No. 727,977. PATENTED MAY 12, 1903.

R. K. LE BLOND & W. F. GROENE.

SPEED CHANGING BOX.

APPLICATION FILED FEB. 20, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

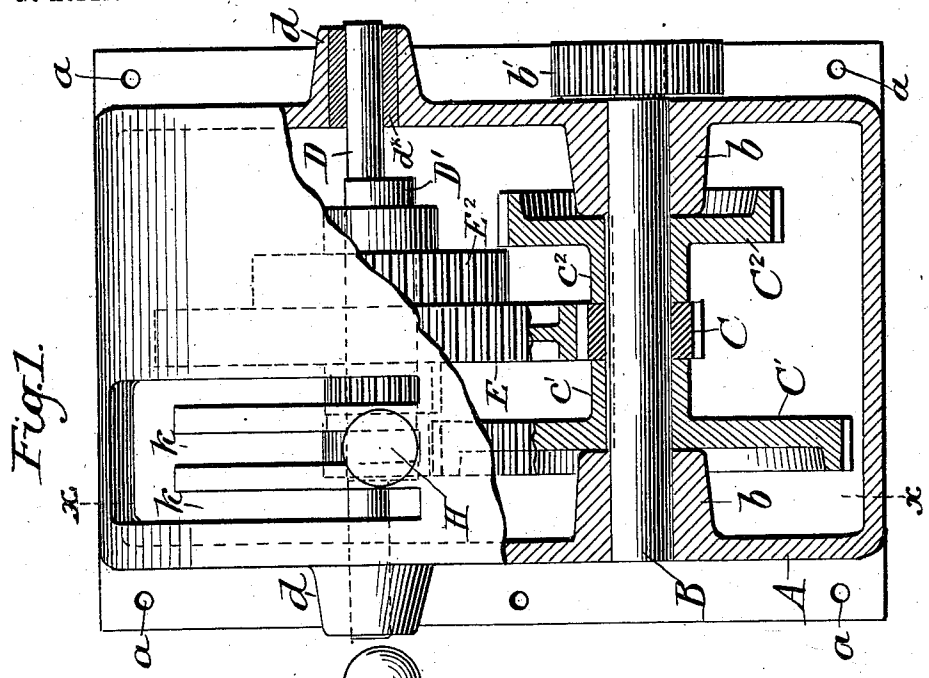
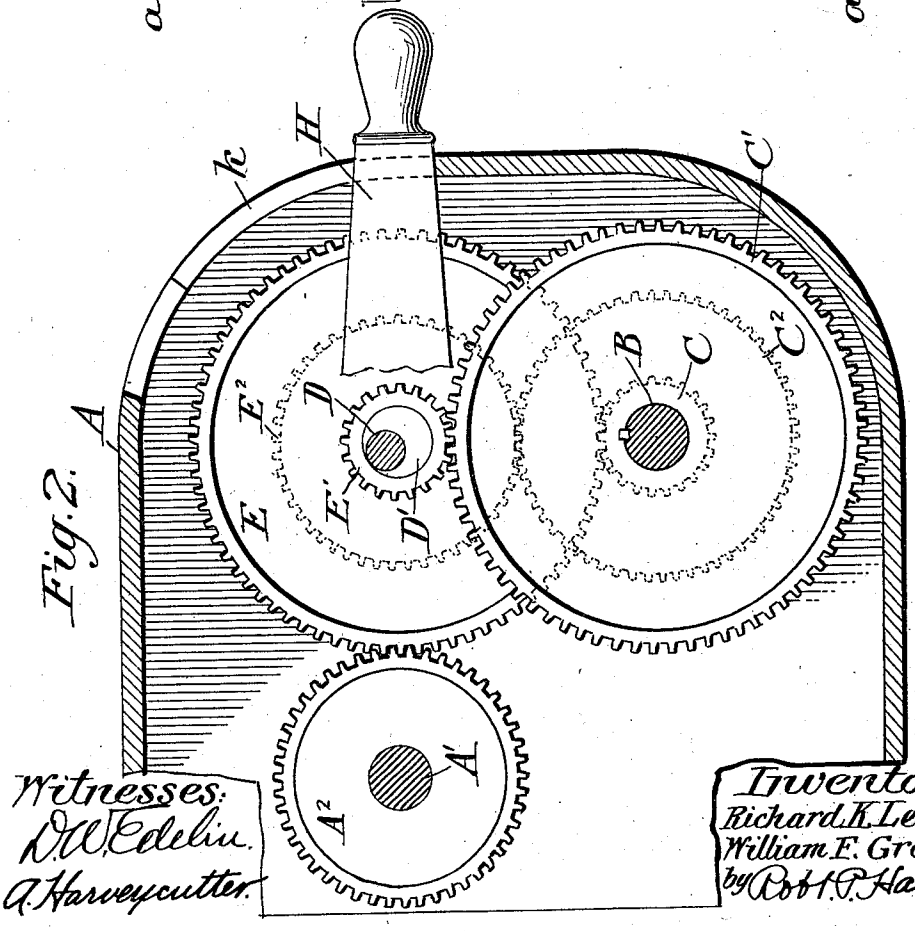


