No. 764,746. PATENTED JULY 12, 1904.

A. MILL.

VARIABLE SPEED MECHANISM.

APPLICATION FILED JULY 28, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

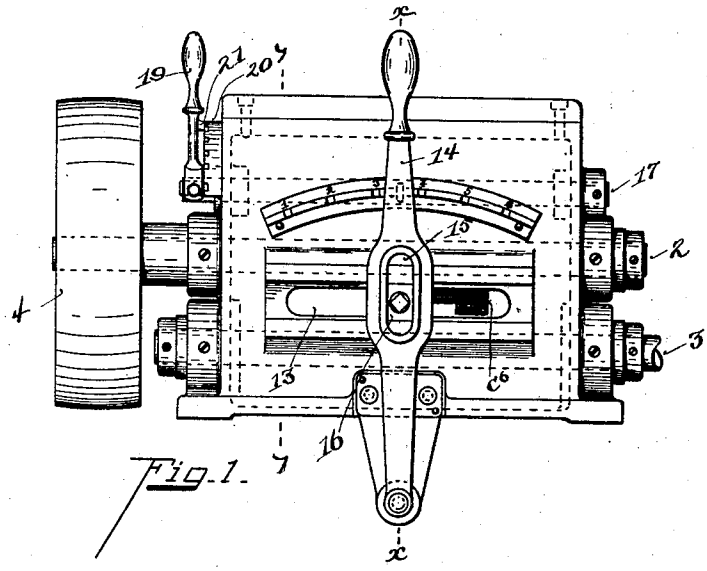


Fig. 1.

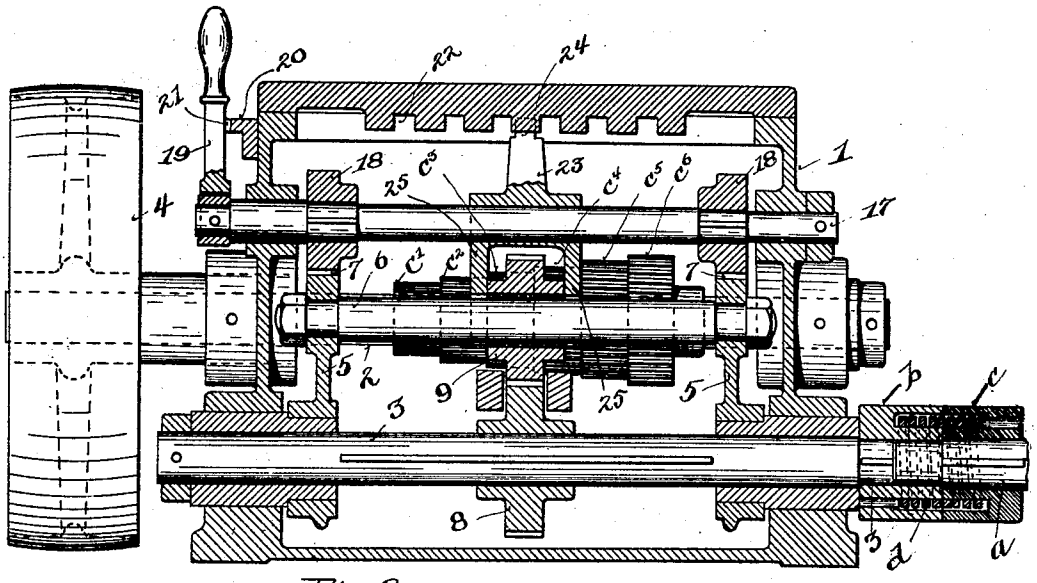


Fig. 2.

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VARIABLE SPEED MECHANISM.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

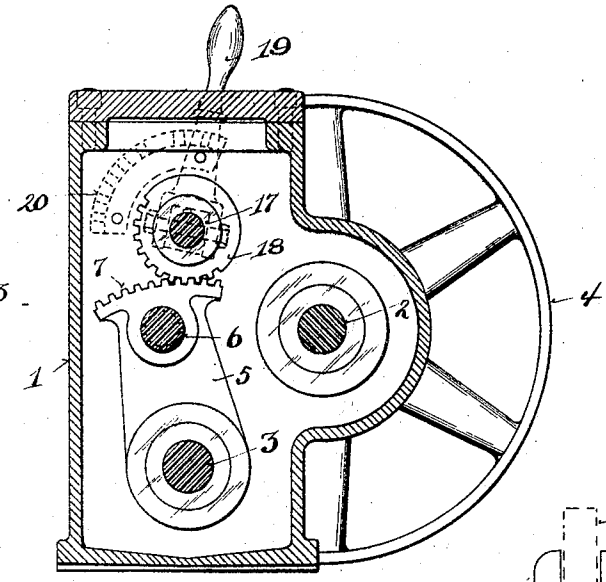


Fig. 5.

