No. 666,290. Patented Jan. 22, 1901.

S. W. WARDWELL, JR.

MACHINE FOR WINDING HEAVY TWINE.

(Application filed Apr. 21, 1899.)

(No Model.) 6 Sheets—Sheet 1.

Fig. 2.

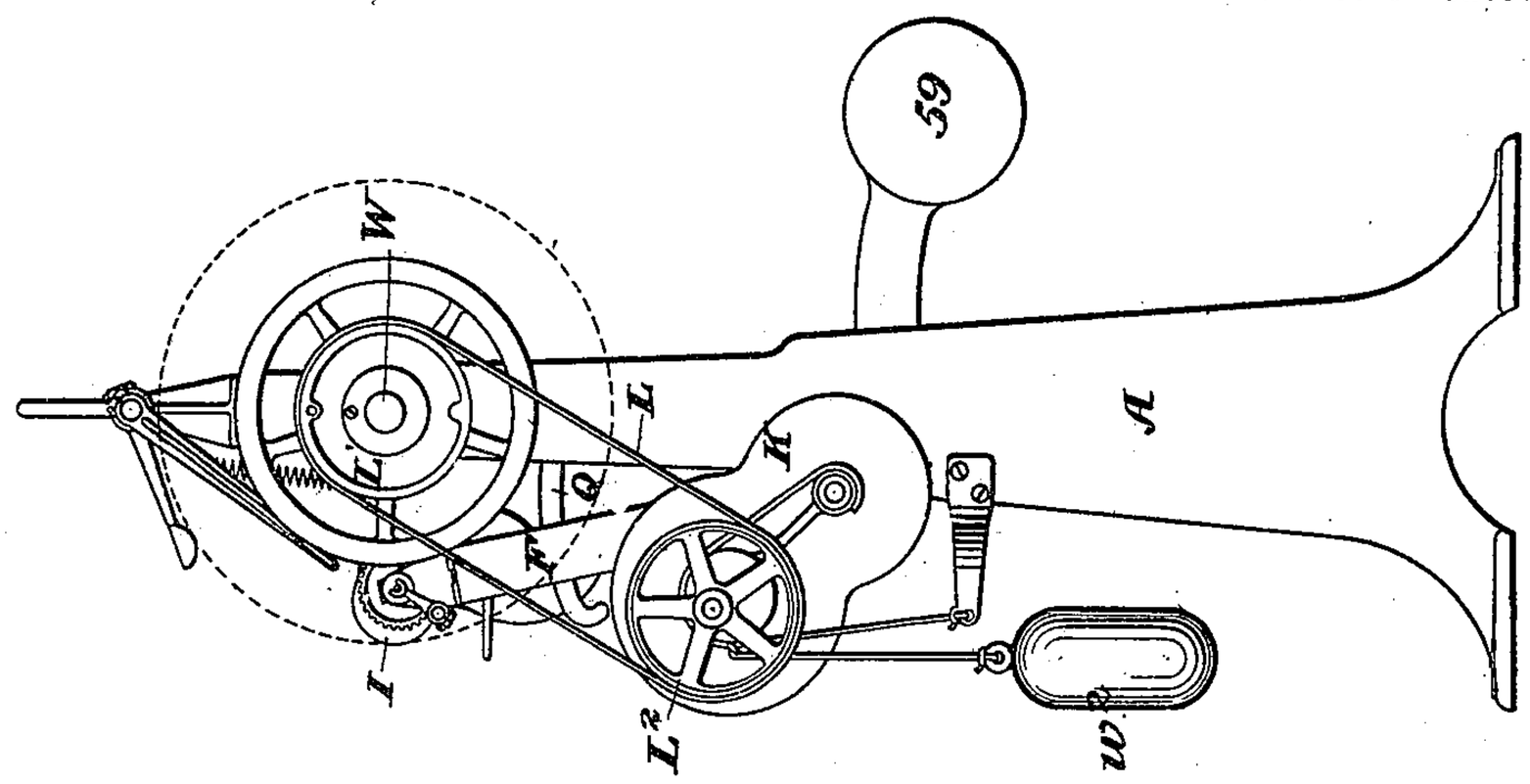
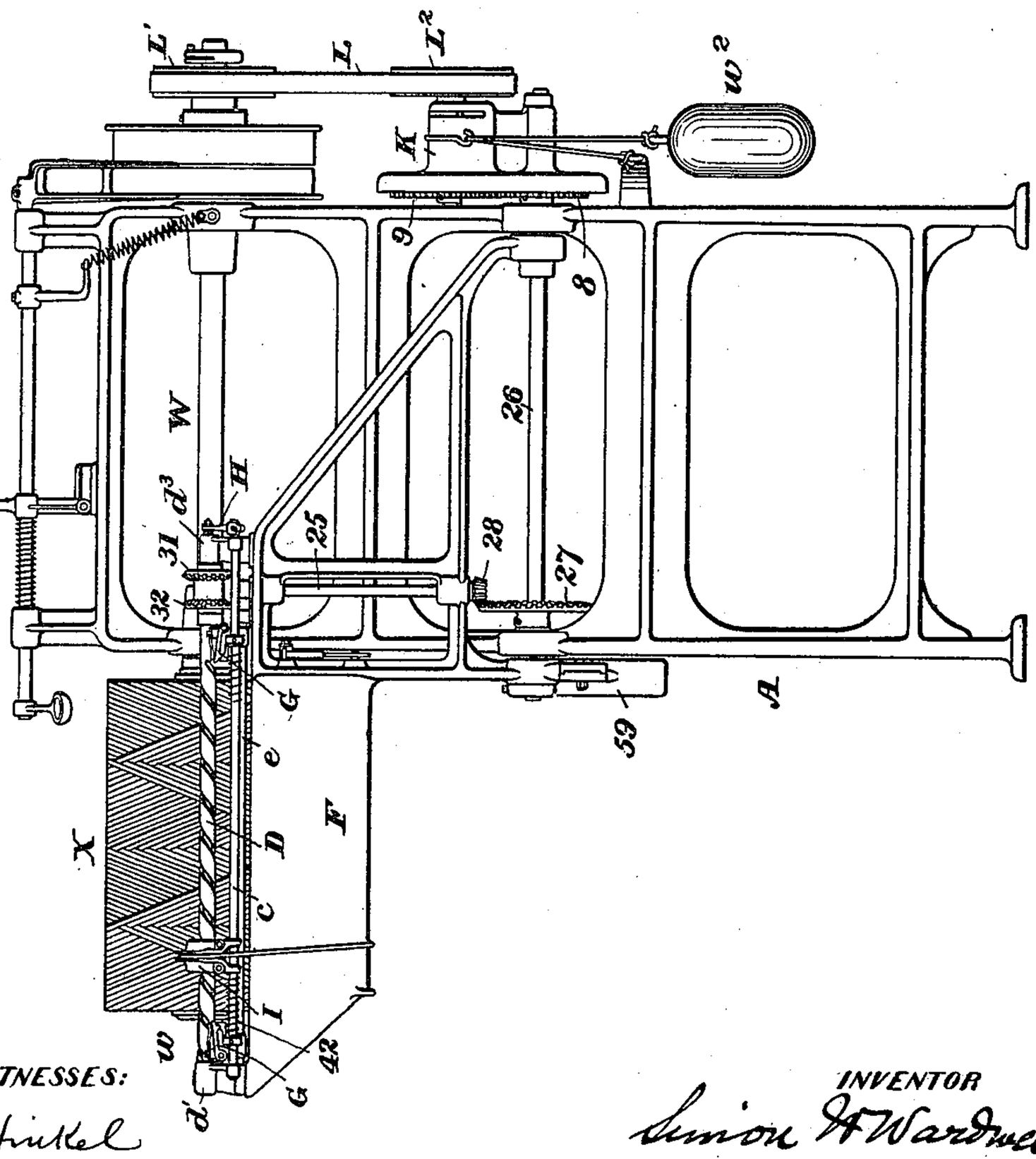