Fig. 2.



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SPEED CHANGING BOX.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

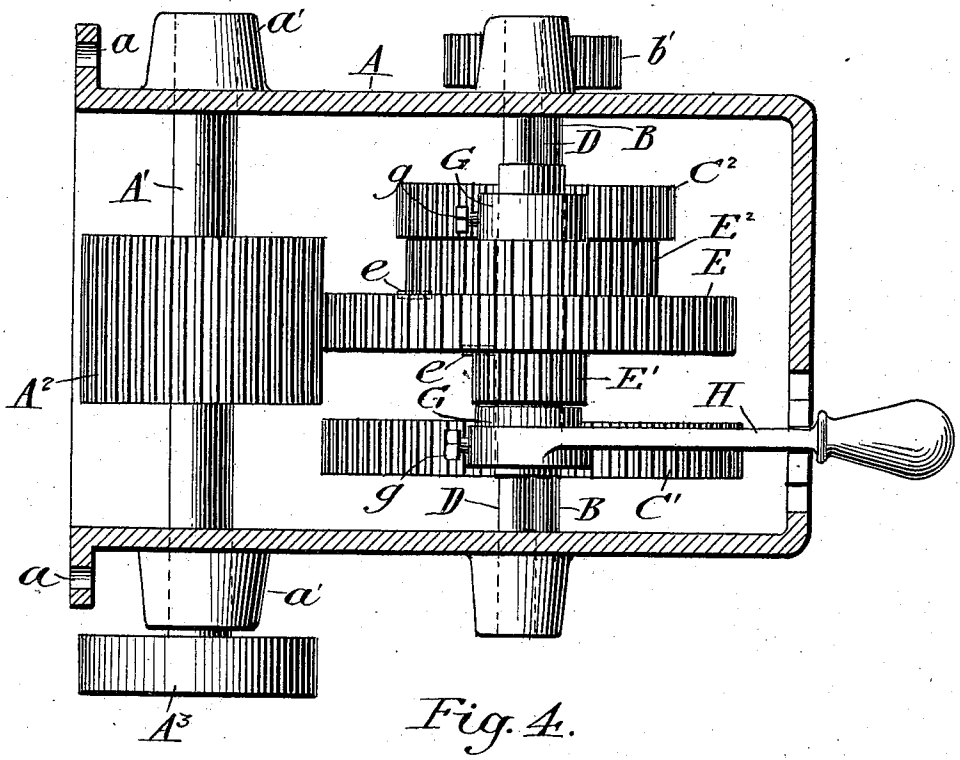
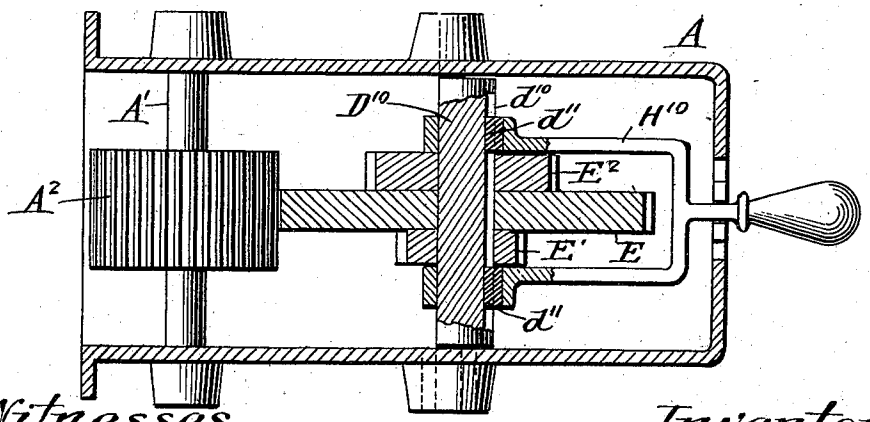


