No. 776,200. PATENTED NOV. 29, 1904.

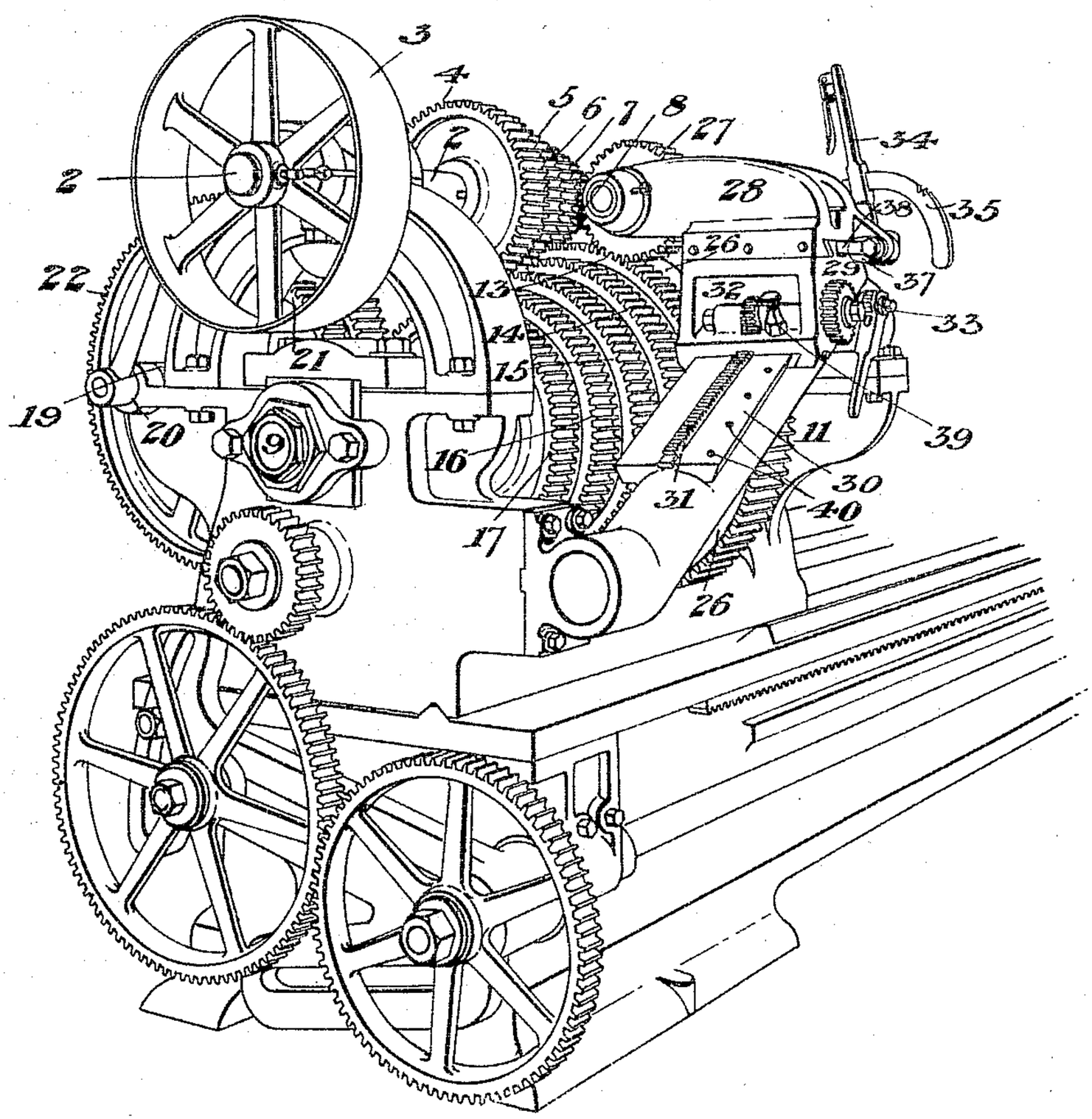
J. T. H. PAUL.

SPEED CHANGING GEAR.

