

No. 771,077.

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A. B. LANDIS.
CHANGE SPEED GEARING.
APPLICATION FILED APR. 18, 1902.

NO MODEL.

Fig. 6.

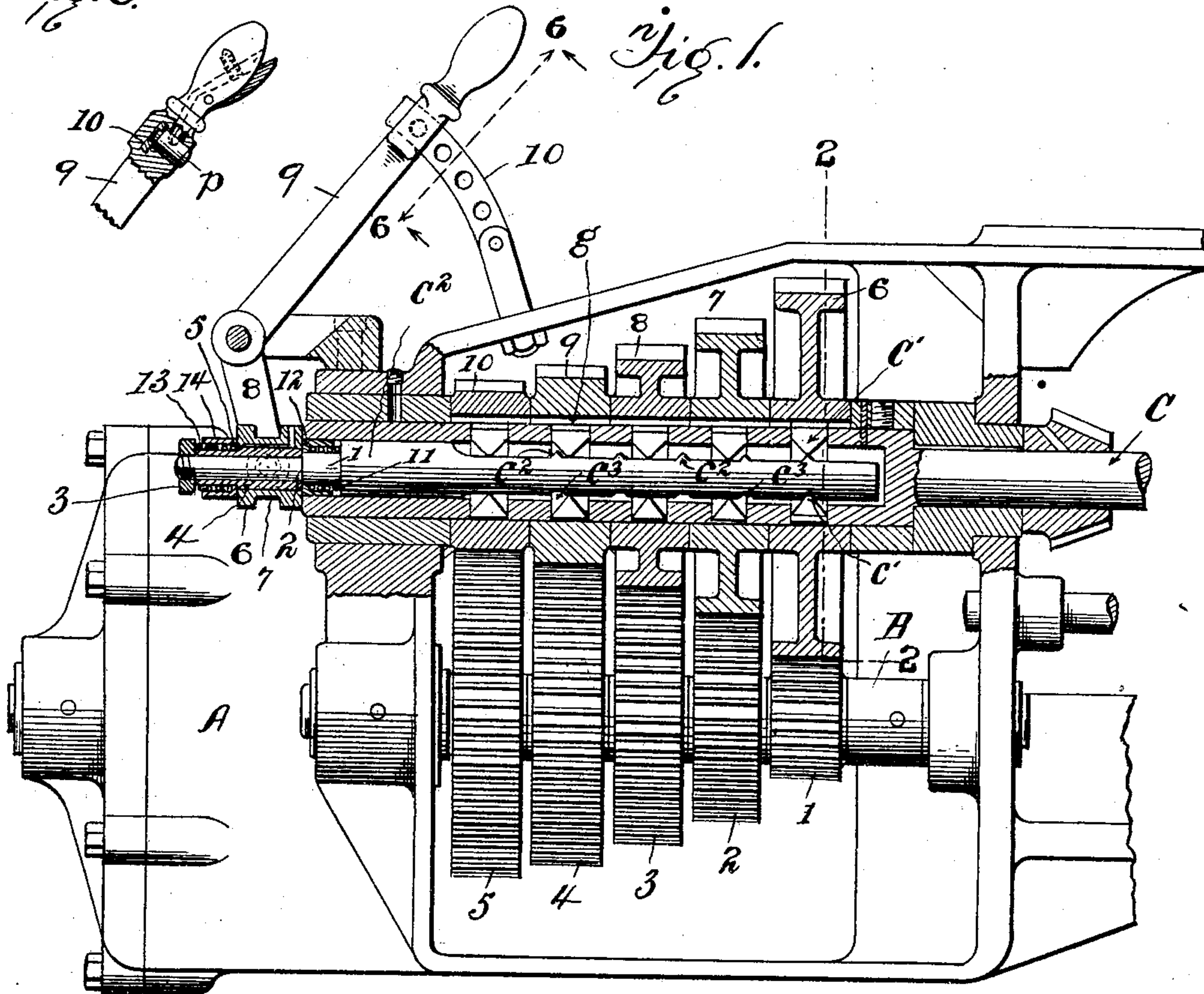


Fig. 2.