Fig. 1.



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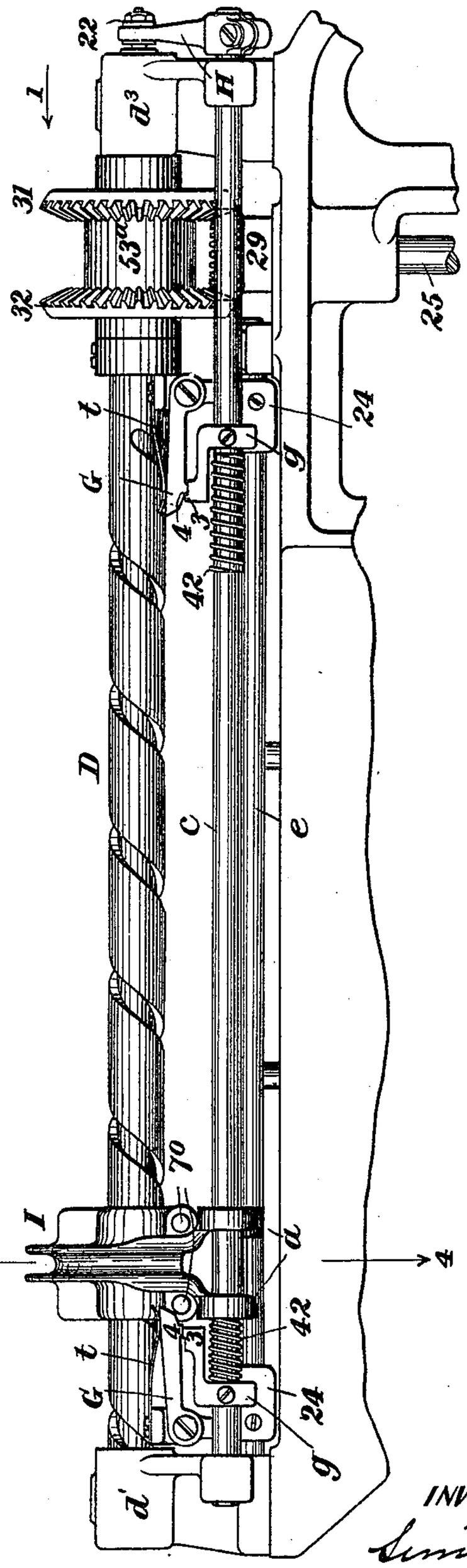

Fig. 3.

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Fig. 5.

