No. 671,561. Patented Apr. 9, 1901.

E. MARX.

VARIABLE SPEED MECHANISM.

(Application filed Sept. 22, 1900.)

(No Model.) 4 Sheets—Sheet 1.

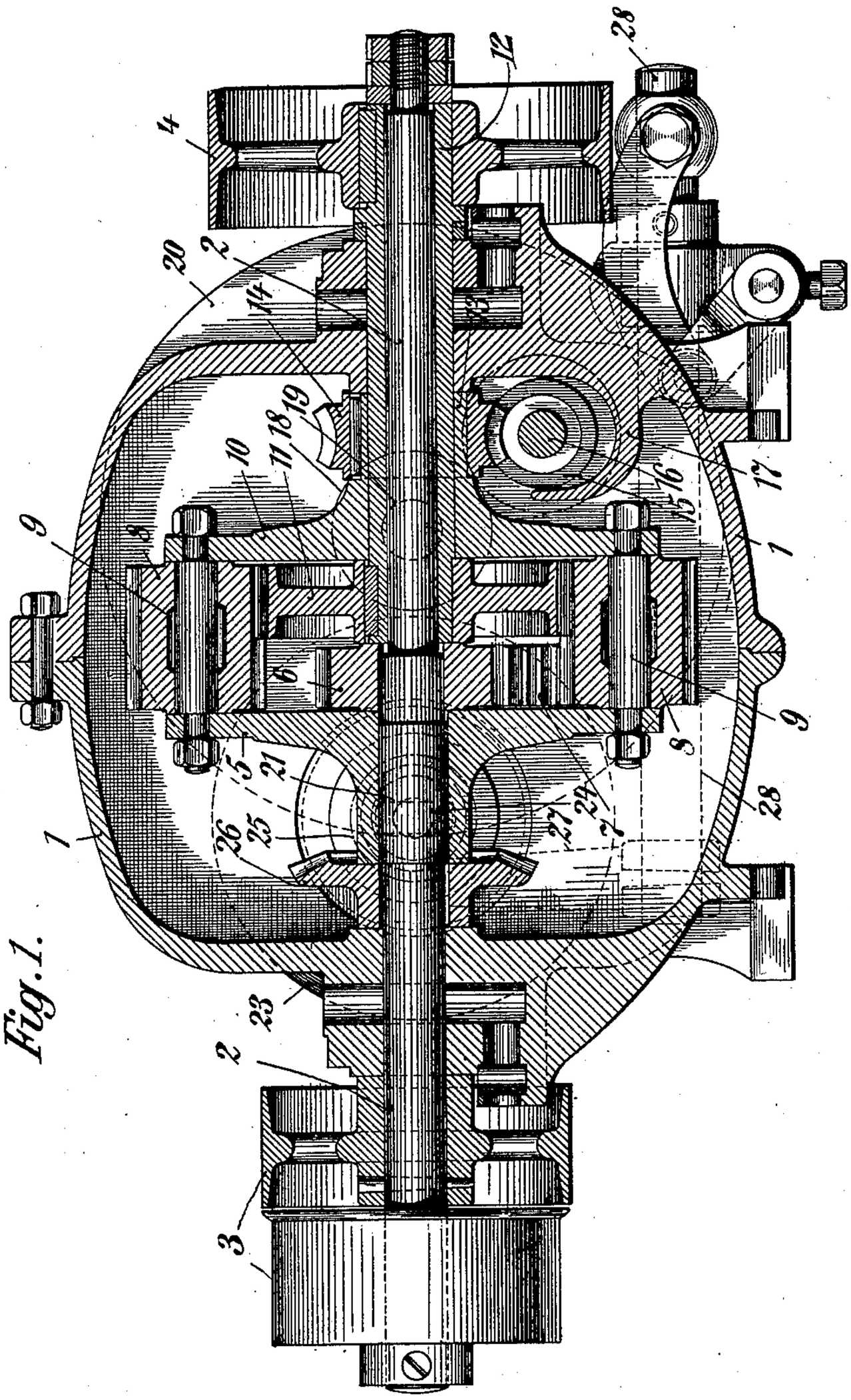

Fig. 1.