Fig. 4.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 727,977. Patented May 12, 1903.

UNITED STATES PATENT OFFICE.

RICHARD K. LE BLOND AND WILLIAM F. GROENE, OF CINCINNATI, OHIO, ASSIGNORS TO THE R. K. LE BLOND MACHINE TOOL COMPANY.

SPEED-CHANGING BOX.

SPECIFICATION forming part of Letters Patent No. 727,977, dated May 12, 1903.

Application filed February 20, 1903. Serial No. 144,227. (No model.)

To all whom it may concern:

Be it known that we, RICHARD K. LE BLOND and WILLIAM F. GROENE, citizens of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Speed-Changing Boxes, of which the following is a specification.

The invention to be hereinafter described relates to speed-changing boxes—that is, devices for transmitting different speeds—which may be employed generally in any machine where it is desired that certain mechanism shall be driven at one speed under certain conditions and other speeds under certain other conditions; and the object of the present invention, stated generally, is to improve prior structures of this general type and to provide a speed-changing box of simple construction which at the same time will be effective and reliable in operation; and with these general objects in view the invention consists of the parts and combinations, as will hereinafter be fully described and then definitely pointed out in the claims.

In the drawings, Figure 1 is a front view of a device embodying the present invention, parts being broken away and others shown in the section to more clearly disclose the arrangement. Fig. 2 is a section of the device on line $x\,x$, Fig. 1; and Fig. 3 is a plan view thereof, the top of the casing being broken away to disclose the parts below. Fig. 4 is a partial sectional plan view of modification.

In the drawings, A represents any usual style or general character of casing adapted for connection with the machine to which the device is to be applied by means of usual fastenings passing through holes $a\,a$.

Mounted in suitable bearings—as, for instance, bearings $a'\,a'$ in the sides of the casing A, Fig. 3—is the shaft A′, which may be driven from any usual source of power—as, for instance, the wheel A^3, connected to a desirable source of motion—and this shaft will be hereinafter referred to as the "driver-shaft" for the purpose of identification.

Secured to the driver-shaft A′, so as to rotate therewith, is the gear A^2, which may be identified as the "driver-gear." It will be noted that the driver-gear A^2 has an extended face for a purpose that will hereinafter appear.

Mounted in suitable bearings—as, for instance, the bearings $b\,b$ in the sides of the casing A, Fig. 1—is the shaft B, which, as it driven through the means hereinafter to be described, may for identification be termed the "driven" shaft. The terms "driver" and "driven" shaft as herein used are merely relative and are used for identification only, as it is obvious that motion through these shafts might be transmitted in the opposite direction, in which case shaft B would become the driver and shaft A′ the driven shaft.

Secured to the driven shaft B is a gear b', from which motion of the shaft may be taken in any usual manner. Likewise secured to the driven shaft B, as by the usual key connection, are the gears C, C′, and C^2, the said gears being of different diameters or sizes. These gears are arranged on the driven shaft B, with the smallest or gear of least diameter disposed between the other two gears and separated from each of said other gears by suitable separating means—as, for instance, the elongated hubs $c'\,c^2$ of the gears C′ C^2, respectively—and for a purpose that will hereinafter appear. The bearings $b\,b$ in the casing A may also be elongated, so that the said gears C C′ C^2 may all be held in the desired fixed relation, as shown.