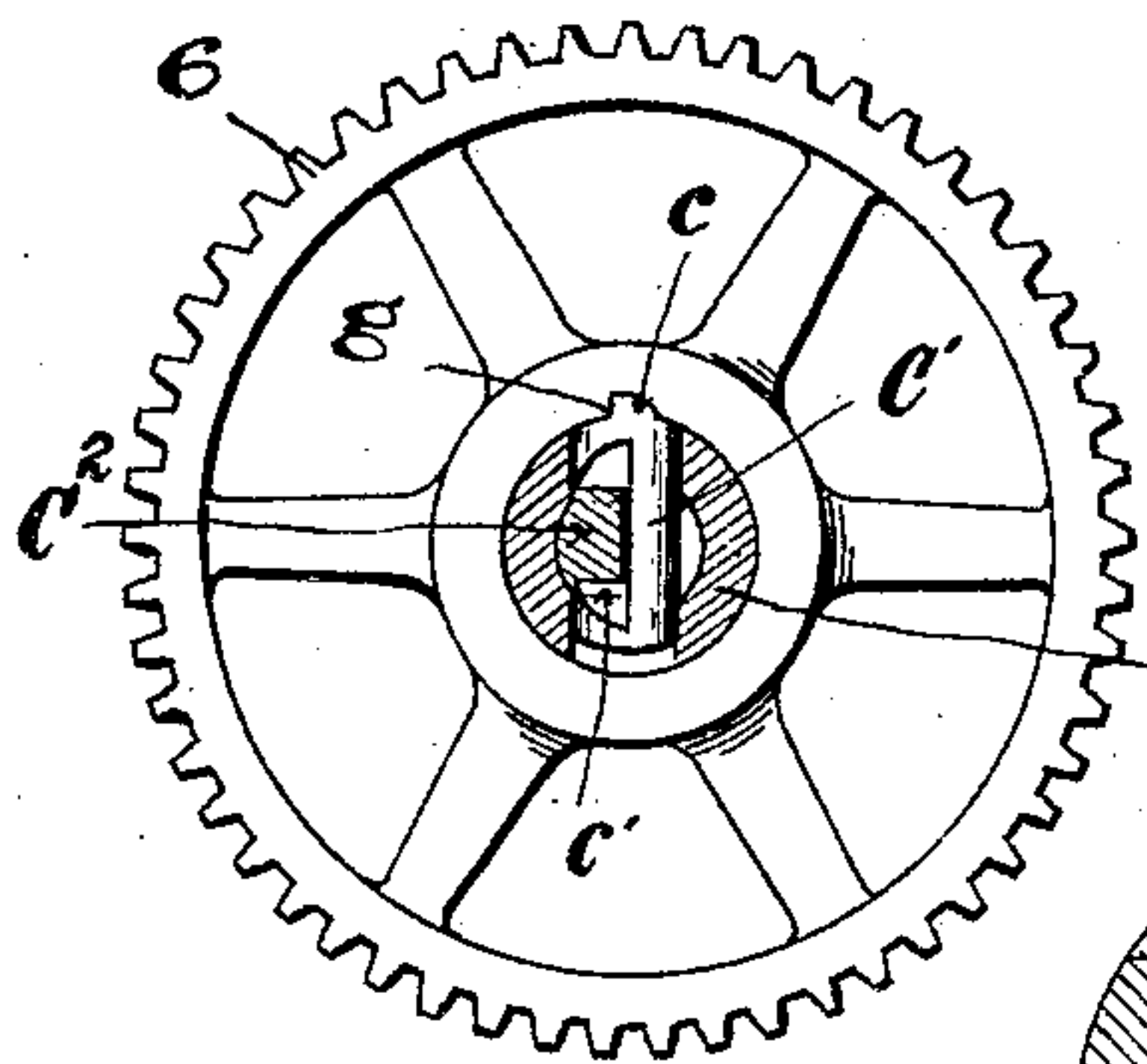


Fig. 3.