APPLICATION FILED DEC. 31, 1903.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 1.



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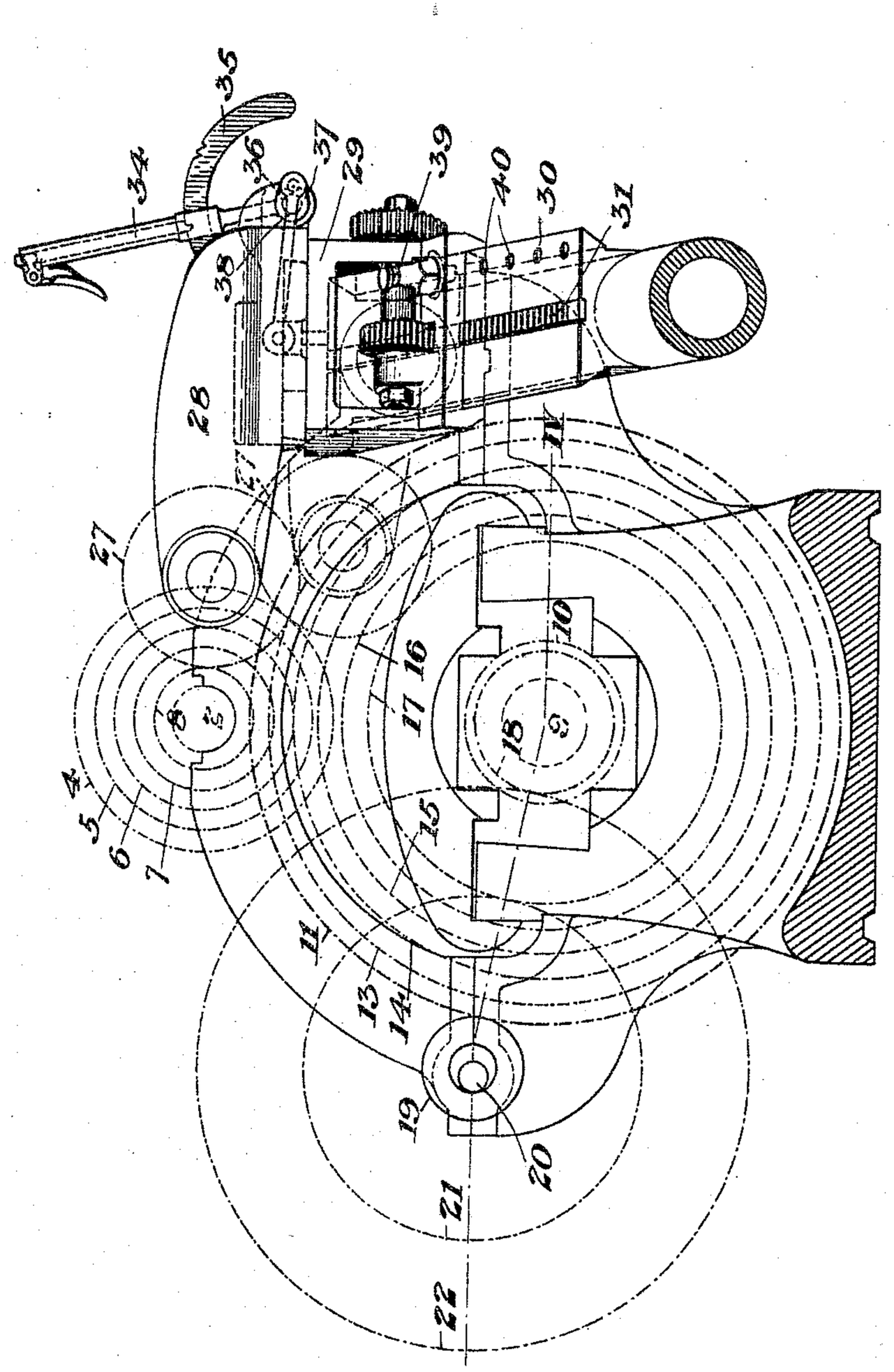
NO MODEL. 4 SHEETS—SHEET 2.

