(No Model.) 4 Sheets—Sheet 1.

J. JOHNSTON.

SPEED CHANGING MECHANISM.

No. 371,265. Patented Oct. 11, 1887.

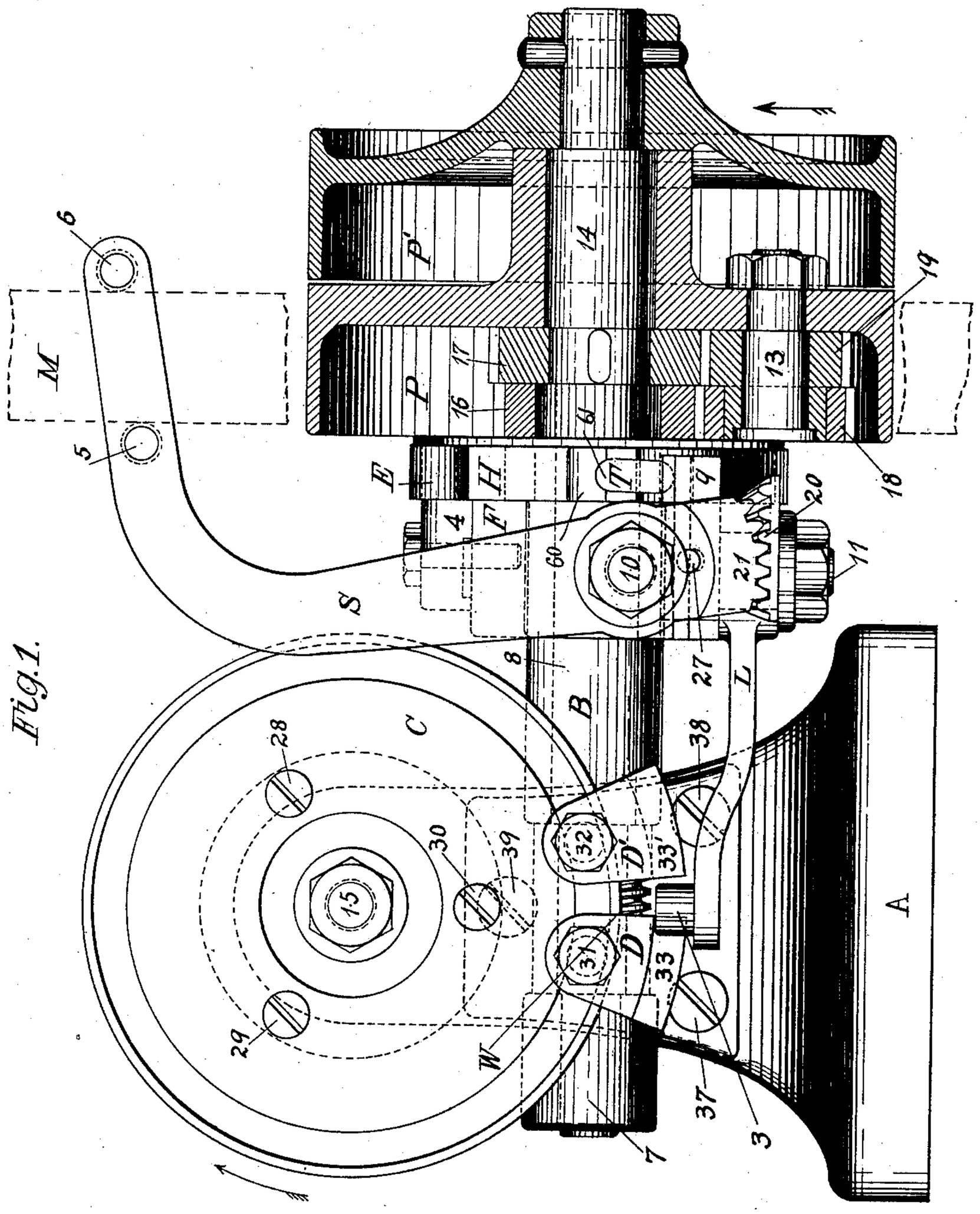

Fig. 1.