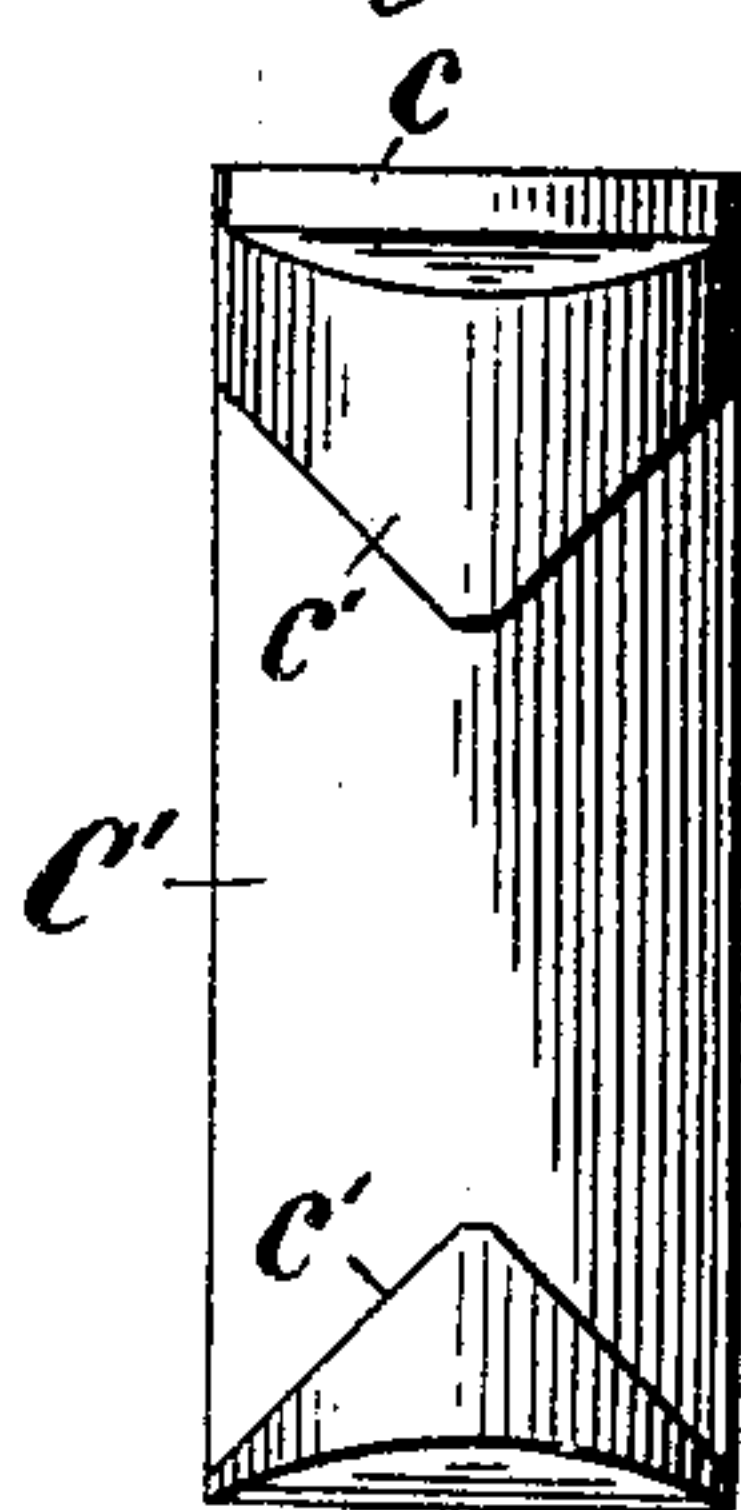