Fig. 2.



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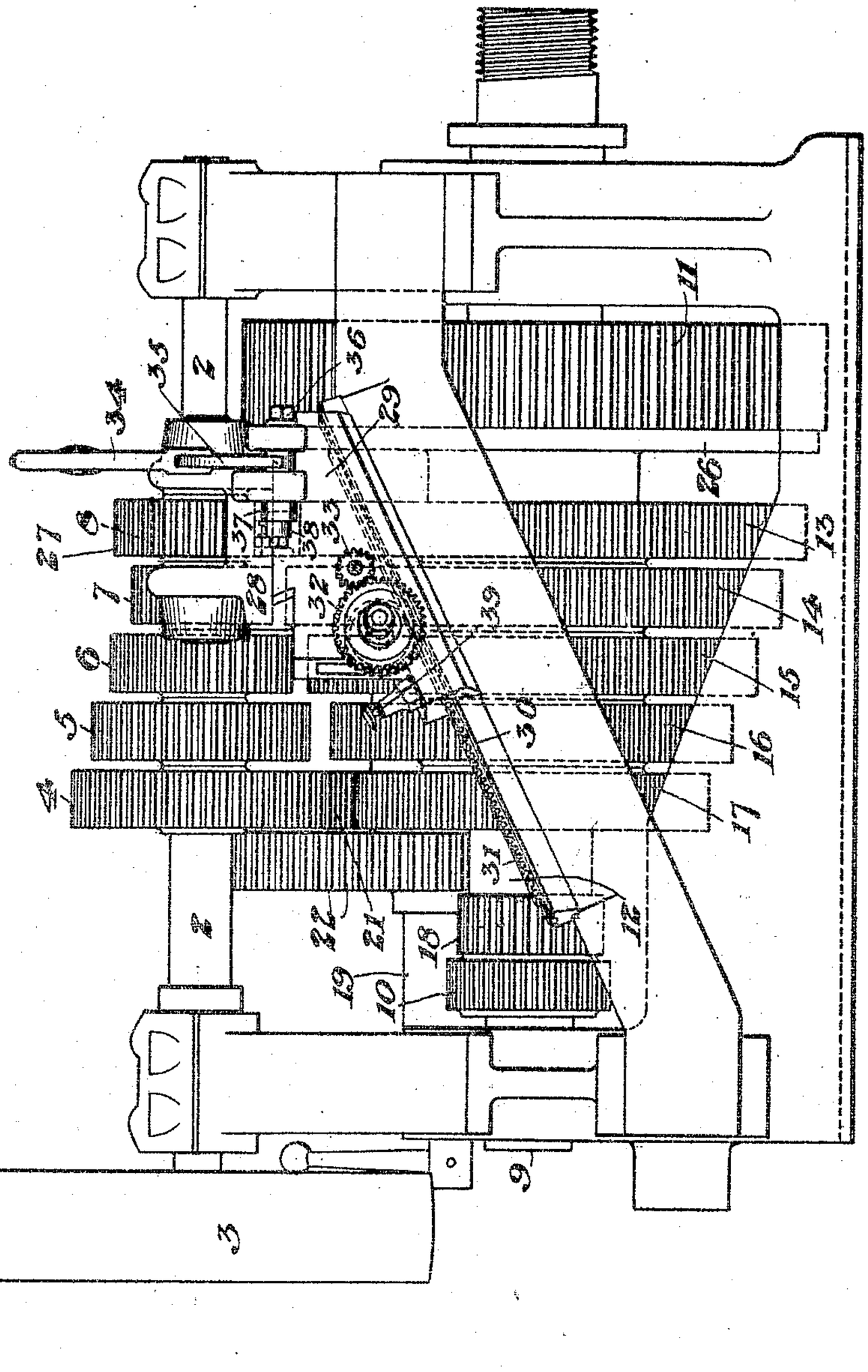
NO MODEL. 4 SHEETS—SHEET 3.

Fig. 3.



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No. 776,200. PATENTED NOV. 29, 1904.