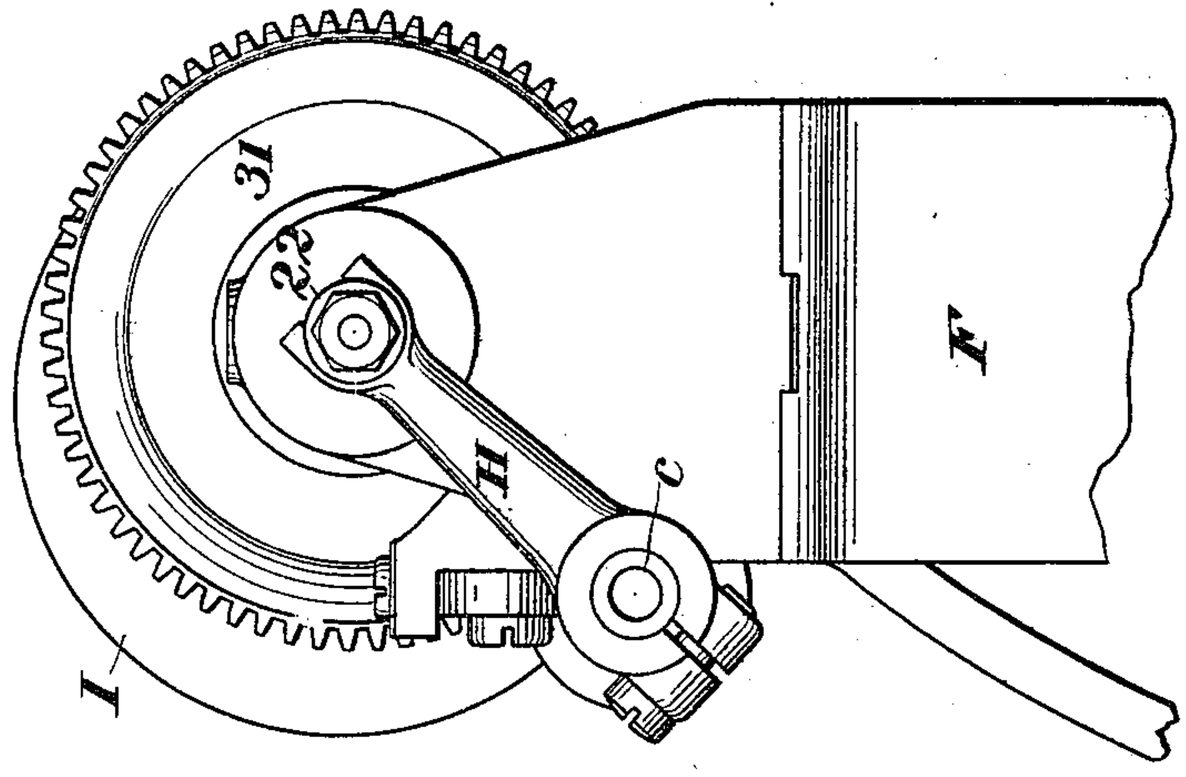

Fig. 4.

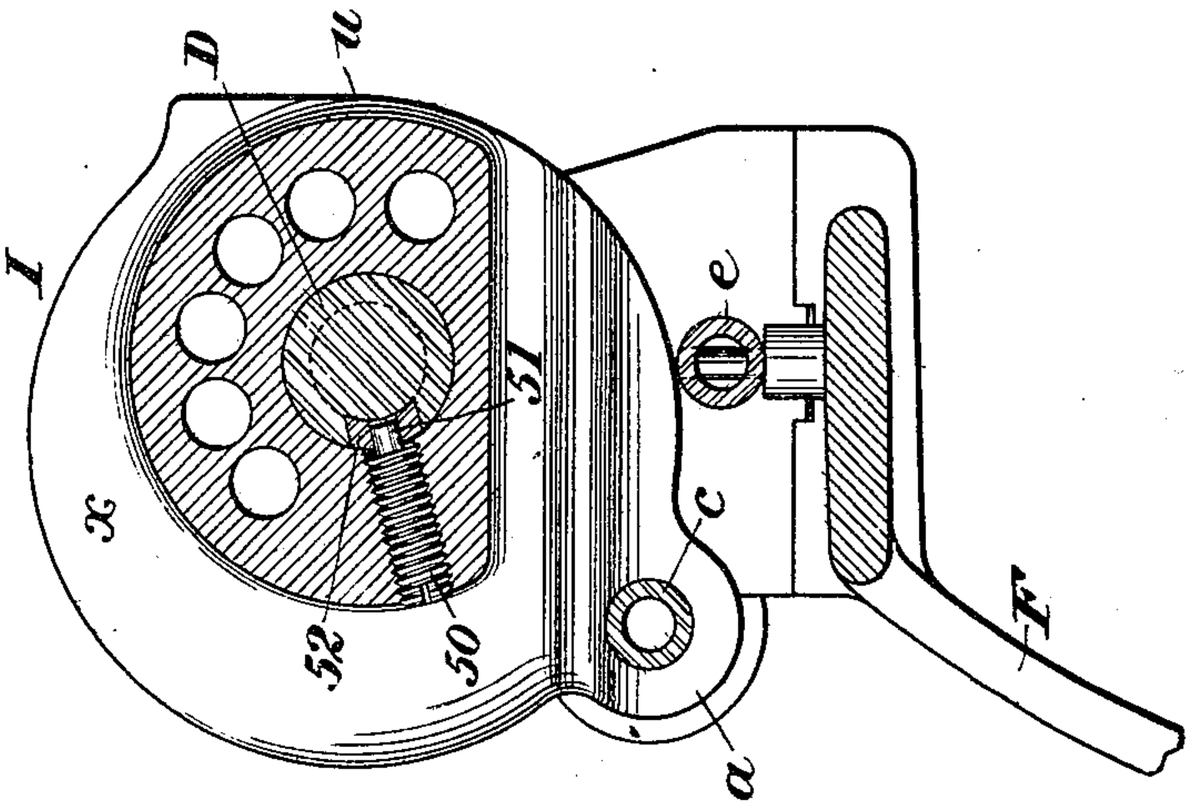

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Fig. 7.

