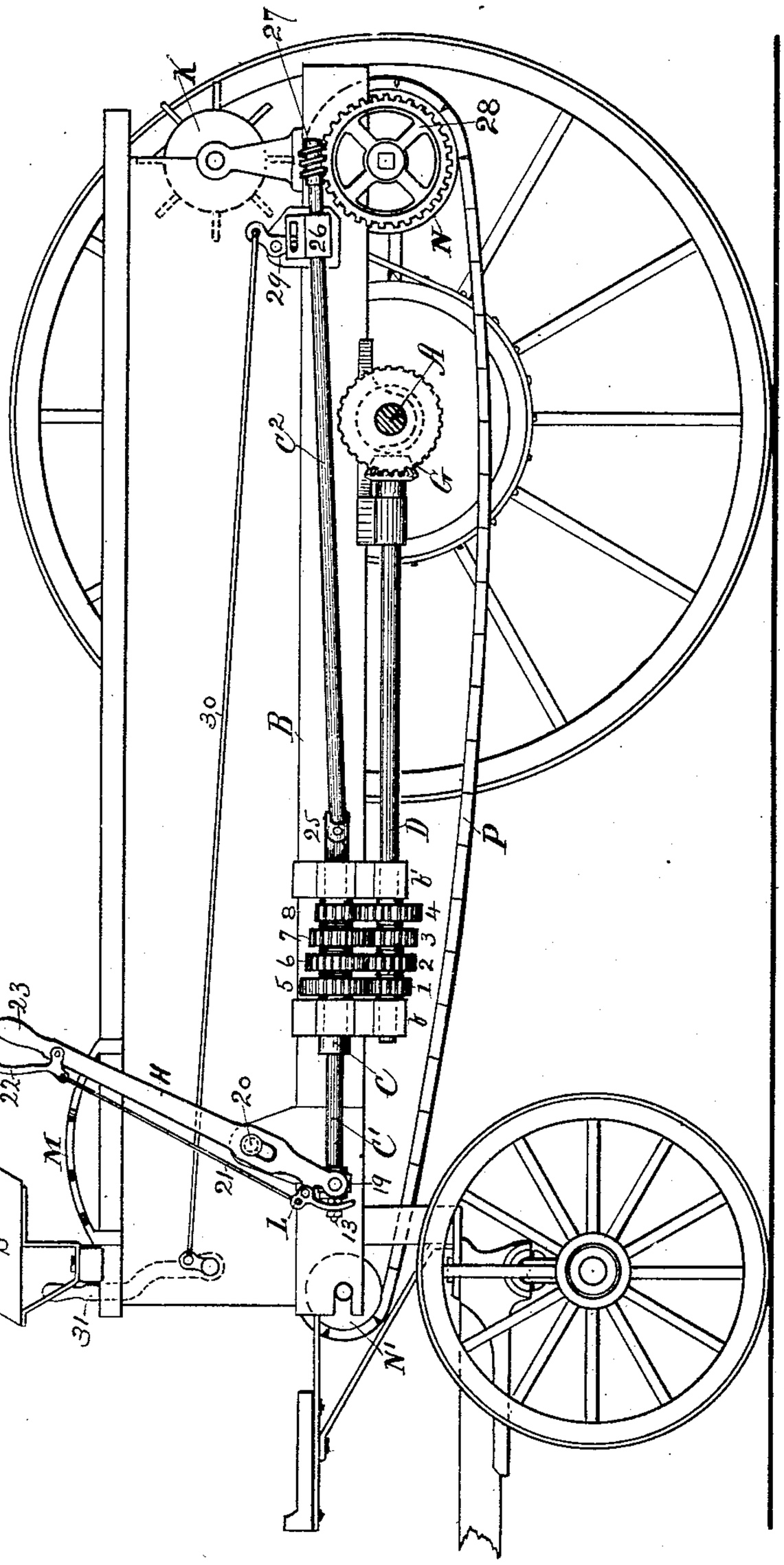

FIG. 1.

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NO MODEL. 2 SHEETS—SHEET 2.