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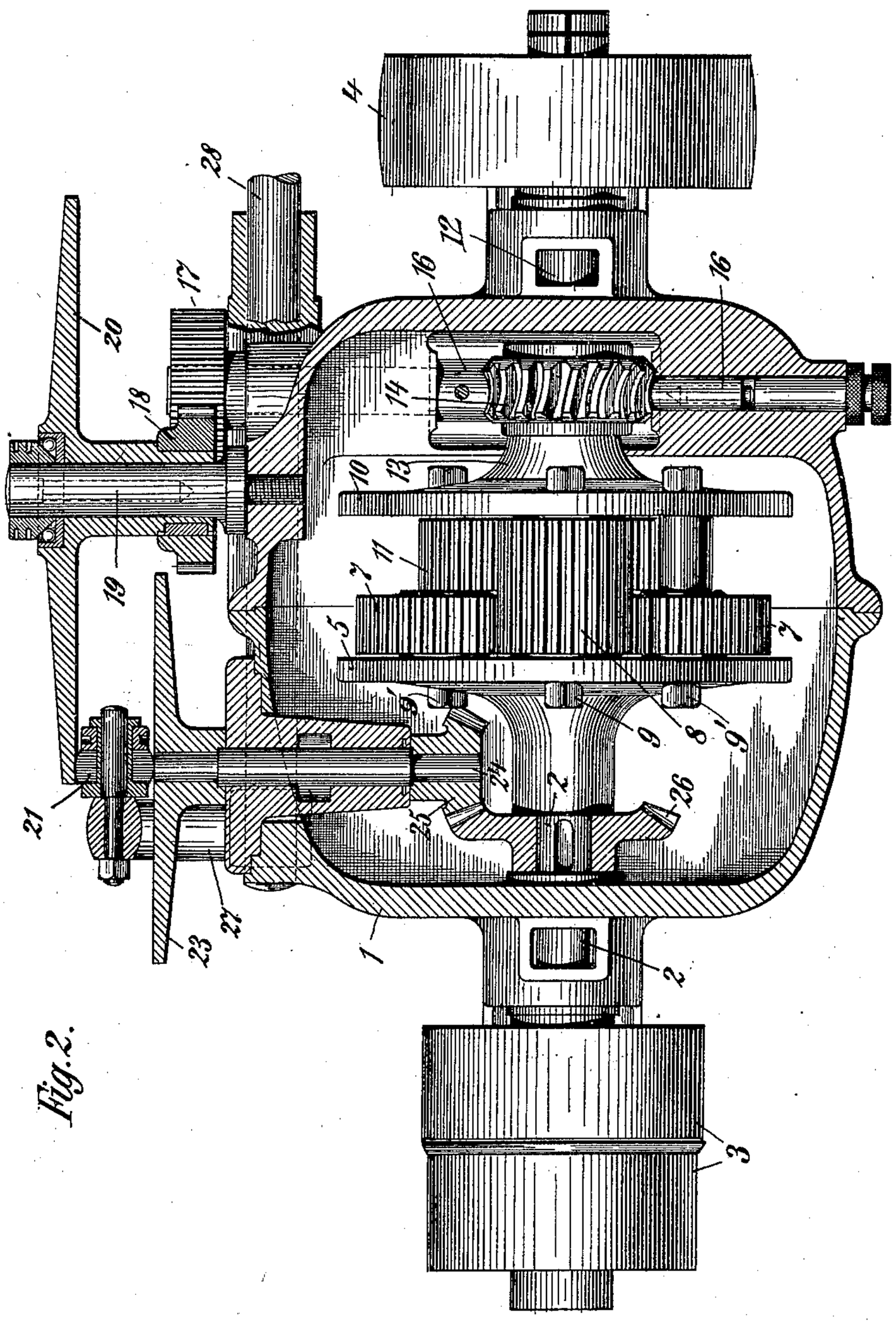

Fig. 2.