Disposed intermediate the driver-shaft A′ and driven shaft B is the shaft D, having an eccentric portion D′ and here termed the "eccentric transmitting-shaft." Upon the eccentric portion D′ of the shaft D there is loosely mounted the gears E, E′, and E^2, said gears being suitably connected in any usual manner, as by keys $e\,e$ or otherwise, so as to rotate in unison and together on the eccentric portion D′ of the shaft. The gears E, E′, and E^2 are held in proper relation upon the shaft by the collars G and set-screws $g\,g$ in usual manner. The end portions of the eccentric transmitting-shaft D are suitably mounted in bearings, as $d\,d$, formed in the sides of the casing A, so that said shaft may be moved longitudinally.

Projecting from one of the collars G or otherwise fixed to the shaft D is the handle H, which extends through suitable slots or

openings *k k* in the casing A, whereby the said shaft may be rotated in its bearings and also be moved lengthwise, as will be apparent.

From the construction shown and thus described it will be apparent that the middle or center gear E on the eccentric transmitting-shaft is larger in diameter than the two side gears with which it is connected and that said large center gear is maintained in mesh with the driver-gear A^2 on the driver-shaft. The said driver-gear A^2 has a broad face, as shown, in order that as gear E on the eccentric transmitting-shaft is moved sidewise by the handle H or otherwise it will remain in mesh with and receive motion from said driver-gear, as will be apparent.

The gears C, C', and C^2 on the driven shaft B are held in separated relation with respect to the smallest gear C in the center and separated a distance from the face of the said smallest gear to permit the entire disengagement of the gear E on the eccentric transmitting-shaft from said center gear C by movement of gear E either to the right or left, said distance of separation being approximately equal to the face width of the gear E. In the drawings, Fig. 1, gear E is shown as in mesh with the small center gear C, and by movement of the gears on the eccentric transmitting-shaft to the right it will be apparent that said gear E will be thrown out of engagement with the small center gear C and rest in the space between it and the next adjacent gear C^2. Such sidewise movement to the right of the gears E E' E^2 on the eccentric transmitting-shaft will at the same time throw the gears E^2 and C^2 into engagement. Likewise movement of the gears on the eccentric transmitting-shaft to the left in Fig. 1 will throw the gear E out of engagement with the small center gear C and will throw into engagement the gears E' and C'. Thus from the construction described it will be seen that the gears on the eccentric transmitting-shaft receive constant motion from the driver-gear A^2 through the large central gear E and that this motion may be transmitted to the driven shaft B to impart varying speeds either through the central gears E C or through the end gears E^2 C^2 or E' C' and that only a slight endwise movement of the eccentric transmitting-shaft is necessary through the handle H to secure this change of speed transmission. When the parts are standing at rest, there would be no practical objection to changing the relative engagement of the gears E E' E^2 and C C' C^2 without first throwing the engaged gears out of mesh; but when the parts are in motion if an attempt were made to change the engaging relations between said gears the said gears will either lock themselves tightly or break the teeth, and to avoid this objection we have therefore mounted the gears E E' E^2 eccentrically upon the shaft D, and we have likewise provided engaging slots *k* for the handle H, which before the gears can be moved sidewise must be thrown upward. This upward movement of the handle H turns the eccentric transmitting-shaft in its bearings, thus first disengaging the teeth of the gears from the driven gears before they can be moved sidewise. The slots *k* in the casing will obviously act as a lock to prevent sidewise movement of the gears E E' E^2 before they are thrown out of engagement with the driven gears.

To change the speed by the device hereinbefore described, it is only necessary to manipulate the handle H by throwing it upward in its slot *k* to disengage the gears E E' E^2 from the driven gears, whereupon the eccentric transmitting-shaft and the gears carried thereby may be moved into a new relation with respect to the driven gears, and then by a downward movement of the handle H the desired gear on the eccentric transmitting-shaft may be thrown into engagement with its appropriate driven gear on the shaft B, and this without stopping the machine. During the movement of the gears on the eccentric transmitting-shaft under manipulation of the handle H the large gear E remains in mesh with the driver-gear A^2, as will be obvious.