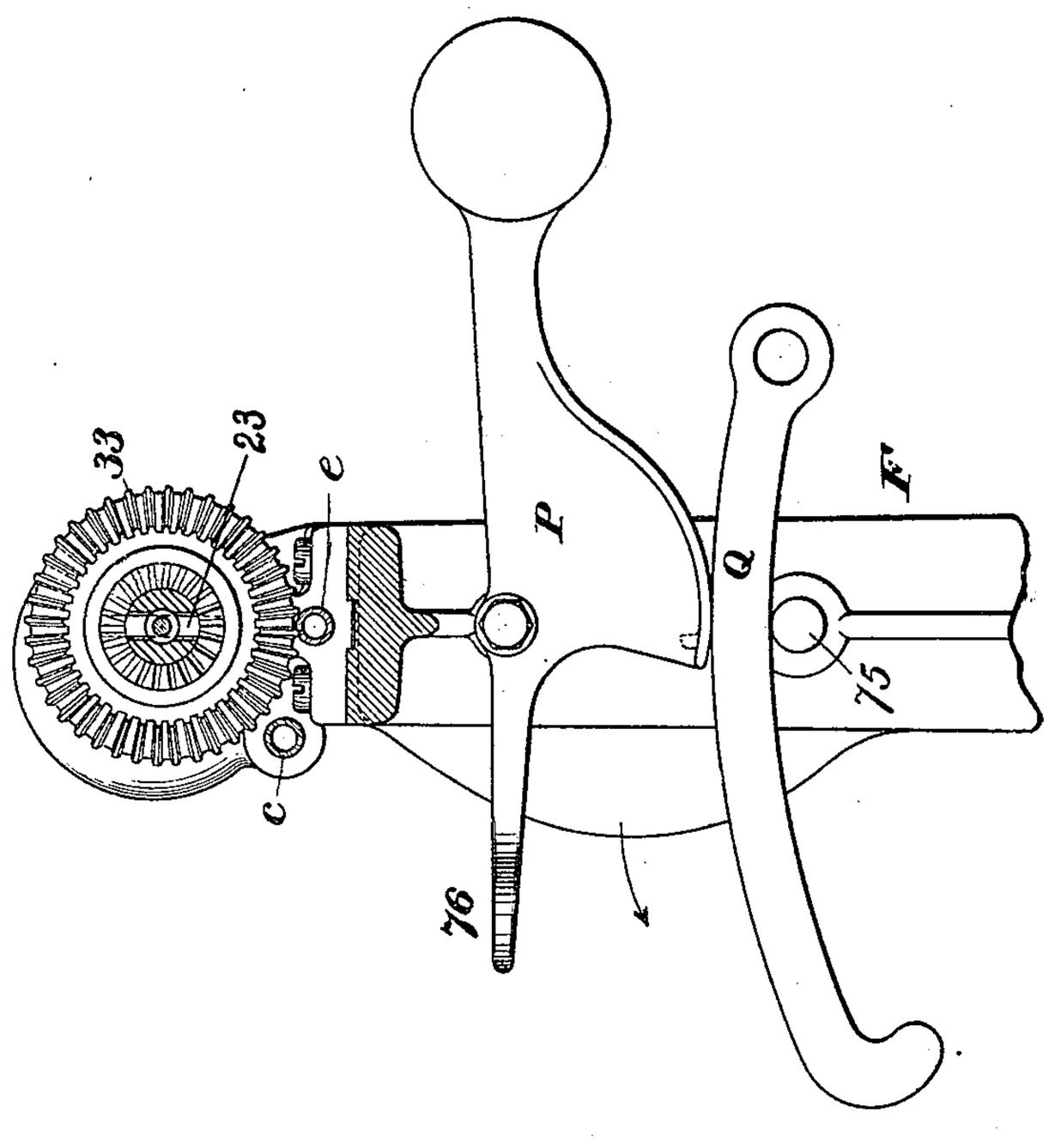

Fig. 6.