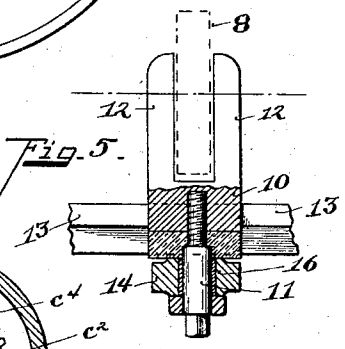
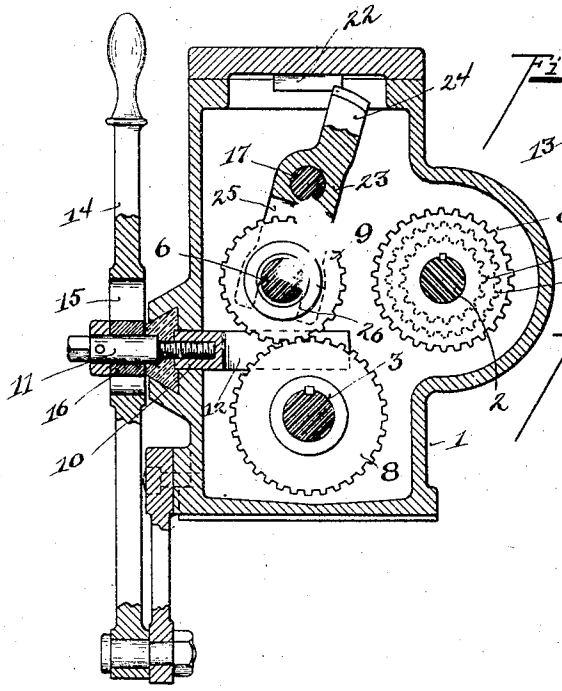


Fig. 4.



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UNITED STATES PATENT OFFICE.

ANTON MILL, OF CINCINNATI, OHIO.

VARIABLE-SPEED MECHANISM.

SPECIFICATION forming part of Letters Patent No. 764,746, dated July 12, 1904.

Application filed July 28, 1903. Serial No. 167,369. (No model.)

To all whom it may concern:

Be it known that I, ANTON MILL, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Variable-Speed Mechanism, of which the following is a specification.

My invention relates to a speed-changing device for transmitting power, and is adapted to be used as a speed-changer for countershafts or as an attachment for lathes, drills, and other machines requiring variable-speed changes.

The object of my invention is to produce a cheap but durable and simple speed-changer that can be easily and quickly manipulated without liability of breaking teeth or causing shocks or jars in the act of throwing in and out of gears.

The features of my invention are more fully set forth in the description of the accompanying drawings, making a part of this specification, in which—

Figure 1 is a front elevation of my speed-changer. Fig. 2 is a central vertical section showing parts in elevation. Fig. 3 is a section on line *y y*, Fig. 1. Fig. 4 is a central vertical section on line *x x*, Fig. 1. Fig. 5 is a detail view of the gear-shifting fork and attachment.

1 represents the casing, in which are journaled the driving-shaft 2 and the driven shaft 3.

4 represents the driving pulley-wheel on shaft 2.

c' c^2 c^3 c^4 c^5 c^6 represent different-diameter gear-wheels, preferably arranged in the form of a cone of gear-wheels on shaft 2. On shaft 3 is pivoted a rocking frame composed of the rocking arms 5 at each end of the casing.

6 represents a rocking or tumbler shaft journaled at each end in the ends of the arms 5 and serving to complete the rocking frame, which rocks on shaft 3 as a center. The arms 5 are provided with segment-teeth 7. Shaft 3 is splined full length, and gear-wheel 8 slides therewith and turns thereon.

9 represents a gear-wheel on tumbling-shaft 6, so as to slide therewith and turn thereon, gear-wheels 8 and 9 being intermeshed.

10 represents a shifting member having the stem 11 and forked arms 12. Gear-wheels 8 and 9 at their line of intermesh lie between the forked arms 12 and are thus held so as to shift in constant alinement. The case is provided with the horizontal slot 13, through which the stem 11 of the shifting member 10 projects.