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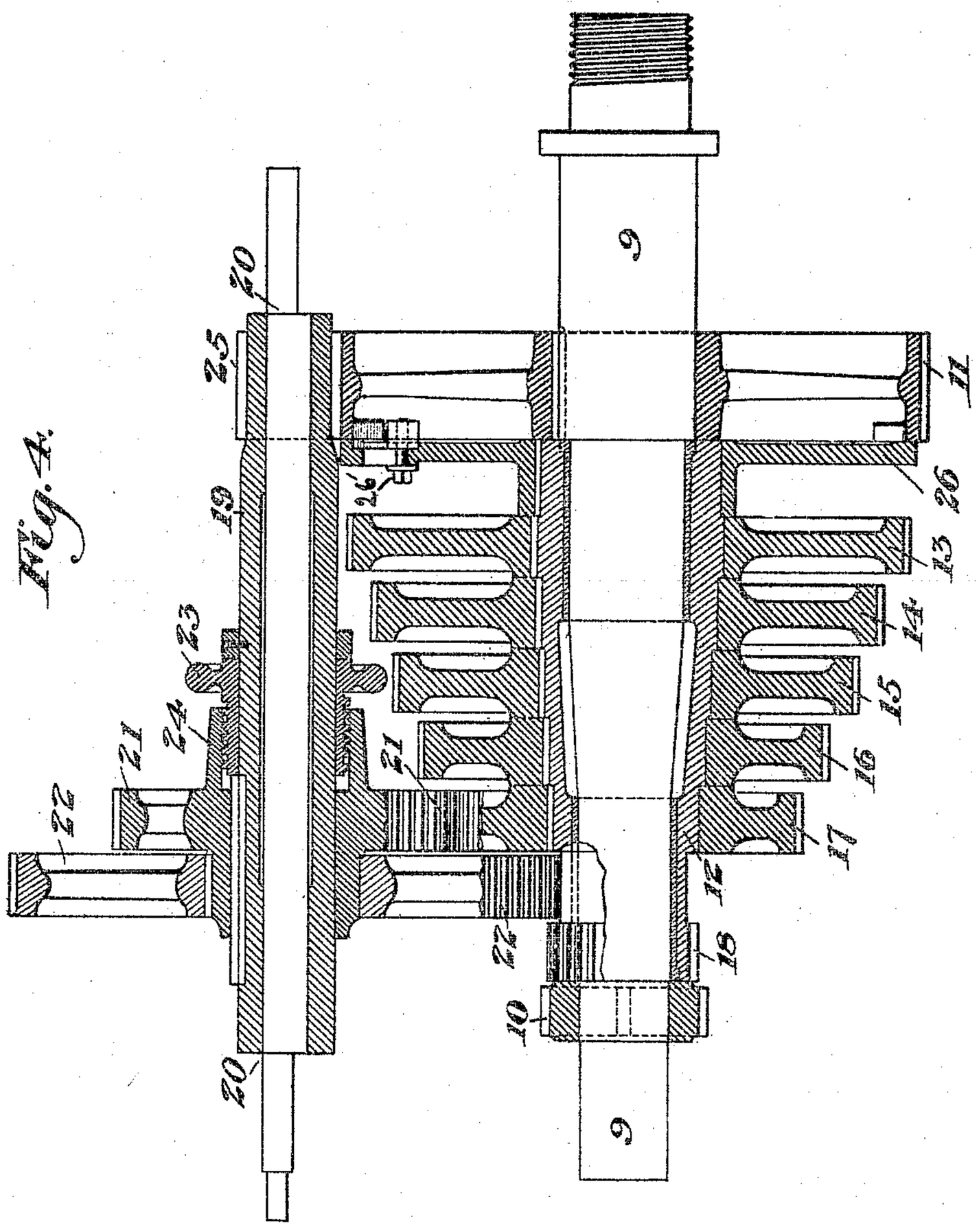
APPLICATION FILED DEC. 31, 1903.

NO MODEL. 4 SHEETS—SHEET 4.

Fig. 4.



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UNITED STATES PATENT OFFICE.