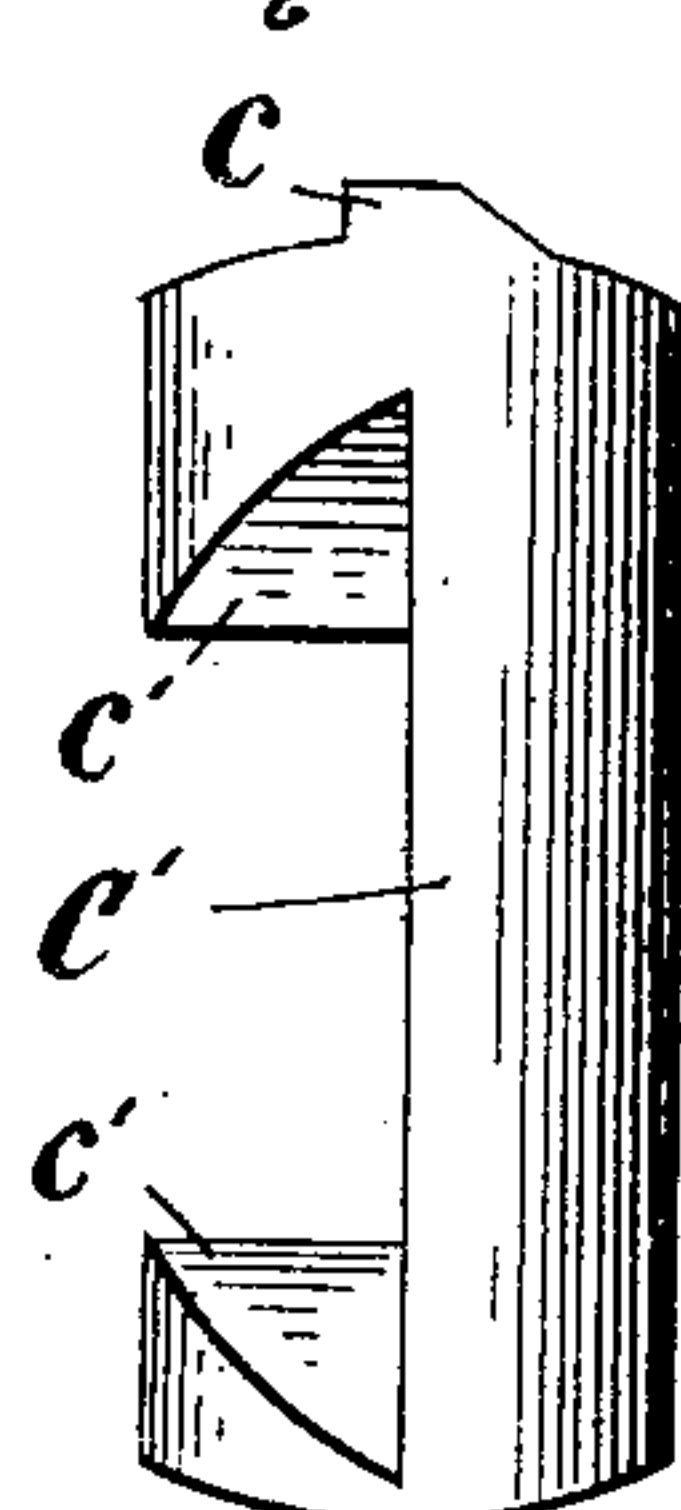