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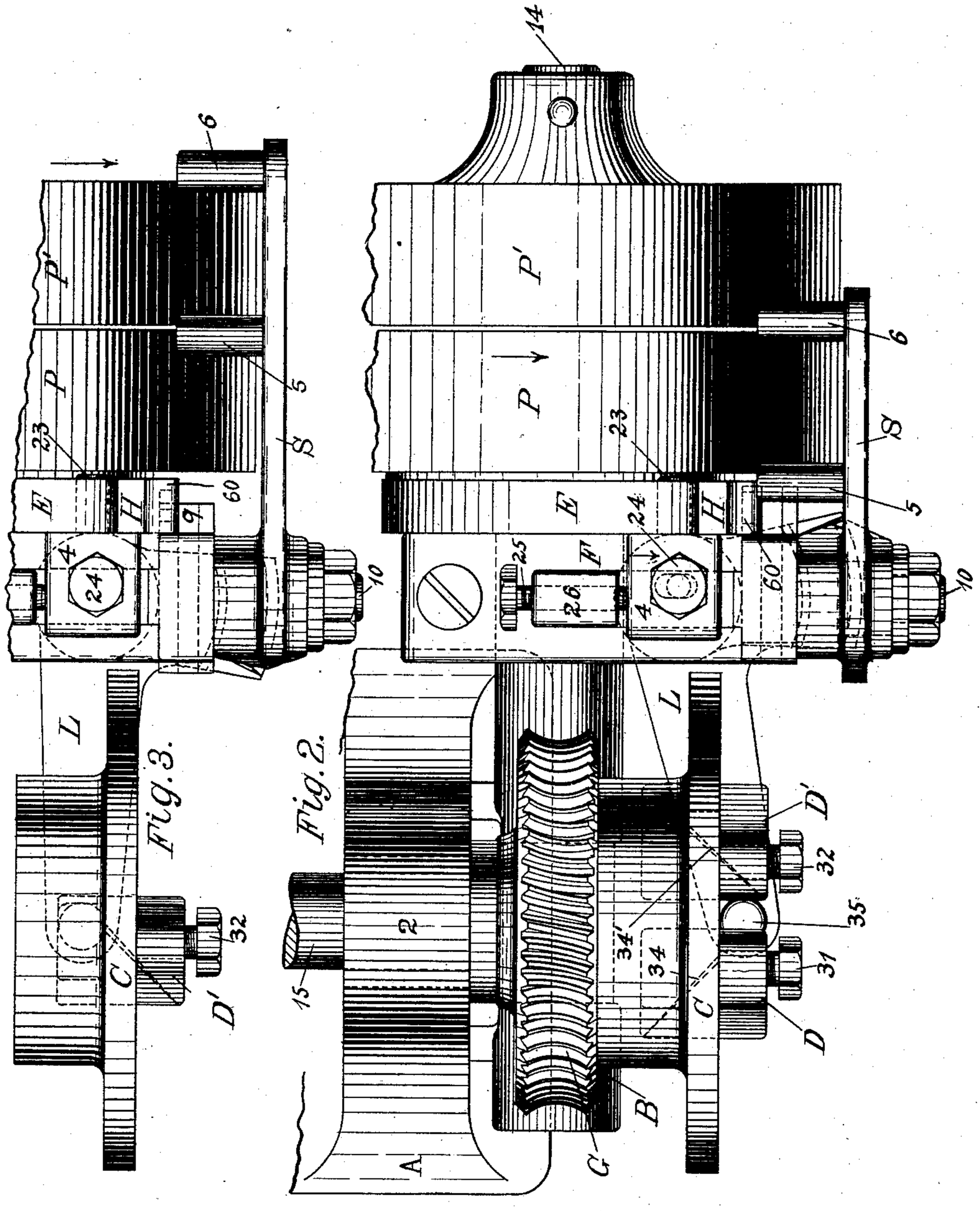

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SPEED CHANGING MECHANISM.

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Fig. 4.