While we have described the above specific details as embodying our invention, it will be understood, of course, that such details may be varied and changes made in the size, form, and relation of parts without departing from the spirit of the invention.

In Fig. 1 is shown a bush $d^{\times}$ of a size to permit the ready removal and replacement of the shaft D when assembling the parts or changing size of gears, it being only necessary to remove the bush, which may be of any usual character, whereupon the shaft can be removed and replaced through the bearing *d*.

Fig. 4 shows a modified form of mounting for the eccentric shaft and the gears thereon, in which the shaft D^{10} is provided with a key way or slot d^{10}, with which a suitable key or keys d^{11}, carried by the yoke H^{10}, may engage, the gears E E' E^2 being loosely mounted on the eccentric shaft, as before. By this arrangement the eccentric shaft is not movable longitudinally in changing the relation of the gears thereon with gears C C' C^2; but the gears E, E', and E^2, loosely mounted to turn on the eccentric shaft and disposed between the arms of the yoke H^{10}, are slid lengthwise on the shaft by movement of the yoke. Moreover, the key connection of the yoke with the shaft enables the yoke to turn the eccentric shaft to effect the engagement and disengagement of gears E E' E^2 and gears C C' C^2, as will be obvious.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a speed-changing box, a driver-shaft, a gear on said shaft, a driven shaft, a series of gears of different diameters thereon, an eccentric transmitting-shaft, a series of gears of different diameters on said shaft, said

gears deriving motion from the driver-shaft, and means to turn the eccentric transmitting-shaft to carry one of the gears thereon into and out of engagement with a gear on the driven shaft.

2. In a speed-changing box, a driver-shaft, a gear rotatable therewith, a driven shaft, a series of gears disposed thereon, an eccentric transmitting-shaft, a series of gears of different diameters loosely mounted thereon, one of said gears on the eccentric transmitting-shaft having a constant engagement with the gear on the driver-shaft, means for moving the said series of gears on the eccentric transmitting-shaft sidewise and for turning the eccentric shaft to engage and disengage the gears thereon with the respective gears on the driven shaft.

3. In a speed-changing box, a driver-shaft, a gear mounted thereon to rotate therewith, a driven shaft, a series of gears disposed thereon, an eccentric transmitting-shaft, a series of gears of different diameters loosely mounted to turn thereon, said shaft being movable longitudinally to carry the gears on said shaft into different relation with the gears on the driven shaft, and means for turning the eccentric transmitting-shaft to carry one of the gears thereon into and out of engagement with one of the gears on the driven shaft.

4. In a speed-changing box, the combination of a driver-shaft, a driver-gear rotatable therewith, an eccentric shaft, a series of gears of different diameters loosely mounted thereon, said gears connected to rotate in unison, a driven shaft, a series of gears of different diameters disposed thereon with a space between them equal in width to the face width of the central gear on the eccentric shaft and means for moving said gears on the eccentric shaft into different relations with the gears on the driven shaft and for turning said eccentric shaft to engage and disengage the gears on the eccentric shaft with the gears on the driven shaft.

5. In a speed-changing box, the combination of a driver-shaft, a gear thereon rotatable therewith, a shaft, a series of three gears of different diameters loosely mounted thereon and connected to rotate in unison, a driven shaft, a series of three gears of different diameters secured thereto and disposed with a space between adjacent gears of the series equal to the face width of the central gear of the first-named loosely-mounted series of three gears, means for moving said series of loosely-mounted gears into different relations with the gears on the driven shaft and an eccentric for moving the loosely-mounted series of gears toward and from the gears on the driven shaft.

In testimony whereof we affix our signatures in presence of two witnesses.

RICHARD K. LE BLOND.
WILLIAM F. GROENE.

Witnesses:
WM. PAKREN,
GEO. T. PRITCHARD.