Fig. 4.

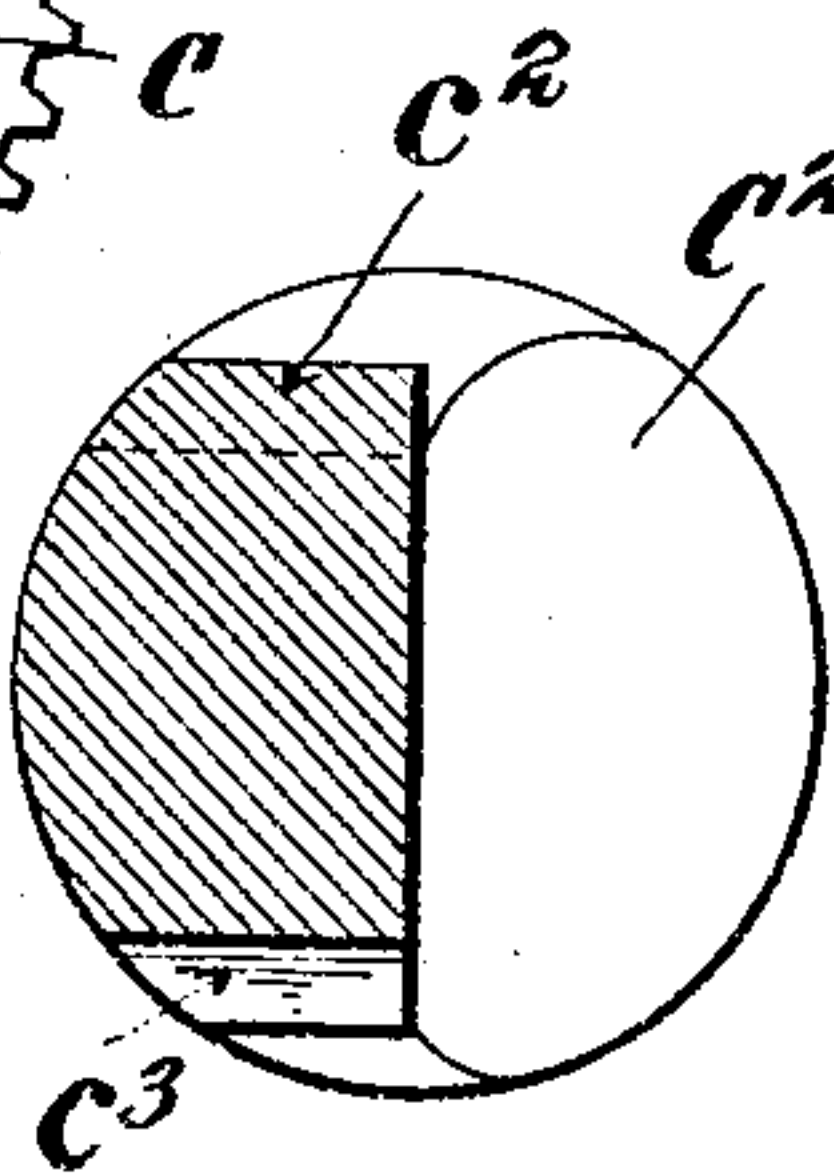


Witnesses

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Fig. 5.



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CHANGE-SPEED GEARING.

SPECIFICATION forming part of Letters Patent No. 771,077, dated September 27, 1904.

Application filed April 18, 1902. Serial No. 103,594. (No model.)

To all whom it may concern:

Be it known that I, ABRAHAM B. LANDIS, a citizen of the United States, residing at Waynesboro, in the county of Franklin and State of Pennsylvania, have invented certain new and useful Improvements in Change-Speed Gearing, of which the following is a specification.

My invention consists in an improved construction and arrangement of parts of driving-gear the speed whereof may be changed while in motion by the coupling successively of gears of various sizes to the driving-shaft; and it relates particularly to means whereby the coupling mechanism is operated positively to uncouple one of said gears before coupling another, all as will be hereinafter more fully described and claimed.

Referring to the accompanying drawings, which are made a part hereof, and on which similar reference characters indicate similar parts, Figure 1 is a view, partly in section and partly in side elevation, of a set of driving-gears embodying my said invention; Fig. 2, a cross-section on the dotted line 2 2 in Fig. 1, the gear-wheel being shown in elevation; Fig. 3, a front view of one of the clutch-pins separately, on an enlarged scale; Fig. 4, a side elevation of said clutch-pin; Fig. 5, a cross-section through the operating-rod, on an enlarged scale; and Fig. 6, a detail view looking in the direction indicated by the arrows from the dotted line 6 6 in Fig. 1.

In said drawings the portions marked A represent the frame, in which the parts are mounted, B the counter-shaft, and C the driving-shaft, on which my improved speed-changing mechanism is mounted. The frame A is of any suitable form and contains bearings in which the several shafts are mounted. It may be formed as a part of the machine with which the invention is to be used or may be a separate frame attached thereto or mounted on any convenient supporting part, as will be readily understood. The shaft B may be either the driven or the driving shaft and is journaled in suitable bearings in said frame and has keyed thereto to revolve therewith a series of gear-wheels 1, 2, 3, 4, and 5 of graduated diameters. The shaft C is also mounted

in suitable bearings in said frame A parallel with shaft B and has a series of gear-wheels 6, 7, 8, 9, and 10, loosely mounted thereon, of graduated diameters to mesh with the gear-wheels of shaft B. Each of said gear-wheels is formed with a groove *g* in the interior surface of its hub, extending longitudinally thereof, one side of which is formed square or straight and the other side of which is tapered, as shown most clearly in Fig. 2. The outer end of shaft C is perforated longitudinally and formed tubular throughout that portion on which said gear-wheels are mounted. Transverse perforations are formed in said tubular part and extend through each side thereof, and in said transverse perforations are mounted a series of clutch-pins *C'*. The clutch-pins *C'* are each of a length substantially corresponding with the diameter of the portion of the shaft C in which they are mounted and are formed with a projecting rib *c* on one end, one face of which is formed straight and the opposite face of which is tapered. Said ribs are arranged to extend longitudinally and parallel with the shaft and are adapted to fit into the grooves *g* of the gear-wheels when thrown outward beyond the surface of the shaft. A central notch is cut in the side of each pin, preferably to a depth equal to about one-half of the diameter thereof, as shown most clearly in Figs. 2 and 4, and the portions on each side of said notch are tapered from each side to a point at the center, forming double-faced cams *c'* on each side of said notch and projecting toward each other.