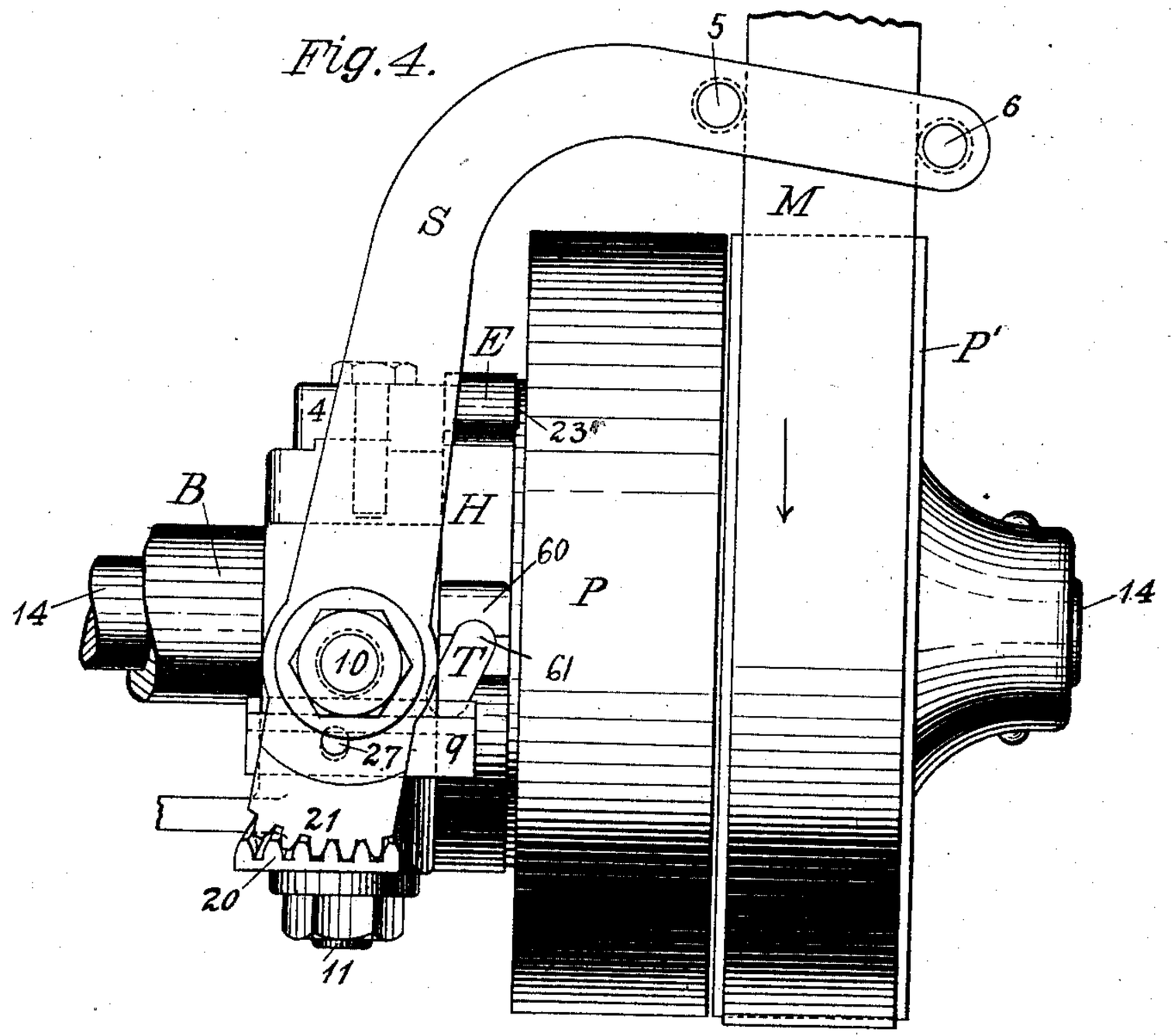
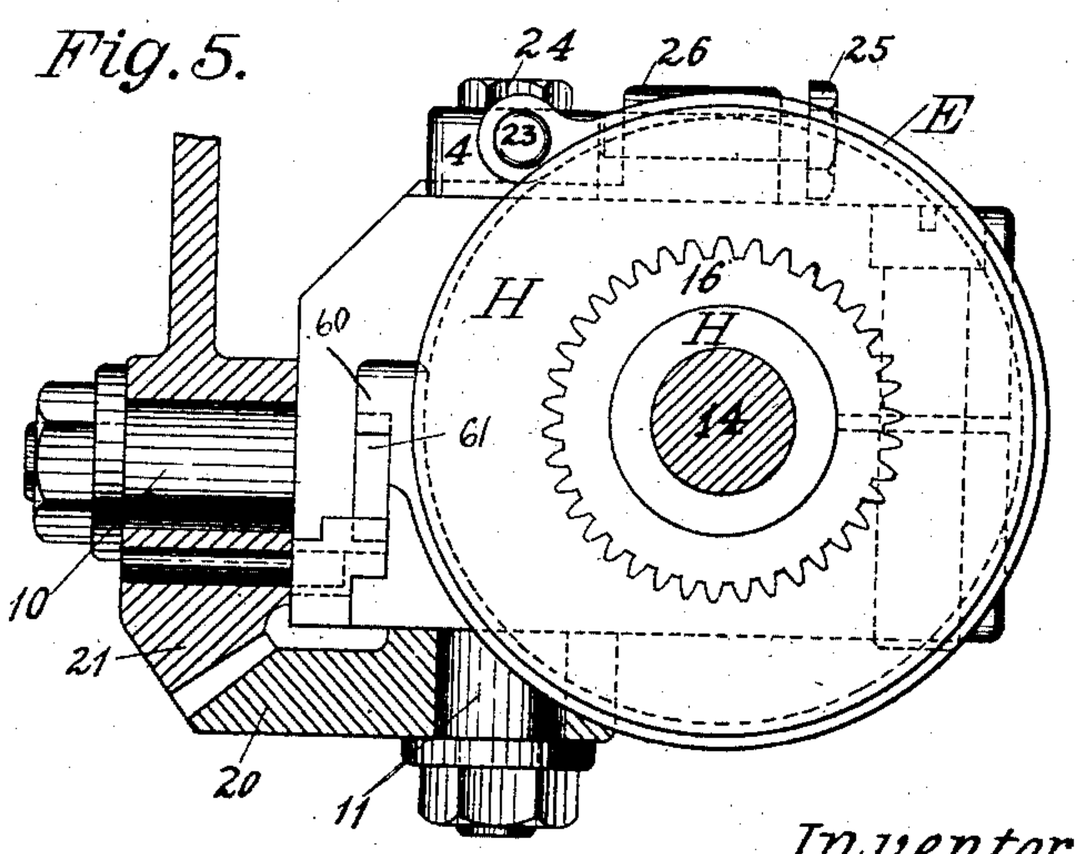