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SPEED-CHANGING GEAR.

SPECIFICATION forming part of Letters Patent No. 776,200, dated November 29, 1904.

Application filed December 31, 1903. Serial No. 187,291. (No model.)

To all whom it may concern:

Be it known that I, JOHN T. H. PAUL, of Newcastle, Lawrence county, Pennsylvania, have invented a new and useful Speed-Changing Gear, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 shows in perspective a lathe provided with my improvement. Fig. 2 is an end elevation showing the various gear-wheels in outline. Fig. 3 is a side elevation, and Fig. 4 is a horizontal section on the line IV IV of Fig. 2.

The purpose of my invention is to replace the complicated mechanisms heretofore commonly employed for changing the gear of lathes or other machine-tools by providing mechanism simple in its nature, enabling the speed of the lathe-spindle to be changed quickly and by the mere shifting of an intermediate pinion. It renders the lathe easy to operate and to keep in order, and by affording a wide range within which the speed of the lathe-spindle may be varied it very greatly increases its efficiency.

In the drawings, 2 represents the power-shaft of the lathe driven by a belt-wheel 3 and carrying a series of pinions 4, 5, 6, 7, and 8 of successively smaller diameters fixed to the shaft. Below the shaft 2 and parallel therewith is the lathe-spindle 9, carrying gear-wheels 10 and 11 keyed thereto and also carrying a loose sleeve 12, carrying a suitable number of gears 13, 14, 15, 16, and 17 of successively smaller diameters and preferably also a gear-wheel 18. The lathe is also preferably provided with the usual back shaft 19, which is journaled on an eccentric shaft 20, Figs. 2 and 4, so that the gear-wheels 21 and 22 can be moved into and out of engagement with the gears on the sleeve 12, after which they can be shifted by a threaded nut 23, which works within a screw-socket 24 on the hub of the pinion 21, the pinion 22 being fixed to and moving longitudinally with the pinion 21. The back shaft 19 also carries a gear-wheel 25, which meshes with the gear 11 on the spindle 9, and the spindle may be connected with the sleeve 12 by means of a locking-disk 26, which is keyed to the sleeve and has locking devices 26′, enabling it to be secured detachably to the face of the gear 11. Normally, however, the gear-wheel 11 is not directly connected with the sleeve 12.

For the purpose of transmitting power from the shaft 2 to the spindle 9 I employ a shifting pinion 27, mounted on a sliding carriage 28, which is adapted to slide in a direction perpendicular to the shaft 2 on a shifting head 29, which is mounted on a slide 30 and is preferably connected therewith by a rack 31 and pinion 32, so that by turning the shaft of the pinion 32 by means of a ratchet-feed 33 or otherwise the head 29 may be shifted back and forth along the slide 30, so as to bring the connecting-gear 27 opposite to the wheels 4 17 or 5 16 or 6 15 or 7 14 or 8 13, as desired.

As shown in Figs. 1 and 3, the slide 30 is inclined both vertically and horizontally relatively to the shaft 2 and spindle 9, so that in whatever position the head 29 may be on said slide the carriage 28 will be directed toward the pitch-lines of the two gear-wheels to which it is opposite and may be moved into mesh with said gear-wheels to connect the same by projecting the carriage 28 on the slide. This motion of the carriage 28 is preferably effected by a lever 34, moving on a locking-quadrant 35, the lever 34 being mounted on a rock-shaft 36, which is journaled in the carriage and carrying a crank 37, connected to the sliding head 29 by link 38. When it is desired to shift the connecting-gear 27 from one pair of gear-wheels on the shaft 2 and spindle 9 to another pair, the connecting-gear 27 is retracted by the lever 34, then is moved longitudinally by motion of the sliding head 29 into proper position, and then is projected into meshing engagement by reverse motion of the lever. A locking-pin 39, adapted to engage with holes or notches 40, secures the sliding head in adjustable position. Accordingly as the connecting-gear 27 is shifted from one pair of gear-wheels on