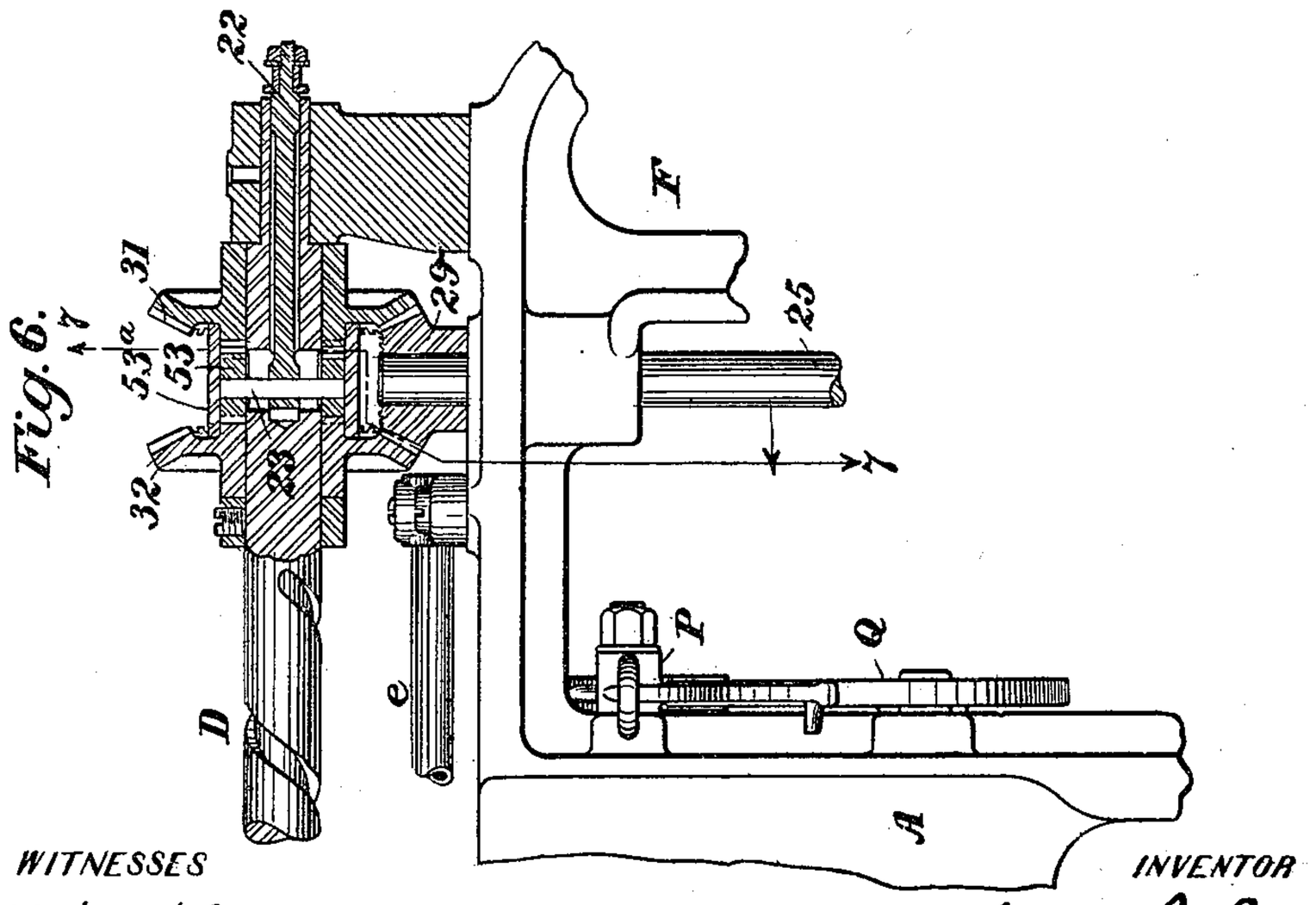

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Fig. 9.