Fig. 5.



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(No Model.)

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SPEED CHANGING MECHANISM.

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Fig. 8.

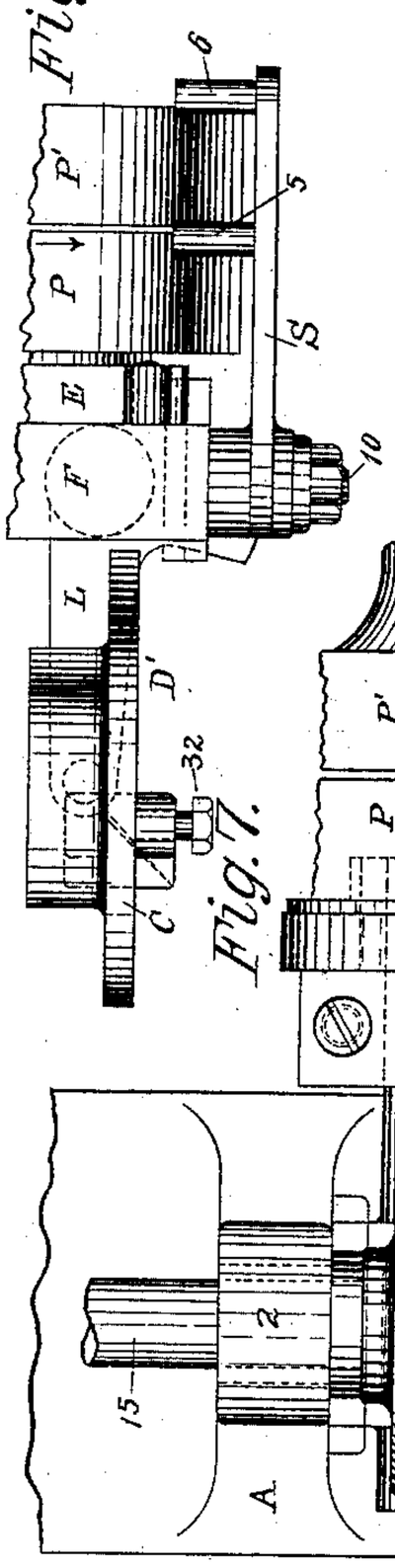


Fig. 9.