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Fig. 3.

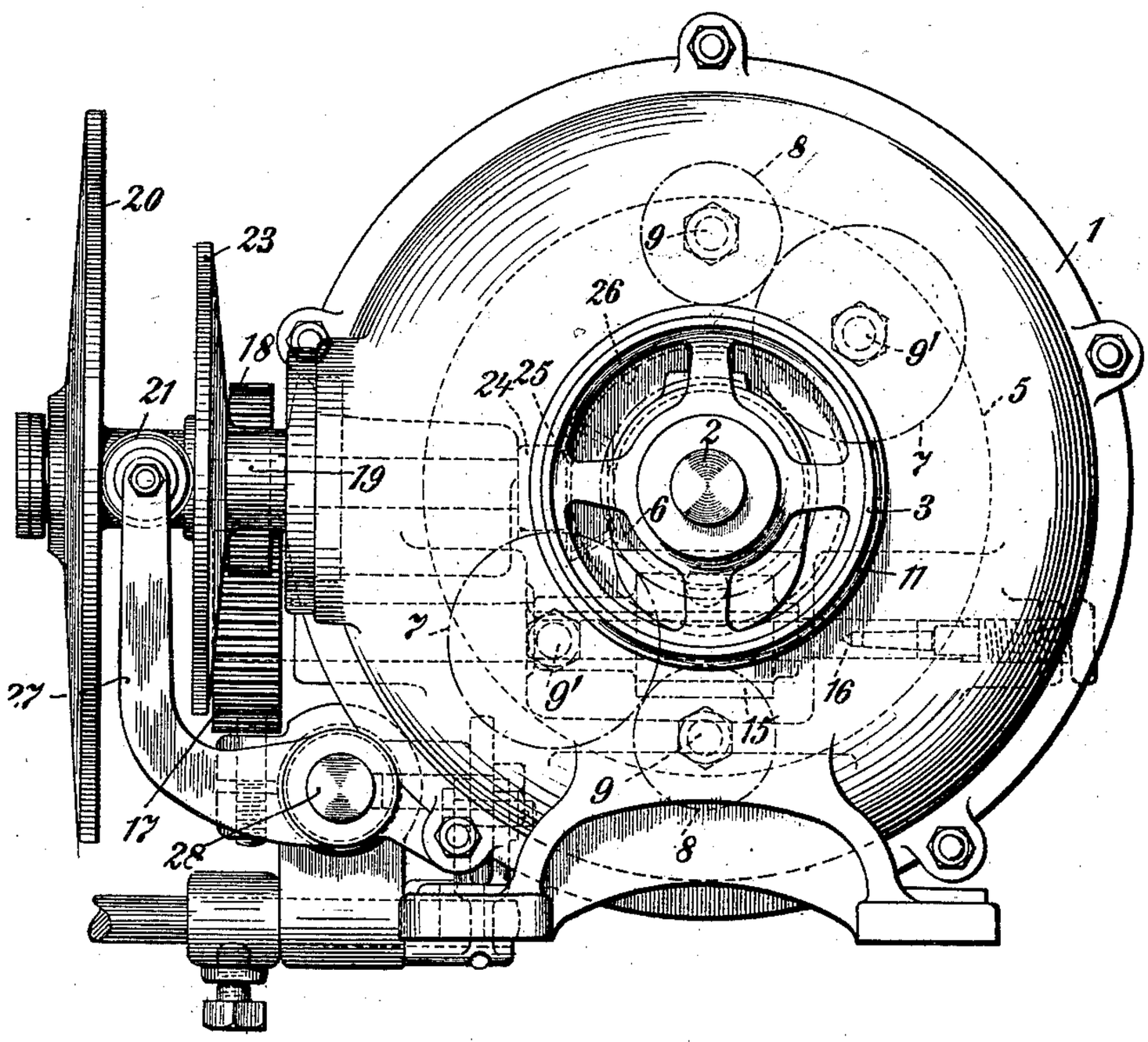