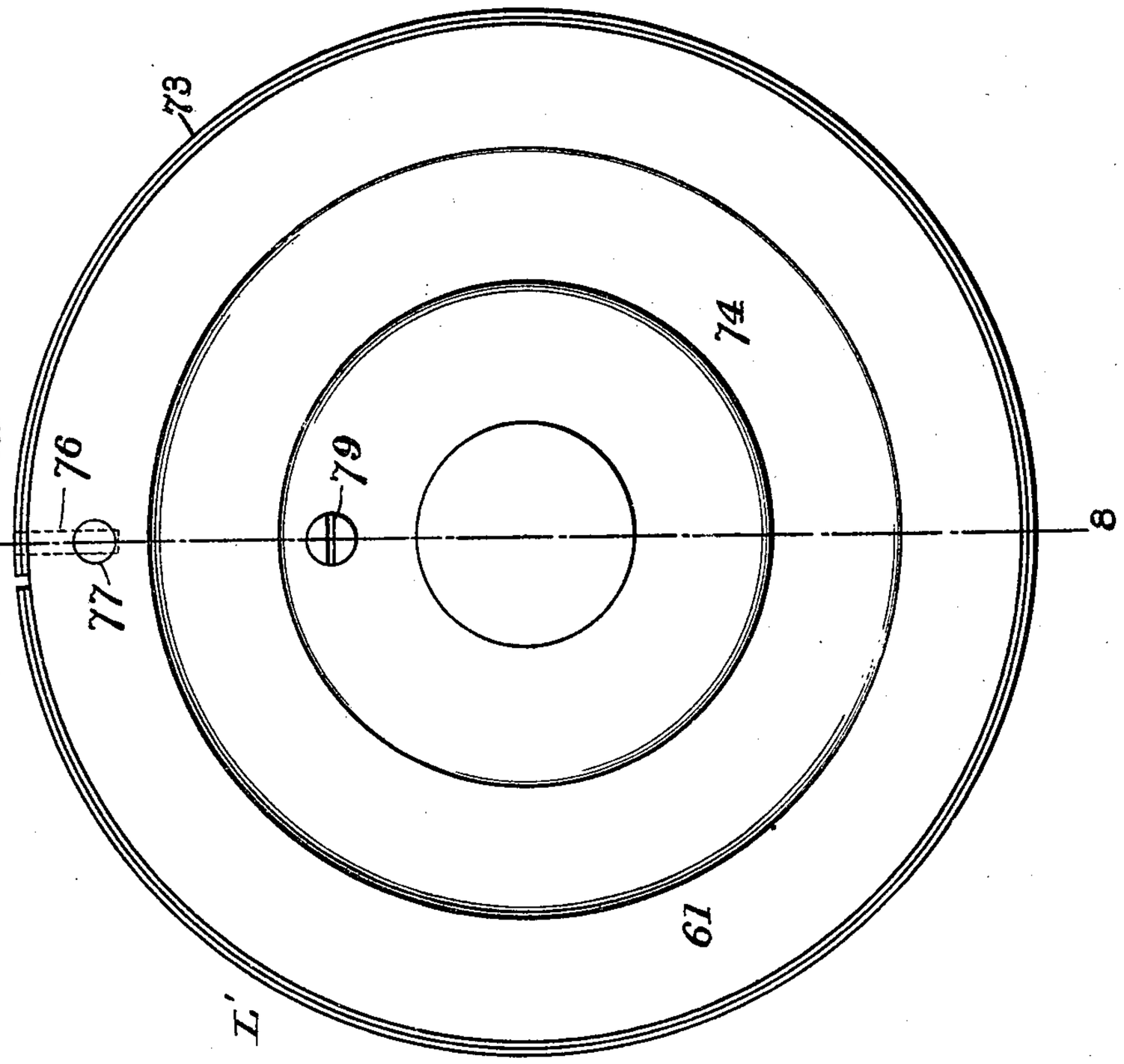

Fig. 8.

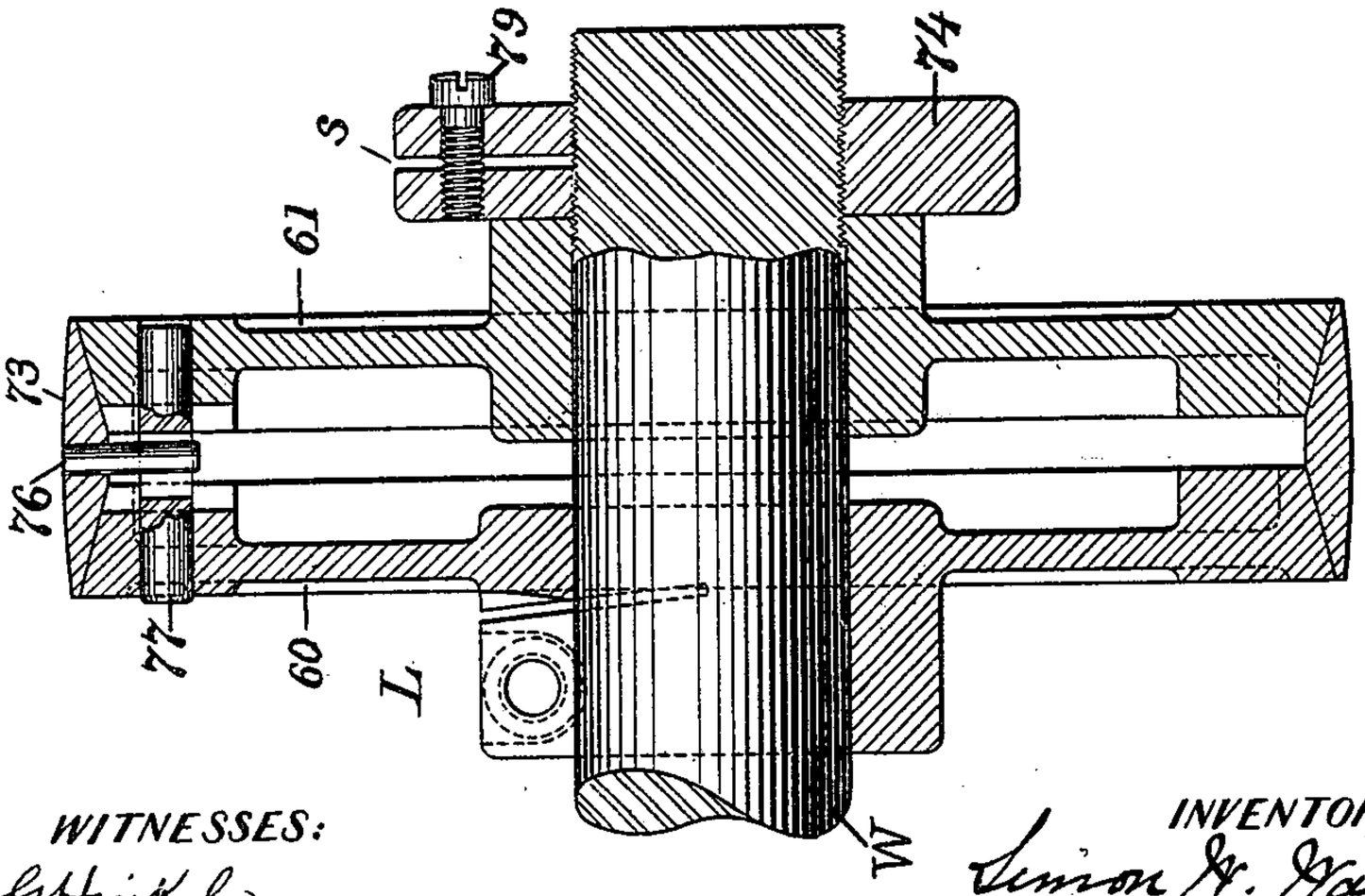

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Fig. 12.