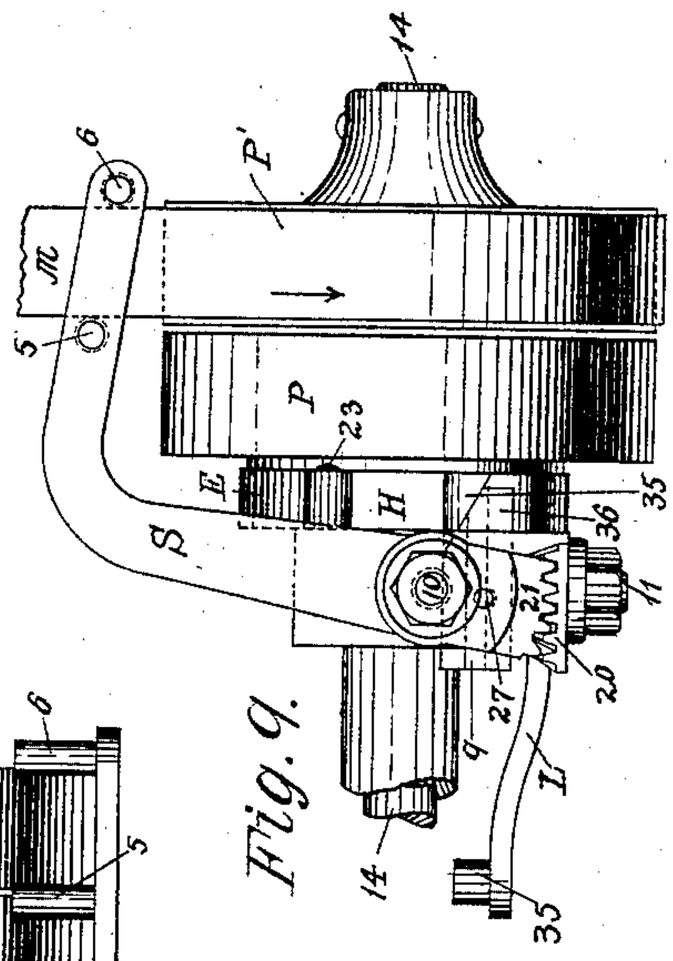


Fig. 10.

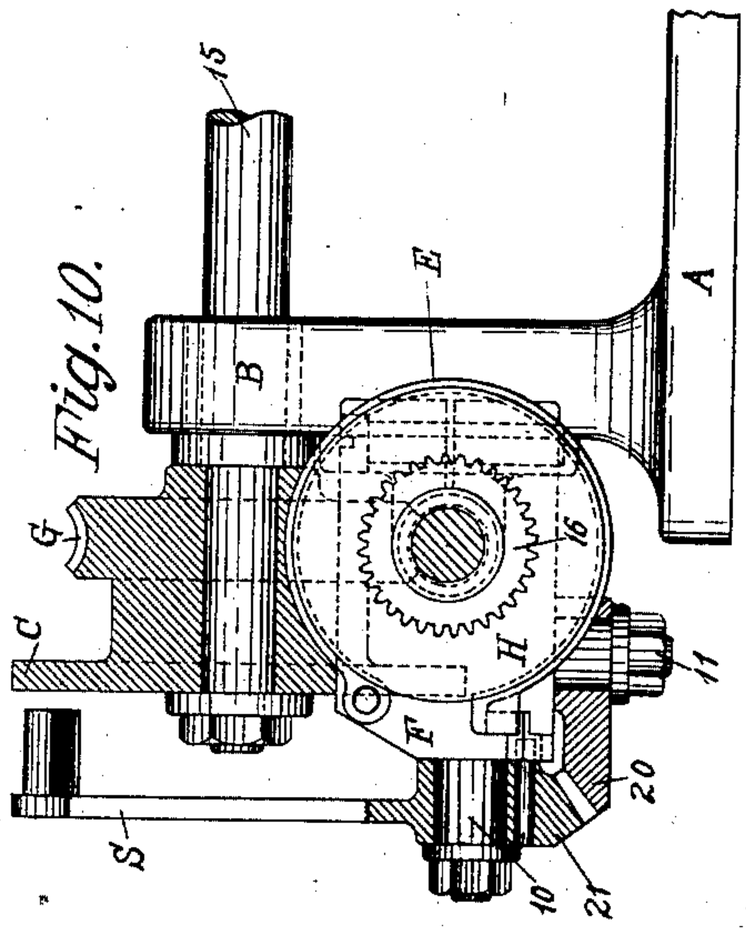


Fig. 7.