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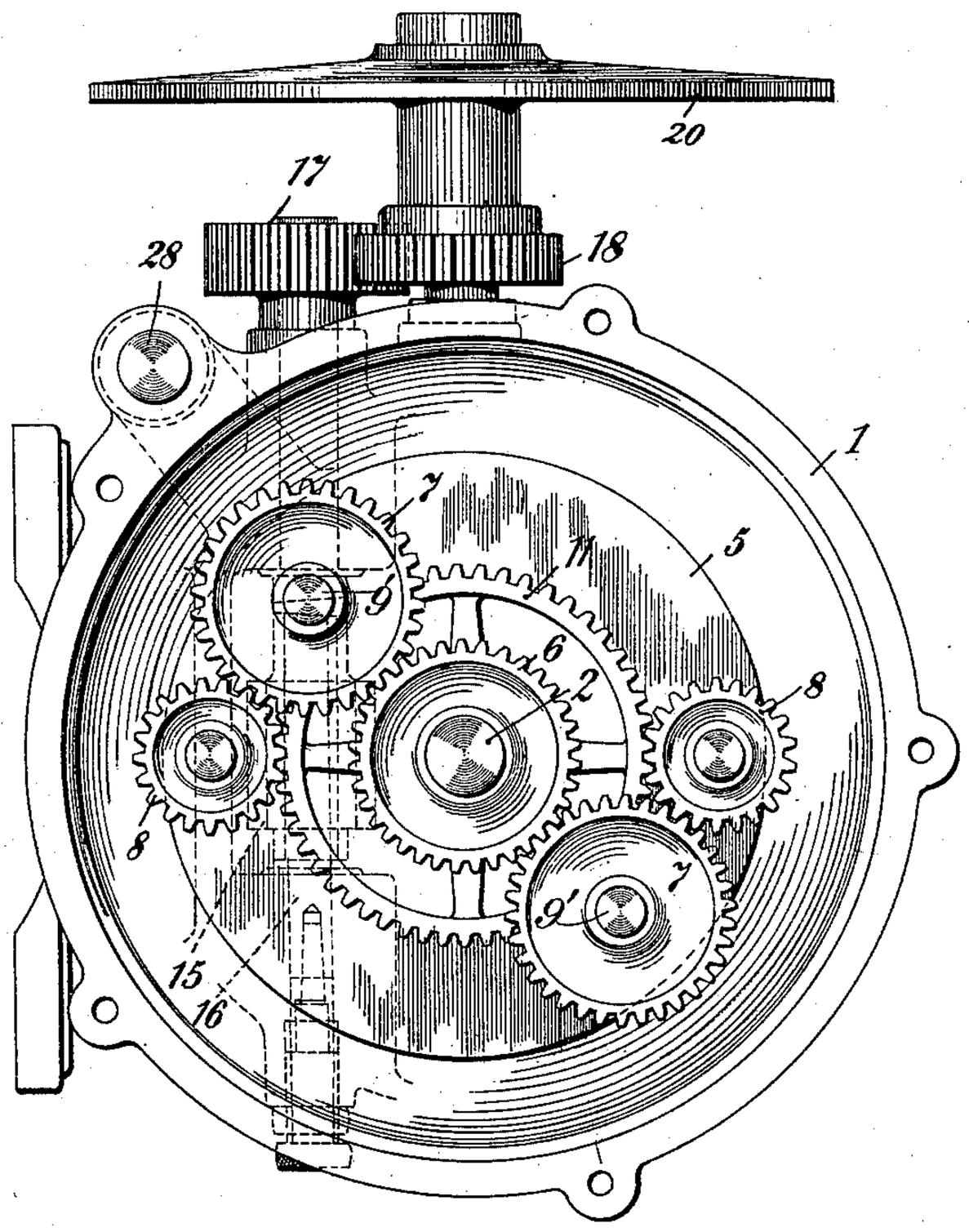
Fig. 4.