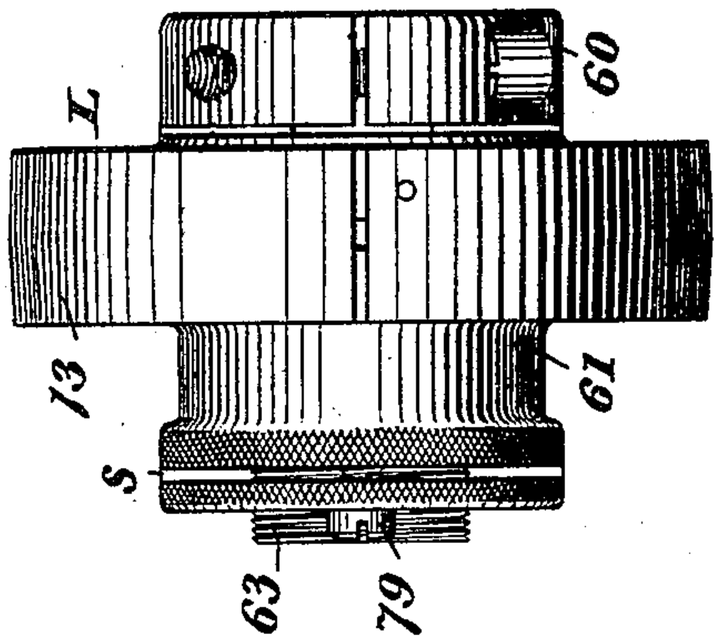


Fig. 11.

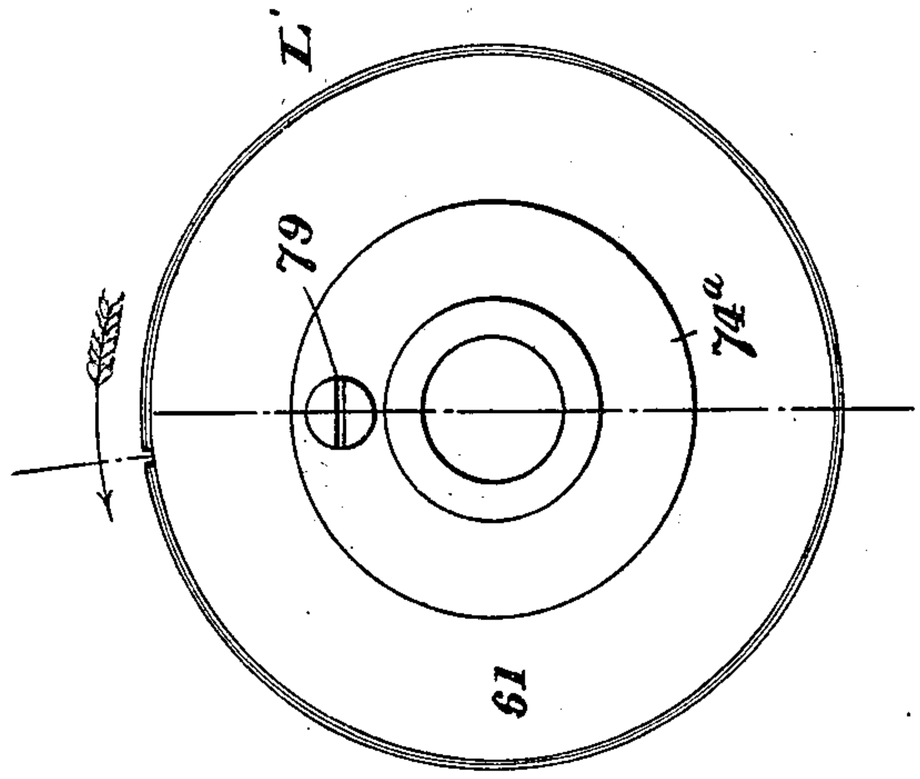
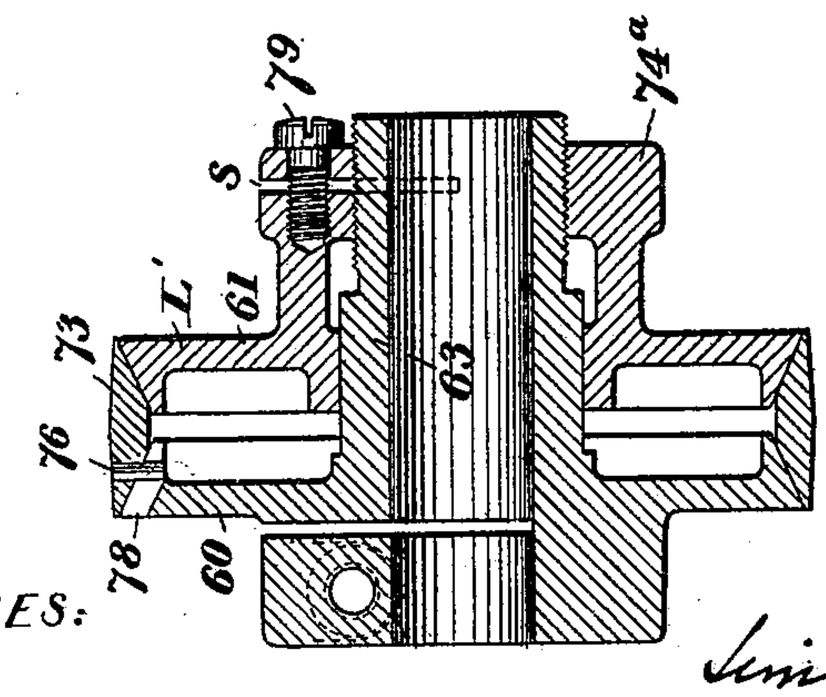


Fig. 10.