A rod *C²* is mounted in the longitudinal perforation in the shaft C, having one side cut away, as shown in Figs. 2 and 5, throughout that portion which is adjacent to the clutch-pins, being thus adapted to fit within the notches in the sides of said clutch-pins between the cams *c'*. A series of double-faced cams *c²* is formed upon the upper edge of said rod and a series of notches *C³* on its opposite edge, a notch and a cam corresponding with each other in size and position. Said notches and cams are arranged so that no two cams will engage a clutch-pin at the same time, being graduated in position so that as the rod *C²* is moved longitudinally said cams will operate

to release one clutch-pin and engage the next successively throughout the length of the clutch mechanism. The outer end of the rod C^2 is formed with a shoulder 1 near the outer
 5 end of said shaft and a short distance therefrom with a second shoulder 2, its extreme outer end being screw-threaded and provided with a nut 3. From the shoulder 2 to said
 10 nut it is provided with a sleeve 4, said sleeve 4 being formed with a shoulder 5. A collar 6 with a circumferential groove 7 is mounted on said sleeve 5 at its inner end and is connected, by means of a shifting-fork of any usual
 15 construction having antifriction-rollers engaging with said groove 7, with an operating-lever 9, which is pivoted to engage, by means of a spring-pawl p , with a segment 10, having a series of perforations and notches with which
 20 said pawl engages positioned so that as said lever is moved from one notch or perforation to the next the rod will be operated to move the next adjacent clutch-pin, as will be presently described.

Between the shoulder 1 in the rod C^2 and
 25 the adjacent end of the sleeve 4 is interposed a spring 11, preferably inclosed in a metal ferrule 12, and a similar spring 13, inclosed in a ferrule 14, is mounted between the nut 3 and the shoulder 5 in said sleeve 4. It will
 30 thus be seen that the collar 6 is mounted on the rod C^2 between supporting-surfaces which will yield to permit a slight independent movement of said collar.

In operation, the parts being in the position
 35 shown in Fig. 1, the gear-wheel 6 is locked to the shaft through the clutch-pin C' , which is held outwardly into engagement with the groove g therein by means of the cam c^2 being in engagement with the point of the cam c' of
 40 the clutch-pin. It being desired to change the speed from that secured through this connection to that which will be secured through the next wheel, the lever 9 is moved down on the segment 10 until its pawl p will engage
 45 with the next perforation. This will throw the rod C^2 outwardly, so that the side of the notch c^3 , riding over the point of the lower cam c' , will positively withdraw said clutch-pin from engagement with the groove in the
 50 gear-wheel 6 and bring the side of the next cam c^2 against the side of the cam c' of the next clutch-pin, the spring 13 on the outer end of the rod being at the same time compressed until the gear-wheel 7 shall have rotated to the point where its groove g will pass
 55 over the rib c of its clutch-pin, when the pressure of said spring 13 will operate to throw said rod and, through the cam c^2 , throw said clutch-pin outwardly into engagement
 60 with said groove, locking said gear-wheel to the shaft. The springs 13 and 11 will restore the parts immediately to their normal positions by forcing the ferrules 12 and 14 against the shoulder 5 on sleeve 4 and the end of said
 65 sleeve, said springs being under tension when

the ferrules are against said shoulders. The operation of shifting from one wheel to another in either direction will be the same as just described. It will thus be seen that before one clutch-pin can be engaged with its
 70 gear-wheel the other clutch-pins are positively withdrawn from any possible engagement with other gear-wheels and positively locked out of engagement therewith, the portion of
 75 the rod C^2 between its cams and notches being of a diameter equal to the distance between the points of the cams c' of each clutch-pin, thus holding said clutch-pins against possible movement until they are positively operated
 80 as above described.