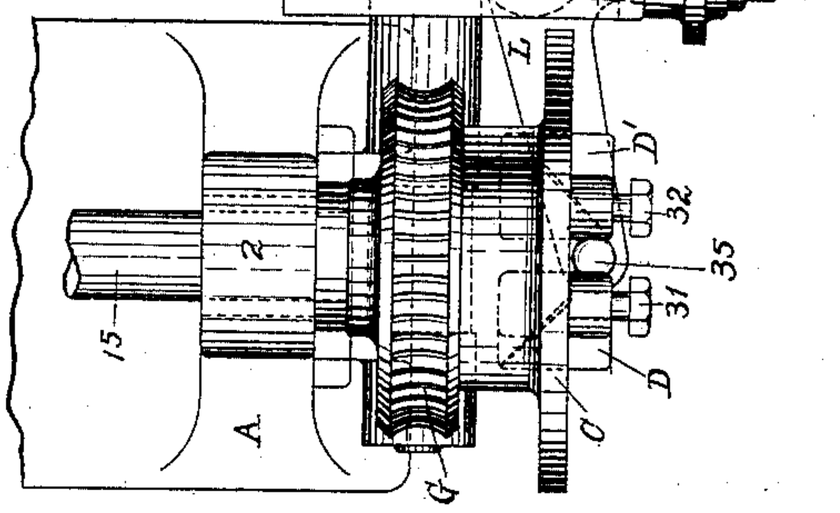
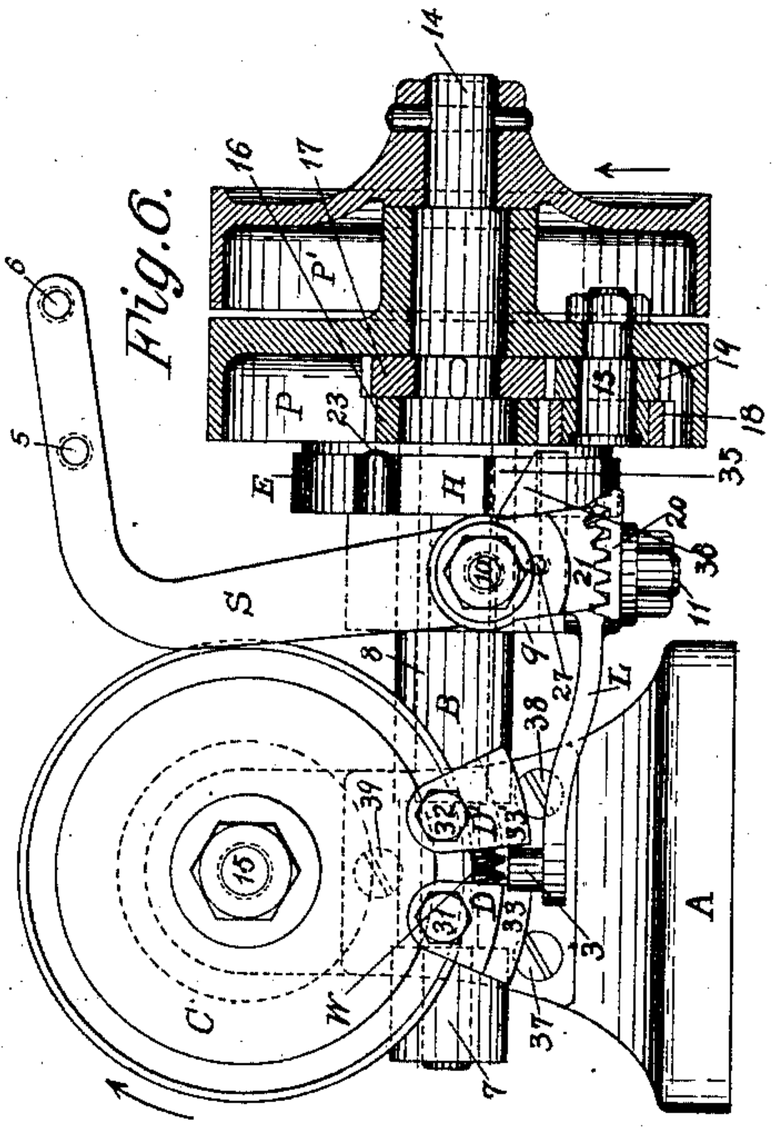


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOHN JOHNSTON, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE HARTFORD MACHINE SCREW COMPANY, OF SAME PLACE.

SPEED-CHANGING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 371,265, dated October 11, 1887.

Application filed May 26, 1887. Serial No. 239,479. (No model.)

To all whom it may concern:

Be it known that I, JOHN JOHNSTON, a subject of the Queen of Great Britain, and now residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Speed-Changing Mechanisms, of which the following is a specification.

This invention relates to that class of machines in which there is a shaft having at one time one speed and at another time a different speed.

The invention has for its object to furnish an automatic mechanism for so operating the cam-shaft of automatic screw-machines having similar requirements.

To this end the invention consists in the improvements and combinations hereinafter more fully set forth.