14 represents a lever pivoted to the outside of the casing and having a longitudinal slot 15. Stem 11 has a boss 16 traveling in slot 15 in the lever 14. It is obvious that by manipulating lever 14 shifting member 10, carrying gear-wheels 8 and 9, may be shifted to selected position opposite any one of the cone gear-wheels, the slot 15 compensating for the arc of the circle in which lever 14 necessarily travels. It is also obvious that when gear-wheel 9 is slid to selected position opposite a cone gear-wheel it may be intermeshed therewith by rocking the rocking frame on its center (shaft 3) toward the cone. The following instrumentalities are provided to rock the said frame. 17 represents a rock-shaft mounted in the casing above the quadrant-frame. At each end of the casing and fixed to shaft 17 are the radial arms 18, having teeth meshing with teeth 7 of the arms 5. One end of rock-shaft 17 projects outside of the casing, and a handle 19 is fixed thereto for rocking shaft 17, thereby rocking arms 18, with shaft 17 as a center, and rocking the rocking frame, with shaft 3 as a center, and so serving to engage and disengage gear-wheel 9 with the cone. The casing on the end is provided with an indented guide-disk 20, lever-handle 19, having a finger 21, registering with said indents. The indents denote the different steps of the members of the cone of gear-wheels. The inside top of the casing is provided with locking detents 22, parallel with rock-shaft 17.

23 represents a latch pivoted on rock-shaft 17 and adapted to slide thereon. The latch has the upwardly-extending finger 24, adapted to engage and disengage the detents 22, and the latch has the downwardly-extending forked arms 25, straddling gear-wheel 9. These forked arms 25 have longitudinal slots 26 straddling shaft 6, the straddle of the gear-wheel causing latch 23 to travel on shaft 17

as gear-wheels 8 9 travel, respectively, on shafts 3 and 6, the longitudinal slots in the forked arms compensating for the arc of the circle in which the tumbling-shaft 6 necessarily moves.

The detents 22 are opposite the members of the cone. If a change is to be made, lever-handle 19 is manipulated to throw back the rocking frame, throwing gear-wheel 9 out of mesh with the cone, and also throwing the finger 24 of latch 23 out of locking engagement with one of the detents 22. Lever 14 is then manipulated to slide gear-wheels 8 and 9 by means of shifting member 10, opposite the selected gear-wheel of the cone, the latch 23 traveling therewith to position opposite the detent belonging to the gear-wheel selected. Lever 19 is then rocked forward until finger 21 enters the detent 20, representing the step of the selected gear-wheel of the cone. This rocking forward of the rocking frame also rocks the finger of latch 23 into the proper detent, and so the gear-wheel 9 is intermeshed with the selected gear-wheel of the cone. The frame is locked in its selected step by finger 21 and detents 20, and the shifting member 10 is locked in selected horizontal position by the finger of latch 23 locking into selected detent 22. Obviously the intermesh of gear-wheel 9 with the selected member of the cone can only be made when the fingers 21 and 24 are opposite the proper notches of detents 20 and 22, respectively. The projecting end of shaft 3 is coupled to shaft *a* by two sleeves *b* and *c*, keyed, respectively, to shafts 3 *a* and joined together by coil-spring *d*. This avoids jar in making speed changes.

The arrangement shown is preferred; but obviously it is only relative and may be reversed without departing from the spirit of this invention. These speeds may be otherwise amplified or compounded as desired.

Having described my invention, I claim—

1. In a variable-speed device, a shaft, different-diameter gear-wheels thereon, a second shaft, rocking arms moving on said second shaft as a center, a tumbler-shaft supported by said arms, slidable intermeshing gears on said second and tumbler shafts, means for shifting said gears, and means for rocking said arms, substantially as described.

2. In a variable-speed device, a shaft, different-diameter gear-wheels thereon, a second shaft, rocking arms moving on said second shaft as a center and movable to and from the first shaft, a tumbler-shaft supported by said arms, means for rocking said arms and shaft, intermeshing gear-wheels on said second and tumbler shafts, means for shifting said gear-wheels on their shafts, and means for locking them in adjusted position, substantially as described.

3. In a variable-speed device, a shaft, different-diameter gear-wheels thereon, a second shaft, rocking arms journaled thereon, a tumbler-shaft journaled in said arms, intermeshing gear-wheels slidable on said second and tumbler shafts, means for rocking said arms and tumbler-shaft, and a shipping-arm engaging said gears for shifting the same, substantially as described.