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UNITED STATES PATENT OFFICE.

EDUARD MARX, OF DRESDEN-PLAUEN, GERMANY.

VARIABLE-SPEED MECHANISM.

SPECIFICATION forming part of Letters Patent No. 671,561, dated April 9, 1901.

Application filed September 22, 1900. Serial No. 30,851. (No model.)

To all whom it may concern:

Be it known that I, EDUARD MARX, a subject of the King of Saxony, residing at Dresden-Plauen, in the Kingdom of Saxony, German Empire, have invented certain new and useful Improvements in Variable-Speed Mechanism, (for which I have applied for a patent in Germany, dated February 23, 1900,) of which the following is a specification.

This invention is an improved variable-speed mechanism for driving machine-tools—such as lathes, drilling-machines, or for electric motors, motor-cars, &c., and by means thereof the speed of such machines, &c., can be readily regulated.

It consists in the novel construction and combination of parts hereinafter described, and illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section through the mechanism. Fig. 2 is a part horizontal section and part top plan view of the mechanism. Fig. 3 is an end elevation, and Fig. 4 a transverse section.

Similar figures refer to similar parts through the several views.

The device consists, essentially, of mechanism which is inclosed in a casing, connects a driven shaft with a driving-spindle of the apparatus, and is in engagement with a non-reversible gear.

In the casing 1 a shaft 2 is axially journaled, its ends projecting beyond the opposite ends of the casing. On one end of the shaft 2 is secured a fixed and a loose pulley 3, 3′, while on the other end of the shaft 2 is a sleeve 12, which extends through the journal-bearing, and on the outer end of this sleeve the pulley 4 is secured. By means of the fixed pulley 3, hereinafter called the "driven" pulley, power is transmitted to the apparatus, and by means of the pulley 4, hereinafter called the "driving-pulley," power is transferred from the variable-speed mechanism to the parts to be driven.

On the sleeve 12, near its inner end, is loosely mounted a disk 10, directly opposite a similar but opposed disk 5, loosely mounted on shaft 2. On the inner end of sleeve 12 is fixed a gear 11, besides a smaller gear 6, fixed to shaft 2, these gears being between the disks 5 and 10. The gear 11 meshes with small long pinions 8, mounted on pins 9, supported by and between disks 5 and 10, and small pinions 8 also mesh with larger pinions 7, also mounted on pins 9′, between disks 5 and 10, pinions 7 also meshing with gear 6. Thus motion is transmitted from shaft 2 to sleeve 12 by a train of gearing, as described.

All the gears 6, 7, 8, and 11 are arranged between the disks 5 and 10, and on driving the shaft 2 they will be rotated at some definite speed. In order to enable this speed to be altered, the following mechanism is provided: On the hub of the disk 10 is fixed a worm-wheel 14, which meshes with a worm 15 on the spindle 16, which is arranged at an angle to the shaft 2, and carries a gear 17 at its outer end, which meshes with a gear 18, fixed on the hub of a friction-disk 20, journaled on a stub-shaft 19, fixed to the casing. A second friction-disk 23 is secured on a spindle 24, close to and parallel with disk 20, and on the inner end of spindle 24 is a bevel-gear 25, which meshes with the bevel-gear 26, keyed on shaft 2. Motion is transmitted from disk 23 to disk 20 by means of an interposed friction-roller 21, mounted on an arm 27, which can be moved backward or forward on the spindle 28 to adjust the friction-roller 21 radially of the disks 20 and 23.

The casing 1 incloses all parts of the mechanism except the friction-disks.

Any convenient part of a machine, such as the mandrel-stock of a lathe or the bed-plate or wall-plate of a drilling-machine, can be constructed with or as a casing for this variable-speed mechanism, or it may be combined with an electric or other motor—that is, the variable-speed mechanism can be directly attached to the motor-shaft or to that of the machine to be regulated.