In the drawings accompanying and forming a part of this specification, Figure 1 is a front elevation, partially in section, of a speed-changing mechanism embodying my improvement. Fig. 2 is a top view of same. Fig. 3 is a view similar to a part of Fig. 2, showing some of the parts in different positions. Fig. 4 is a view similar to a part of Fig. 1, showing some of the parts in different positions. Fig. 5 is an end elevation of said mechanism partially in section and with some of the parts removed. Fig. 6 is a part elevation, partially in section, showing my improvements in a modified form. Fig. 7 is a top view of the same. Fig. 8 is a view similar to a part of Fig. 7, showing some of the parts in different positions. Fig. 9 is a view similar to a part of Fig. 6, showing some of the parts in different positions. Fig. 10 is an end elevation of said mechanism partially in section and with some of the parts removed.

Similar characters designate like parts in all the figures.

The frame of the mechanism may have any form suitable for carrying the several parts of said mechanism. In the drawings such a frame is designated in a general way by A. It has a bearing, 2, for worm-gear shaft 15, and has attached thereto by screws 37, 38, and 39 the worm-shaft bracket B. Said shaft 15 carries a worm-gear, G, whereby it is driven, and cam-carrier C, which has adjustably fixed thereto suitable belt-shipping cams or dogs, D D′, for operating the belt shipper or shifter S. For this purpose said cams have, respectively, suitable oppositely-disposed cam-faces or inclines, as 33 33′, which act on a pin, 3, fixed on lever L. The bracket B has bearings 7 and 8 for the driving-shaft 14, and a bearing for friction-drum H, to which drum is fixed the driving-gear or sun-wheel 16. Said driving-shaft has thereon a loose pulley, P, and also has fixed thereon the driven sun-wheel 17 and pulley P′. Said bracket B has fixed thereon adjacent to the drum H a block, F, carrying the belt-shifter S and its operating devices, and the friction apparatus for clamping at the proper times the said drum H.

The belt-shifter consists or may consist of an ordinary lever, S, provided with belt-guides 5 and 6 and arranged to swing on stud 10, projecting from block F. Another similar stud, 11, carries the shifter-operating lever L, which has at the outer end thereof a pin or roll, 3, actuated by cams or dogs on the cam-carrier C. Said lever L has thereon, as shown in the drawings, a segment of a gear, 20, which meshes with another similar segment, 21, on the lever S. By this or other equivalent means a lateral horizontal movement of said lever L, in its own plane, acts to impart a corresponding movement to the belt-shifter in another plane from its position in Figs. 1 and 2 to its position in Figs. 3 and 4, and vice versa.

The friction-strap E, surrounding the drum H, is fixed at one end to the block F by some convenient means. As shown in the drawings, said strap is connected to a pin, 23, projecting from the adjustable block 4, this block being secured to the block F by binding-screw 24, and adjusted thereon by means of screw 25, working in a projection, 26, on said block F. The strap E is operated (to clamp drum H) from shifter S through the pin 27, toggle-slide 9, driven by said pin, and a toggle, T, one end of which toggle, 61, fits in a socket in the movable end 60 of said strap, and the opposite end of which fits in a corresponding socket in said slide 9. Shaft 14 is driven by pulley P, when drum H and gear 16 are held at rest, by strap E, through an ordinary sun-and-planet movement consisting of the train of gears 16, 18, 19, and 17. The gears or planet-wheels 18 and 19, unless formed integral, are rigidly se-

cured to one another and turn together on stud 13 in pulley P. Gear 16 is the driving sun-wheel, and gear 17 is the driven sun-wheel, and is fixed to shaft 14. Cam-carrier C is or may be fastened to worm-gear G by screws 28 29 30, or it may be otherwise secured to shaft 15. The cams D D′, whose inclined faces 33 and 33′, respectively, are shown best by dotted lines at 34 and 34′, respectively, in Fig. 2, are adjustably fixed to said cam-carrier by the usual set-screws, 31 32.

The screw 25, projection 26, adjustable block 4, and screw 24 are provided as means to adjust the tension of strap E on drum H. By turning the screw 25 in the proper direction the block 4 is moved in the direction of the arrow shown thereon, (see Fig. 2,) and the tension of strap E on drum H is increased. By turning said screw in a reversed direction said block is allowed to move in a direction opposite to that shown by said arrow, thereby decreasing the tension of strap E on drum H. Screw 24 is to hold fast block 4 after this has been properly adjusted.