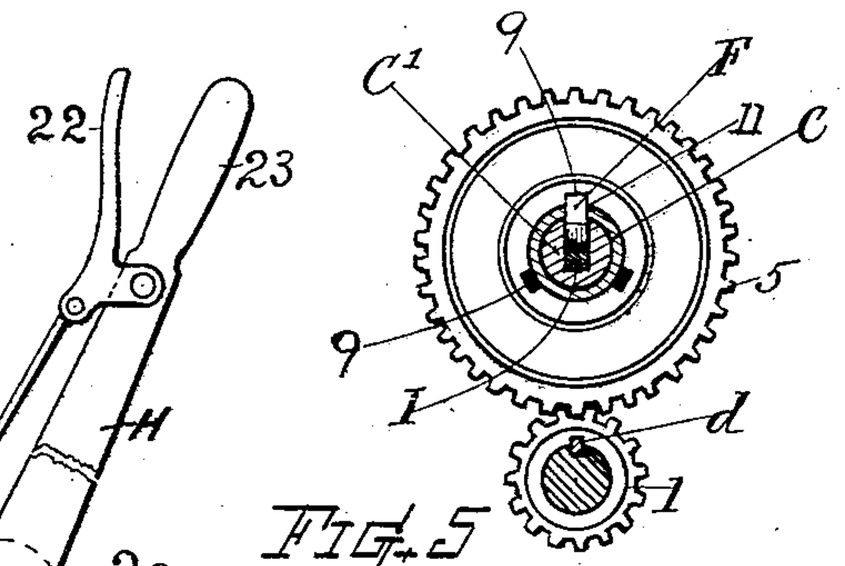

FIG. 5

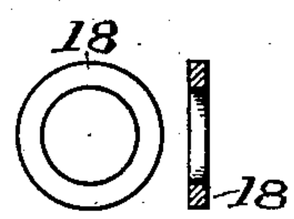

FIG. 6

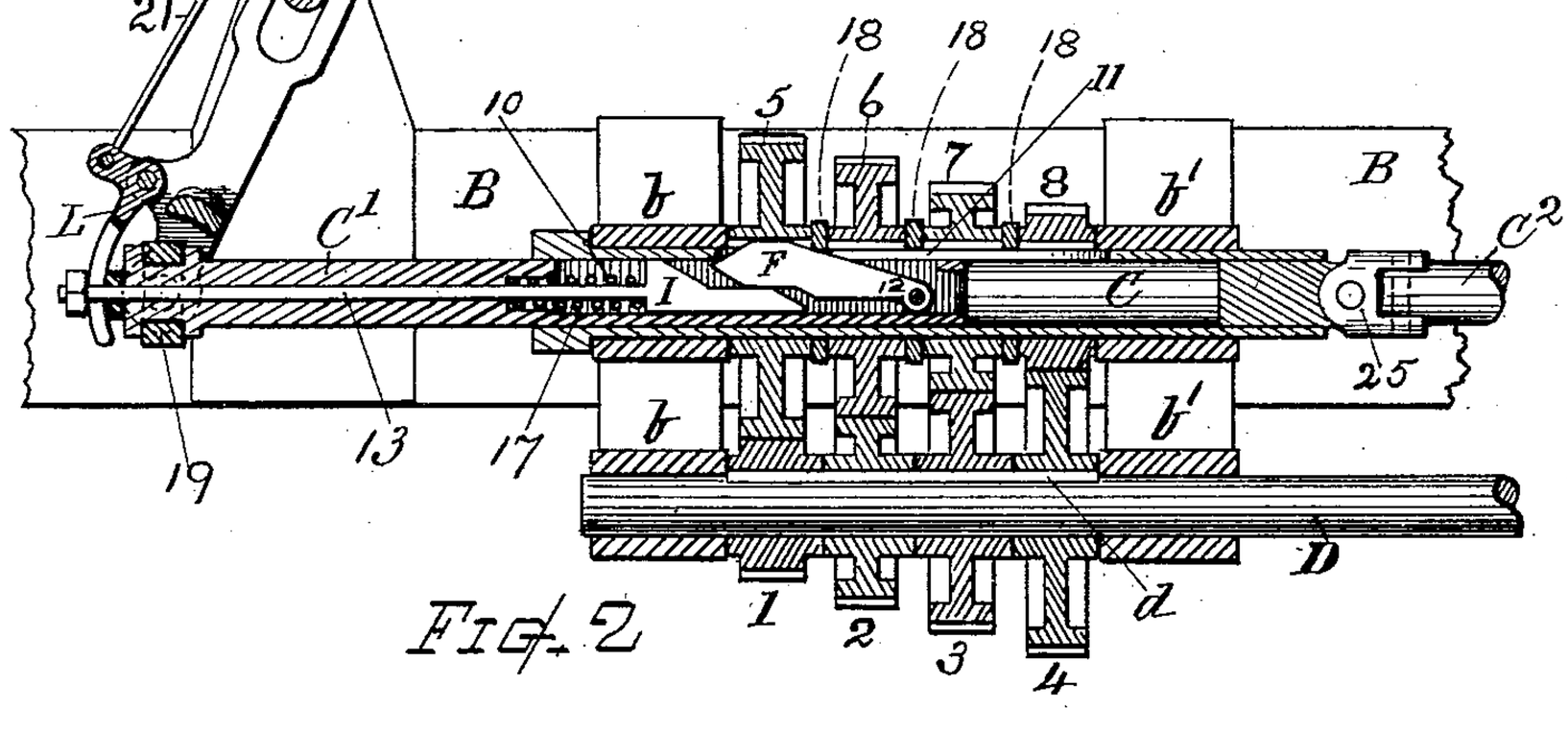

FIG. 2

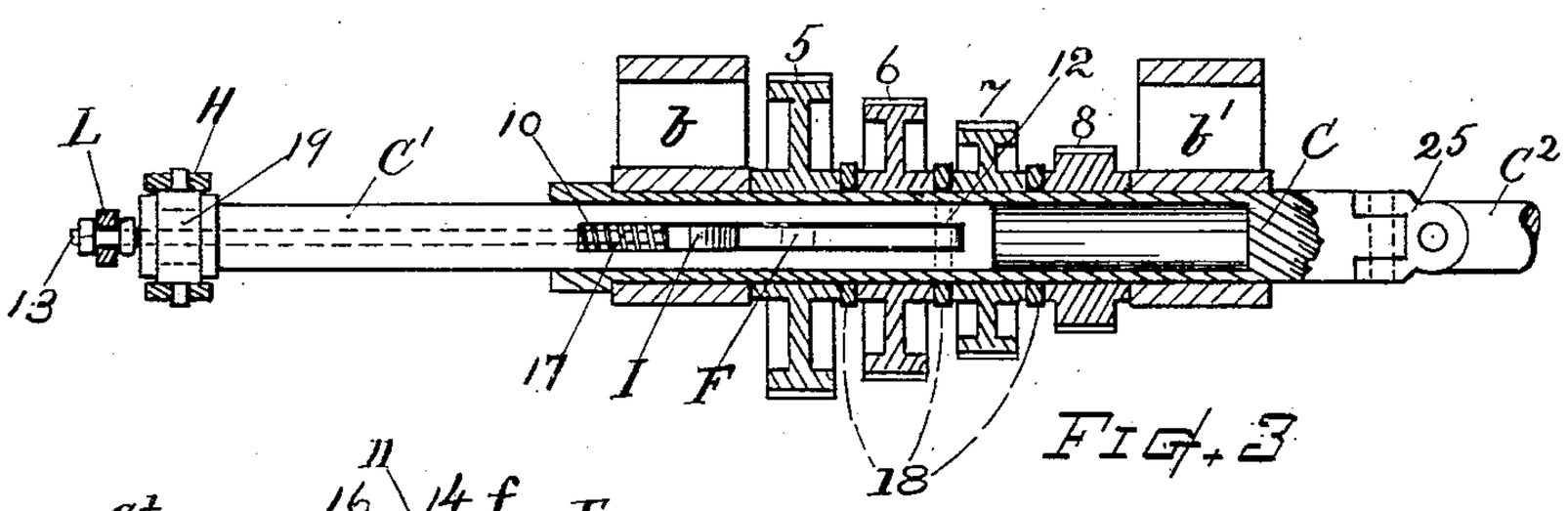

FIG. 3

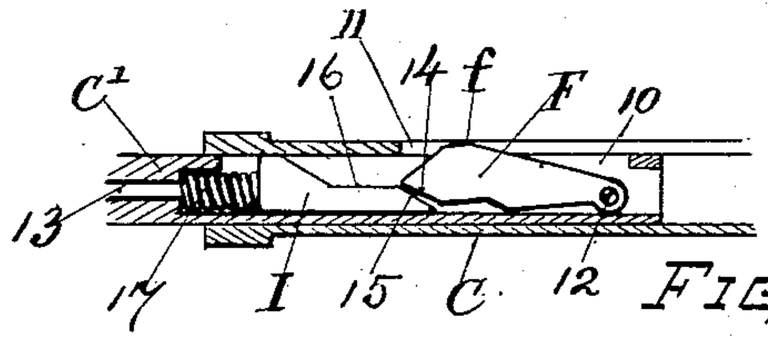

FIG. 4

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No. 735,068. Patented August 4, 1903.

UNITED STATES PATENT OFFICE.

JOHN D. CURTIS, OF WORCESTER, MASSACHUSETTS.

SPEED-CHANGING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 735,068, dated August 4, 1903.

Application filed January 12, 1903. Serial No. 138,624. (No model.)