The operation of the apparatus is as follows: The rotation of the fixed pulley 3 is transmitted to the shaft 2, so that the gear 6 is rotated and transmits motion through the gears 7, 8, and 11 to the sleeve 12. From the pulley 4 on the sleeve 12 the power can be transmitted to the machine, &c. The disks 5 and 10, which are mounted loosely on shaft 2 and sleeve 12, respectively, are normally prevented from rotating with the shaft or sleeve by the worm 15, which engages with the worm-wheel 14 on the hub of the disk 10; but by

means of the friction-gearing 20, 21, and 23 the disks 5 and 10, which carry the gears 7 and 8, can be rotated with any desired velocity by properly adjusting the position of the friction-roller 21 between the friction-disks 20 and 23. When the friction-roller 21 is at the middle point of the friction-disk 23, no motion is imparted to disk 20, and consequently the disks 5 and 10 are stationary and the sleeve 12 is rotated at the highest velocity. By moving the friction-roller away from the center of the disk 23 and toward the center of disk 20 the disks 5 and 10 will be rotated in a direction opposite to that of the sleeve, and the latter is accordingly driven at a proportionately lower velocity. By increasing the speed of rotation of disk 20 by properly shifting the friction-roller the speed of sleeve 12 and pulley 4 is lessened proportionately, and by decreasing the speed of disk 20 that of said sleeve and pulley is proportionately increased. Thus with a given continuous speed of shaft 2 any desired speed of sleeve 12 and pulley 4 can be obtained by properly adjusting the position of roller 21.

In the drawings I have shown the disk 10 supported upon a sleeve and the shaft 2 extending through and supporting said sleeve. I consider this the preferred construction; but it is perfectly obvious that if the shaft 2 was divided between the gears 6 and 11 the sleeve might be dispensed with and the operation of the parts would be exactly as before.

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

1. In a variable-speed mechanism the combination of a shaft and sleeve, the disks loosely mounted on the adjoining ends of the shaft and sleeve respectively, gears on the inner end of the shaft and sleeve, and intermediate gearing supported by the disks whereby motion is transmitted from the shaft to the sleeve; with gearing for controlling the rotation of said disks, a friction-disk for actuating said gearing, a second friction-disk, gearing for continuously driving the latter from the shaft, and an adjustable friction-roller between the friction-disks whereby motion may be transmitted from one to the other, all substantially as and for the purpose described.

2. In a variable-speed mechanism, the combination of a shaft and sleeve, disks 5 and 10 mounted on the adjoining ends of the shaft and sleeve, gears 7, 8 mounted on said disks 5 and 10 and meshing with each other, a gear 6 secured on the end of the shaft and meshing with the gears 7, a gear 11 secured to the sleeve and meshing with the gear 8, a worm-wheel 14 secured on the hub of the disk 10, a worm 15 engaging with said worm-wheel 14, a spindle 16 on which the said worm is secured, a friction-disk 20 and gearing for driving spindle 16 therefrom, a friction-roller 21 bearing against the friction-disk 20, a friction-disk 23 secured on a spindle 24, on which disk the friction-roller 21 likewise bears, means to vary the position of the friction-roller relative to the friction-disk, and gearing for driving spindle 24 from the shaft, substantially as and for the purpose set forth.

3. In a variable-speed mechanism, the combination of a shaft and sleeve, disks 5 and 10 mounted on the adjoining ends thereof, pinions 7, 8 supported by the said disks 5 and 10 and meshing with each other, a gear 6 secured on the shaft and meshing with the pinions 7, a gear 11 secured to the sleeve and engaging the pinions 8, two friction-disks 23 and 20, means for driving disk 23 from the shaft, a friction-roller 21 between the said disks 23 and 20, means for altering the position of the roller 21 relative to the disks and always in contact with both of the same, and means to transmit the motion of the disk 20 to the disk 10, substantially as described and for the purpose specified.

In testimony whereof I have hereunto set my hand in the presence of two witnesses.

EDUARD MARX.

Witnesses:

OSWALD SPARKE,

WILHELM REISSIG.