4. In a variable-speed device, a shaft, different-diameter gear-wheels thereon, a second shaft, rocking arms, a tumbler-shaft journaled therein, intermeshing gear-wheels slidable on said second and tumbler shafts, the tumbler gear-wheel being adapted to intermesh with any of the gear-wheels on the first shaft, when rocked and slid into position, means for rocking said arms and tumbler-shaft, and a shipping-arm engaging said gear-wheels and adapted to slide them in unison on their respective shafts, substantially as described.

5. In a speed-changer a shaft a cone of gear-wheels thereon and a secondary shaft parallel with the cone-shaft, a gear slidable thereon, a rocking tumbler-shaft parallel with and between the cone and the secondary shafts, a slidable gear on the tumbler-shaft, means for moving both gears horizontally coextensively with the length of the cone-gears, and means for oscillating the tumbler-shaft and shipping mechanism for effecting the change of speed, substantially as described.

6. A speed-changer composed of a frame, shaft journaled therein, a cone of gear-wheels thereon, a secondary shaft likewise journaled in said frame parallel with and of equal length of the cone-gear, a tumbler-shaft parallel with and of equal length to the cone-shaft, intermeshing gear-wheels movable laterally on the secondary and tumbler shaft, oscillating journal-supports for the tumbler-shaft, means for positively moving the slidable gears on the tumbler and secondary shaft and means for locking the said tumbler-shaft in its various positions, substantially as described.

7. In a variable-speed device, a casing a first shaft and a second shaft journaled therein, different-diameter gear-wheels fixed on the first shaft, rock-arms journaled at each end on the second shaft, a tumbler-shaft journaled in the ends of the rock-arms, intermeshing gear-wheels slidable on said second and tumbler shafts adapted to be intermeshed with any one of said different-diameter gear-wheels, a shipping-arm projected through the casing and engaging said gear-wheels on the second and tumbler shafts for shifting them in unison thereon, and means for rocking and locking said arms in differents positions relative to the different-diameter gear-wheels, substantially as described.

8. In a variable-speed device, a casing, a first and second shaft journaled therein, different-diameter gear-wheels on the first shaft, rocking arms within the casing, a tumbling-shaft journaled in the ends of said arms, intermeshing gear-wheels fixed to turn with and slide on said tumbling-shaft and said second shaft,

means for sliding said gear-wheels on said shafts, and means for rocking said arms, substantially as described.

9. In a variable-speed device, a casing, a first and second shaft journaled therein, different-diameter gear-wheels on the first shaft, rocking arms at each end of the casing pivoted on said second shaft, a tumbling-shaft journaled in the ends of said rocking arms and constituting therewith a rocking frame, intermeshing gear-wheels fixed to turn with and slide on said tumbling-shaft and said second shaft, a shifting member having forked arms engaging said intermeshing gear-wheels whereby they slide in unison on their shafts, the casing having a slot through which said shifting member projects, and means for rocking the said frame, substantially as described.

10. In a variable-speed device, a casing, a first and second shaft journaled therein, different-diameter gear-wheels on the first shaft, rocking arms at each end of the casing pivoted on said second shaft, a tumbling-shaft journaled in the ends of said arms and constituting therewith a rocking frame, intermeshing gear-wheels fixed to turn with and slide on said tumbling-shaft and said second shaft, a shifting member having forked arms engaging said intermeshing gear-wheels whereby they slide in unison on their shafts, the casing having a slot through which said shifting member projects, a rock-shaft in said casing radial arms fixed thereon, said rocking arms and radial arms having intermeshing teeth, a rocking lever fixed on said rock-shaft, and detents adapted to be engaged by said rock-lever for locking the rocking frame in different steps, substantially as described.

11. In a variable-speed device, a casing, a first and a second shaft journaled therein, different-diameter gear-wheels on the first shaft, rocking arms on the second shaft at each end of the casing, a tumbling-shaft journaled in the ends of said rocking arms and forming a rocking frame, intermeshing gear-wheels on said tumbling-shaft and second shaft adapted to turn therewith and slide thereon, a rock-shaft in the casing, radial arms thereon engaging the rocking arms and adapted to rock the said frame, a handle for said rock-shaft, and means for shifting said intermeshing gear-wheels, substantially as described.