To all whom it may concern:

Be it known that I, JOHN D. CURTIS, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Speed-Changing Mechanism, of which the following, together with the accompanying drawings, is a specification sufficiently full, clear, and exact to enable persons skilled in the art to which this invention appertains to make and use the same.

The object of my present invention is to provide a practical and efficient speed-changing mechanism comprising a driving and a driven shaft provided with a series of differentially-proportioned intermeshed gears and a novel means for individually locking the several loose gears to their axial shaft, consisting of an interior latch or dog and a latch-retaining block actuated by hand-lever devices adapted for control by the attendant, as more fully hereinafter explained.

Another object is to provide, in combination with means of the character described for changing or varying speed, means controllable by the attendant for setting or adjusting the speed-change mechanism without stopping the movement of the vehicle or action of the driving mechanism.

I attain these objects by the mechanism illustrated in the accompanying drawings, wherein—

Figure 1 represents a side view, partly in section, showing an embodiment of my invention as applied to a spreader-cart. Fig. 2 represents a longitudinal section through the two shafts and system of differentially-meshed gears and showing the side of the controlling-levers and interlock devices. Fig. 3 is a horizontal longitudinal section through one of the shafts, showing a top view of the interlock devices. Fig. 4 is a fragmentary section illustrating the interlock devices at retracted position. Fig. 5 represents a transverse section of the shafts and the side of one pair of the gears mounted thereon, and Fig. 6 shows the intermediary ring by side and section views.

Referring to the drawings, the letter A indicates the rotatable axle, and B the body-frame of the cart or vehicle.

C and D indicate two parallel shafts, one serving as the power-shaft or driving member and the other as the speeded shaft or driven member in the speed-train, and said shafts are supported and arranged to turn in suitable bearings *b* and *b'*, fixed to the frame. The numerals 1, 2, 3, and 4 indicate a row of spur-gears of different diameters mounted upon one of said shafts, and 5, 6, 7, and 8 indicate a row of spur-gears of countermatching varied diameters mounted upon the other shaft and severally intermeshing with the first-named row of gears in the order of their oppositely-proportioned diameters, the larger gear on one shaft meshing with the smaller gear on the other shaft, while the intermediary-sized gears match in pairs according to their diametric proportions. One of the shafts—in the present instance the power-shaft D—is formed solid, and the gears are rigidly secured thereon by means of a spline or key *d* to rotate with the shaft, while the other shaft C is formed hollow or tubular, and the gears mounted thereon are arranged independently rotative, so as to turn freely upon the shaft, each of these loose-mounted gears being provided within its hub with one or more longitudinal grooves or keyways 9 to receive a lock-dog or latch device, as hereinafter explained. The hollow shaft C is composed of a tubular shell having a longitudinal slot 11 along that part upon which the gears are seated and an endwise-movable body or inner member C', which is arranged partly within said shell and partly projecting therefrom at the end and is provided throughout a portion of its length with a longitudinal cavity or groove 10, corresponding in position with the slot in the outer tubular portion. Within the groove 10 I arrange a latch F, transversely pivoted, as at 12, and adapted to swing outward from the slot of the shaft and engage with its edge *f* the keyway in one of the loose-mounted gears. A sliding block I is also arranged in the groove 10 for controlling said latch and is connected with an endwise-movable rod 13, that extends out through an axial bore in the body member C' and is fitted for longitudinal movement therein for sliding the block toward and from the latch. The latch-piece is formed with an incline 14 at its end, and the block is formed with an inclined end 15 and a straight portion 16 adjacent thereto, whereby said block

is adapted for forcing outward the latch F and for locking it in its outward position by the wedging action when the block is moved outward or for releasing the latch-piece when the block is retracted. A coil-spring 17, arranged on the rod between the block and end wall of the groove, serves to press the block normally toward the latch-piece. Between each of the loose gears there is arranged about the shaft a ring collar or guard 18, the interior circle of which corresponds with the exterior circumference of the shaft C, so that the latch F must necessarily become retracted while passing from one of the gears to another. Consequently only one gear can be operatively engaged at a time.

The outer end of the member C′ is provided with a wrist-sleeve 19, confined between annular collars or shoulders, and pivotally connected with said sleeve there is a hand-lever H, fulcrumed at 20 to a suitable support attached to the frame B, said lever being arranged in such manner that the swing of the lever will slide the shaft member C′ inward or outward within the tubular part of the shaft for shifting the position of the latch devices into alinement with either of the gears mounted upon said shaft.