the shaft 2 and spindle 9 to another pair it will transmit power at a geater or less rate of speed to the sleeve 12, and from the sleeve 12 the power is transmitted to the back shaft 19 through the gear-wheels 17 and 21, or if a greater reduction of speed is desired the wheels 21 and 22 may be shifted, so as to disconnect the wheel 21 and to bring the wheel 22 into mesh with the gear-wheel 18, in which case the power will be transmitted from the sleeve to the back shaft 19 through the gear-wheels 18 and 22. The power is transmitted from the back shaft 19 to the spindle 9 through the gear-wheels 25 and 11. If desired, the eccentric bearings of the shaft 19 enable the gear-wheels 25, 17, and 22 to be disconnected entirely from the gear-wheels on the shaft and spindle, in which case the gear-wheel 11 may be connected directly to the sleeve 12 by means of the locking-disk 26 and the power will be transmitted directly from the sleeve 12 to the spindle 9.

The part of the mechanism above described to which my invention relates consists in the connecting-gear 27, mounted on an inclined slideway and adapted to connect the gear-wheels on the shaft 2 with the adjacent gear-wheels, and thus to enable the speed of transmission to be varied by the mere shifting of the connecting-gear from one pair of said gear-wheels to another. These parts may be varied in form, and the other mechanism which I have described as auxiliary may be changed as desired in order to adapt it to the type of lathe to which my improvement is applied.

The number of pairs of gear-wheels on the shaft 2 and spindle 9 may be greater or less than I show in the drawings, according to the range of speed variation desired for the machine.

Within the scope of my invention as broadly claimed instead of moving the gear-wheel 27 longitudinally with respect to the shaft 2 by means of the sliding head 29 I may employ several connecting gear-wheels 27, one opposite each pair of gear-wheels, and may move one of said connecting gear-wheels as required into connection therewith, the other connecting-gears being retracted from engagement. I may also employ on one of the shafts 2 or 9 a long gear-wheel or gear-wheels of equal diameter, the other shaft having gear-wheels of different diameters, as above described.

I claim—

1. In speed-changing mechanism, a driving and a driven shaft or spindle, gearing of relatively different diameter mounted thereon, a slide, an intermediate gear mounted on said slide, a guide for said slide adapted to rigidly support said intermediate gear, said gear being adapted to mesh with said first-mentioned gearing and to be retracted from meshing engagement therewith; substantially as described.

2. In speed-changing mechanism, a driving-shaft and a driven shaft or spindle, a plurality of gears of different diameters mounted thereon, a slide, an intermediate connecting-gear mounted upon the slide, and a guide for said slide adapted to rigidly support said intermediate gear, said gear being adapted to mesh with corresponding gears on the shafts and to be retracted therefrom; substantially as described.

3. In speed-changing mechanism, a driving-shaft, a driven shaft or spindle, a plurality of gear-wheels mounted thereon, an intermediate connecting-gear adapted to mesh with corresponding gears on said shafts, a slide adapted to support said gear, and an inclined slideway for said slide arranged to permit said gear mounted thereon to be moved into and out of gear with the corresponding gears on said shafts; substantially as described.

4. In speed-changing mechanism, a driving-shaft and a driven shaft or spindle, a plurality of gear-wheels of different diameters on each of said shafts, an intermediate connecting-gear adapted to mesh with corresponding gears on said shaft and to be retracted from engagement therewith, a slide for said connecting-gear, and a slideway for said slide inclined both vertically and laterally along said shafts, said gear being movable on said slideway into opposition with the respective pairs of gear-wheels on said driving and driven shafts; substantially as described.

5. In speed-changing mechanism, a driving-shaft, a driven shaft or spindle, gearing on said shafts, said gearing having relatively different diameters, a longitudinally-extending slideway, a slide therefor, a second slideway on said slide, a second slide adapted to move laterally on said second slideway, and a connecting-gear mounted on this slide adapted to mesh with corresponding gears on the shafts and to be retracted from engagement therewith; substantially as described.

In testimony whereof I have hereunto set my hand.

JOHN T. H. PAUL.

Witnesses:
JOHN MILLER,
H. M. CORWIN.