12. In a variable-speed device, a casing, a first and a second shaft, different-diameter gear-wheels on the first shaft, rocking arms pivoted on the second shaft at each end of the casing, a tumbler-shaft journaled in the ends of said arms, intermeshing gear-wheels on said tumbler-shaft and said second shaft, said gear-wheels being adapted to turn with and slide on their said respective shafts, means for shifting the said intermeshing gear-wheels on their said shafts, a rock-shaft in the casing, transmitting devices between the said rock-shaft and rocking arms, a handle for operating said rock-shaft, a latch on said rock-shaft connected so as to slide thereon and rock therewith, connections between the said latch and the said sliding pair of intermeshing gear-wheels, adapted to slide the latch with the gear-wheels, the said casing having locking detents arranged opposite the path of travel of said latch, and alined with the said different-diameter gear-wheels, for locking the said shifting pair of gear-wheels in any selected position, substantially as described.

13. In a variable-speed device, a casing, a shaft, a series of different-diameter gear-wheels thereon, a second shaft, rock-arms movable to and from the first shaft, a tumbler-shaft supported thereby, intermeshing gears on the second and tumbler shafts, means for shifting the same along said shafts, and means for rocking said arms, substantially as described.

14. In a variable-speed device, a casing, a shaft, a series of different-diameter gear-wheels thereon, a second shaft, rock-arms at each end thereof, a tumbler-shaft supported by said rock-arms, intermeshing gear-wheels slidable on said second and tumbler shafts, a shipping-arm for sliding said intermeshing gear-wheels on their shafts, a rock-shaft, transmitting devices between said rock-shaft and the rocking arms carrying the tumbler-shaft, a latch pivoted on the rock-shaft having one end engaging the tumbler-shaft and the slidable gears so as to rock and slide said latch with said tumbler-shaft and its gear-wheel, the casing being provided with detents arranged with respect to the different-diameter gear-wheels on the first shaft, adapted to receive one end of the latch for locking the slidable gear-wheels in different positions, substantially as described.

15. In a variable-speed device, a casing, a first and a second shaft journaled therein, different-diameter gear-wheels on the first shaft, rocking arms on the second shaft at each end of the casing, a tumbling-shaft journaled in the ends of said rocking arms and forming a rocking frame, intermeshing gear-wheels on said tumbling-shaft and second shaft adapted to turn therewith and slide thereon, a rock-shaft in the casing, radial arms thereon engaging the rocking arms and adapted to rock the rocking frame, a handle for said rock-shaft, a shifting member projecting through a horizontal slot in the said casing, said shifting member having forked arms straddling the intermeshing gear-wheels, a lever pivoted to the outside of the casing, having a longitudinal slot in which engages the end of said shifting member projecting through said slot, substantially as described.

16. In a variable-speed device, a casing, a first and second shaft journaled therein, different-diameter gear-wheels on the first shaft, rocking arms pivoted on the second shaft at each end of the casing, a tumbling-shaft journaled in the ends of said arms, a pair of in-

termeshing gear-wheels adapted to turn with and slide on said tumbling-shaft and said second shaft, a shifting member engaging said intermeshing gear-wheels, said casing having a slot through which said shifting member projects, a lever pivoted at the outside of said casing, having a longitudinal slot in which said shifting member engages and means for rocking said tumbler-shaft, substantially as described.

17. In a variable-speed device, a casing, a first shaft, a series of different-diameter gear-wheels thereon, a second shaft, rocking arms thereon at each end and within the casing, a tumbler-shaft supported by said rocking arms, intermeshing gear-wheels on said second and tumbler shafts, arranged to slide opposite the different-diameter gear-wheels, as the tumbler-shaft is rocked into different steps of said different-diameter gear-wheels, a rock-shaft, transmitting devices between the said rock-shaft and rock-arms adapted to rock said tumbler-shaft, a handle for the rock-shaft, means for locking said handle in different positions in the arc of its movement, a shipping-arm projecting through the casing and engaging said sliding intermeshing gear-wheels for shifting them in unison on their shafts, a latch-lever slidably mounted on said rock-shaft, having one end engaging the tumbler-shaft and slidable gears so as to rock and slide therewith respectively, detents in the casing arranged relative to the different-diameter gear-wheels on the first shaft, and a finger on the latch adapted to engage said detents when the tumbler-shaft gear-wheel is intermeshed with a selected gear-wheel on said first shaft, for locking said gear-wheels in train, substantially as described.

In testimony whereof I have hereunto set my hand.

ANTON MILL.

Witnesses:
OLIVER B. KAISER,
LUISE BECK.