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

1. In a speed-changing gear, the combination, of two sets of gear-wheels forming two
 85 cones mounted on parallel shafts and engaging with each other, said parallel shafts, one of which has its gear-wheels rigidly secured thereon, and the other of which is hollow and has its gear-wheels mounted loosely thereon,
 90 sliding locking devices formed with central transverse ways with cam-faces on each side thereof mounted in transverse perforations in said hollow shaft and adapted to engage notches in the hubs of said gear-wheels, and
 95 a rod within said hollow shaft mounted to slide in the central ways in said locking devices and provided with a series of operating cam-faces arranged to engage the cam-faces of said locking devices successively to move
 100 one to engage its gear-wheel and to lock all of the others out of engagement with their wheels, whereby only one wheel can be locked into engagement with the shaft at a time, substantially as set forth.

2. In a speed-changing gear, the hollow shaft provided with a series of transverse perforations, a series of gear-wheels mounted
 105 thereon and provided with grooves within their hubs, a series of clutch-pins mounted in the transverse perforations in said shaft having a central transverse way and formed with engaging points adapted to engage said grooves, and each formed with a cam-face on
 110 either side of the central transverse way, a sliding rod mounted in said hollow shaft and extending through said central transverse way into said clutch-pins, and formed with a series of cam-faces on its opposite sides to engage the cams of said clutch-pins and operate
 115 them positively in both directions, substantially as set forth.

3. In a speed-changing gear, the combination, of a hollow shaft having a series of transverse perforations, a series of clutch-pins
 125 mounted to slide in said perforations, a series of gear-wheels mounted on said shaft and formed to be engaged by said clutch-pins, said clutch-pins being formed with a central transverse notch or way and a cam on each
 130

side thereof, a rod mounted to slide in said hollow shaft and adapted to fit in the way or notch of said clutch-pins and provided with a series of cams on one edge and a series of corresponding notches on the opposite edge adapted to engage the cams and operate the clutch-pins positively in both directions and lock them in adjusted positions, substantially as set forth.

4. In a speed-changing gear, the combination of the hollow shaft provided with fixed shoulders at its outer end having transverse perforations, a series of clutch-pins therein formed with cam-faces, a sliding rod mounted in said hollow shaft and provided with cam-faces to engage said clutch-pins and adapted to be moved longitudinally, a collar on the end of said rod with a shifting-lever and springs interposed between each end of said collar and a fixed shoulder on said shaft, substantially as set forth.

5. In a speed-changing gear, the combination of the hollow shaft, the gear-wheels, the clutch-pins, the sliding rod within said shaft for operating said clutch-pins, a collar on the outer end of said rod, an operating-lever engaged thereby, said collar mounted to slide on a sleeve mounted between a shoulder in the rod and a securing part mounted on its outer end, said sleeve, said securing part, and springs interposed between said collar and adjacent shoulders on said shaft, and fixed shoulders adjacent to each end of said collar

for receiving the pressure of said springs when the parts are in normal positions, substantially as set forth.

6. In a speed-changing gear, the combination of the hollow shaft, the gear-wheels, the clutch mechanism, a rod within said hollow shaft for operating the clutch mechanism, a collar on the outer end of said rod, an operating-lever connected therewith, said collar being mounted to have a limited independent motion, a spring mounted between each end thereof and an adjacent shoulder, the operating-lever pivoted on the frame, and engaging with a sector, and said sector having stops positioned to agree with each change of speed, substantially as set forth.

7. In a speed-changing gear, the combination of the hollow shaft, the series of gear-wheels mounted thereon, the clutch mechanism, a sliding rod in said hollow shaft for operating said clutch mechanism, a collar mounted on the outer end of said rod having a limited independent movement thereon, an operating-lever connected with said collar, and a sector provided with stops to engage said lever, substantially as set forth.

In witness whereof I have hereunto set my hand and seal at Waynesboro, Pennsylvania, this 21st day of March, A. D. 1902.

ABRAHAM B. LANDIS. [L. s.]

Witnesses:

D. J. CROSBY,

ALF. N. RUSSELL.