The operation of my improved mechanism, as thus constructed, is as follows: The parts of the mechanism being at rest about as shown in Figs. 3 and 4, with the shifter-lever L in its rear position behind cam D′, the strap E, slack on drum H, and shifter S holding the belt on pulley P′, said pulley is started by the belt M in the direction shown by the arrow in Fig. 3. Said pulley being fast to shaft 14, said shaft (carrying worm W) is thus driven in the same direction and at the same angular velocity as said pulley, thus imparting to worm-gear G and cam-carrier C motion in the direction shown by the arrow adjacent thereto in Fig. 1. The motions of the parts thus started will continue unaltered until cam D, in its revolution about axis 15, comes in contact with pin 3 on lever L, thereby moving said lever to its forward position and shifter S to the position shown in Figs. 1 and 2. Said shifter carries belt M from pulley P′ over onto pulley P, at the same time driving forward slide 9 and through toggle T, thereby closing up strap E on drum H, and thus firmly clamping this against rotation. The driving-gear 16 being thereby held fast, the planet-wheels 18 and 19 act to drive forward shaft 14, through the sun-wheel 17, fixed thereon, at a reduced speed, which speed depends upon the particular proportions of the several gears of the train. These proportions are to be made suitable to the speed required. The parts will now continue their motions, under the last-described conditions, until the lever L is thrown back by cam D′ to the position shown in Figs. 3 and 4, at which time all the parts of the mechanism will have been returned to their original positions, ready for a repetition of the whole series of operations.

A modified form of my improvement is shown in Figs. 6 to 10, inclusive. Here the strap E is operated through the wedge or inclined face 35 on said strap and the wedge 36 on slide 9. In this modified form said strap is shown without any means of adjusting its tension, pin 23 being fixed in block F. The same means of adjustment as is shown in Figs. 1 to 5 may be supplied here, if desired.

The operation is as follows: When the shifter S is moved from the position shown in Figs. 6 and 7 to that shown in Figs. 8 and 9, the slide 9 is thrown forward, forcing wedge 36 farther under wedge 35, thereby tightening strap E about drum H. When said shifter is moved from the position shown in Figs. 8 and 9 to that shown in Figs. 6 and 7, the wedge 36 is partially withdrawn from under wedge 35, thereby loosening strap E about drum H, and thus permitting this to revolve freely.

My improvements are especially applicable to automatic screw-machines which are constructed and used for producing the finer grades of screws, studs, and like articles. By its use the cam-shafts of such machines are readily given, without shock or jar, the alternate fast and slow speeds which are now generally employed, and which are considered necessary to a proper performance by the machine of its work.

In practice several pairs of cams D D′ are sometimes employed on the same carrier C, the number being governed by the requirements of the particular machine to which the speed-changing mechanism is applied. In adjusting the mechanism for use the clamp should be set to begin to clamp the driving sun-wheel at a time when the belt M is only partially shifted, so that the belt will for a moment drive both pulleys, and before leaving pulley P′ will be able to continue the movement of shaft 14 through the gearing described. In this respect the use of the toggle-connection is peculiarly advantageous, since, practically, the latter part of the shifter movement does not materially tighten the clamp, so that the drum H may be fastened during the early part of said movement, and this by a gradually-applied force and with great power.

It will be understood that this mechanism is capable of modification in various ways and degrees other than the way described, after the manner of machines in general, and within the scope and limits of my invention.

Having thus described my invention, I claim—

1. The combination, with the driving-shaft, of one pulley fixed on said shaft and a second pulley adapted to turn freely on said shaft, a belt-shipper arranged to shift the driving-belt from one pulley to the other, speed-reducing gearing, substantially as described, connecting the second pulley and said shaft, one part of said gearing being a drum adapted to revolve with and to be clamped against revolving with said shaft, and a friction-clamp arranged to act on said drum and operatively connected with said shipper, whereby the movement of the shipper in one direction clamps and in the reverse direction unclamps said drum, substantially as described.

2. The combination, with the driving-shaft, of a pair of driving-pulleys, one fixed and one loose on said shaft, sun-and-planet gearing connecting the loose pulley and shaft, a clamp arranged to hold and release the driving sun-wheel, a shipper-lever, and connections operatively connecting said lever and clamp through a toggle, all substantially as described.

3. The combination, in mechanism of the class specified, of drum H, strap E, surrounding said drum, the belt-shipper, slide 9, operated from said shipper, and toggle T, resting at one end in said slide and at the other in one end of said strap, all substantially as described.

4. The combination, in mechanism of the class specified, of the driven shaft and the belt-shipping cams carried thereby, the driving-shaft geared to said driven shaft and having the tight and loose pulleys, the sun-and-planet gearing connecting said loose pulley and driving-shaft and having the friction-drum, a friction-strap arranged to clamp and unclamp said drum, the shipper operatively connected to be actuated from said cams, and acting through connections with said strap to clamp and unclamp said drum, all substantially as described, and for the purpose specified.

JOHN JOHNSTON.

Witnesses:
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JAS. W. GREEN.