Upon the lower arm of the hand-lever H there is fulcrumed a small secondary lever L, having a forked or slotted arm that engages between lugs or collars in suitable manner in connection with the end of the rod 13 for moving said rod and the block I in relation to the member C′. The other arm of said angle-lever is connected by a rod 21 with a swinging grip-tongue 22, pivoted to the hand-lever near its handle 23 and adapted to be grasped at the same time therewith. When the grip-tongue is pressed toward the handle, the wedge-block I is drawn away from the latch-piece F, permitting the latter to retreat within the shaft; but when the grip-tongue is free the spring 17 forces the block beneath the latch, and the latter is by the inclined surfaces forced outward into engagement with a keyway in one of the gears. A notched segment M serves for indicating the positions of the hand-lever corresponding to the positions of the latch devices when in proper alinement for the latch entering the notch in either of the several speed-changing gears.

In practice this speed-changing mechanism can be arranged with either the shaft C or the shaft D as the power-shaft or driving member, since power and motion can be transmitted through the train from one shaft to the other, or vice versa, with equal facility of operation. As combined in the present illustration the shaft D is connected by beveled gears at G with the axle A of the vehicle and the shaft C is provided with a toggle-joint 25 and an extension C^2, that is supported in a bearing 26 and provided with the worm-screw 27 or suitable means for transmitting motion to the operated mechanism.

By means of the mechanism herein shown and described the attendant is enabled by manipulation of the hand-lever mechanism to change the clutch in the gearing, and thereby regulate the speed of the driven shaft and parts actuated thereby in relation to the power-shaft.

I am aware that differential or coned gears with differently-constructed internally-disposed clutch devices have heretofore been employed for speed-changing purposes. Therefore it will be understood that my invention relates to an improved construction substantially as defined.

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

1. In a speed-changing mechanism, the combination of two shafts, suitable bearings therefor, a series of differentially-proportioned intermeshed gears mounted upon and connecting said shafts, the gears on one shaft rigidly keyed thereto, the gears on the other shaft free and provided internally with notches or keyways, the latter shaft formed hollow and provided with a slot, rings surrounding the shaft between the gears, an endwise-movable member sliding within said hollow shaft, a swinging latch fitted within a cavity in said member and pivoted to swing outward through said slot, a wedge-block slidable beneath said latch, a rod connected with said block and extending out through said shaft member, and means for moving said member and for relatively moving said wedge-block, for the purpose set forth.

2. The combination, with the shaft, a series of tight-mounted gears of different diameters thereon, a tubular slotted shaft, a countermatching series of gears loose-mounted thereon and intermeshing with said tight-mounted gears, longitudinal keyways within the loose gear-hubs, and ring guards or collars between said loose gear; of an endwise-sliding body member within said tubular shaft, having a groove and a pivoted latch-dog within said groove, adapted to swing outward and interlock with one of said loose gears, a locking-block engaging said latch by inclined surfaces, a block-actuating rod extending out through the body member, a spring pressing against said block, a hand-lever jointed to said body member, a fulcrum-pivot for said hand-lever, a secondary lever fulcrumed on said hand-lever and having an arm or fork engaging said block-actuating rod, a grip-tongue pivoted on the hand-lever and a rod connecting said grip-tongue with said secondary lever, for operation substantially as set forth.

3. In a speed-changing mechanism, in combination, with a slotted tubular shaft, a series of gears or wheels mounted to turn loose thereon, and each having an internal longitudinal recess in its hub; and non-recessed rings between the several wheels; of the endwise-movable internal member, the transversely-pivoted latch having inclined and straight surfaces at its inner edge and an

outer edge adapted to engage one of said wheels, the slidable block having inclined and straight surfaces adjacent to said latch, and means for moving said internal member relatively to the series of wheels, a rod connected to said slidable block and means for moving said block relatively to said latch, for the purpose set forth.

4. The combination with the supporting-frame, the rotatable power-shaft, the speed-gears fixed on the power-shaft, the tubular slotted shaft parallel thereto, the counter-matching speed-gears loose-mounted thereon, ring-collars between said gears, an endwise-sliding member within said tubular shaft, a locking-dog and dog-locking block carried upon said sliding member, a block-actuating rod extending longitudinally through said member, the hand-lever fulcrumed on the frame and jointed to said sliding member, the block-controlling lever pivoted on the hand-lever and engaging said block-actuating rod, the pivoted grip-tongue, and a connecting-rod for working said block-controlling lever with the hand-lever, substantially as set forth.

Witness my hand this 8th day of January, 1903.

JOHN D. CURTIS.

Witnesses:
CHAS. H. BURLEIGH,
ELLA P. BLENUS.