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UNITED STATES PATENT OFFICE.

SIMON W. WARDWELL, JR., OF PROVIDENCE, RHODE ISLAND.

MACHINE FOR WINDING HEAVY TWINE.

SPECIFICATION forming part of Letters Patent No. 666,290, dated January 22, 1901.

Application filed April 21, 1899. Serial No. 713,936. (No model.)

To all whom it may concern:

Be it known that I, SIMON W. WARDWELL, Jr., a citizen of the United States, residing in the city and county of Providence, in the State of Rhode Island, have invented certain new and useful Improvements in Machines for Winding Heavy Twine, of which the following is a specification.

My invention relates to machines for winding cops such as are set forth in my Letters Patent No. 480,157, and relates to certain details of construction fully set forth hereinafter and illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of a machine embodying my improvements. Fig. 2 is an end elevation. Fig. 3 is an elevation, enlarged, of the cord-guide and operating parts connected therewith. Fig. 4 is an enlarged section on the line 4 4, Fig. 3. Fig. 5 is an enlarged end view looking in the direction of the arrow 1, Fig. 3. Fig. 6 is an enlarged sectional view of the parts at the right of Fig. 3. Fig. 7 is a section on the line 7 7, Fig. 6, looking in the direction of the arrow. Fig. 8 is an enlarged sectional view of the expansion-pulley on the line 8 8. Fig. 9 is a face view of Fig. 8. Fig. 10 is a section of a modified expansion-pulley. Fig. 11 is a face view thereof, and Fig. 12 is an edge view thereof.

The machine consists, essentially, of a main frame A, supporting the winding-spindle W, the end of which constitutes a cop-holder *w*, a swinging frame F, supporting the reciprocating guide and its driving connections, and suitable connections whereby the reciprocating guide is positively driven in conjunction with the winding-spindle.

As shown in the accompanying drawings, the machine is driven by means of tight and loose pulleys of ordinary construction applied to the winding-spindle W, whence motion is transmitted, through the belt connection L, the two shafts 26 and 25, and suitable gearing connections, to the reciprocating guide I, termed herein the "cord-guide" and as hereinafter described.

The reciprocating guide is made of any desired form adapted to the material to be wound, provided, preferably, with a groove or channel suitably formed and disposed to receive the material and deliver it to the package being wound and with a broad flat face *u* to provide adequate bearing on the package to prevent the guide from indenting the package or unduly abrading the material wound. The edges of the bearing-surface are suitably formed to permit the guide to ride across the coils without displacing them.

The guide I is carried on and driven by the helically-grooved shaft D, which for convenience I term the "screw," and is prevented from turning therewith by means of the guide-rod *e*. Adapted to slide in one of the helical grooves is the shoe 52, Fig. 4, which is so connected with the guide by the screw 50 that as the screw D rotates alternately in opposite directions the latter imparts to the guide a reciprocating motion.

The screw D rotates in bearings *d' d*³ on the top of the frame F and carries at any suitable point two bevel-gears 31 and 32, each free to rotate upon the screw and independent thereof, except as indicated.

At the top of the shaft 25 is the bevel-gear 29, which, meshing with the two gears 31 and 32, causes each to rotate in a direction opposite to that of the other. Between these two gears is a clutch member 53, adapted to engage with each and provided with means whereby it can be shifted from engagement with one gear into engagement with the other to reverse its rotation. The clutch member, while free to slide longitudinally on the screw D, is so connected therewith as to impart its motion of rotation in either direction. A transverse pin 23 connects the clutch member 53 with a rod 22, which extends through the hollow end of the screw D and projects beyond the same. This rod 22 is connected with a rod *c* by means of the arm H, which, secured at one end to the rod *c*, is at the other end provided with a fork, which fits in an annular groove in a collar at the end of rod 22. The rod 22 is thus free at all times to rotate with the screw D, but can be shifted longitudinally by means of the rod *c* to throw the clutch from engagement with one gear into engagement with the other.

The rod *c* is shifted at the end of each traverse from the guide I or some part connected therewith, as by the guide I striking against one or the other of the two contact-pieces, which may operate through any intermediate

appliances to cause the shifting of the reversing devices. As shown, there are two parts G G, which act as detents in one position, but when lifted release the shifting devices. Each part G engages a contact-piece *g*, which is adjustable in position on the rod *c*.

It is obvious that any friction between the ears *a* of the guide I and the shifter-rod *c* or the jar of the machine might disengage the clutch before the proper time for such disengagement, and for this reason I provide positively-acting detents. The latter are pivoted to the supports 24, which are adjustable in position on the guide-rod *e*. Each of these detents has a shoulder 4, adapted to a corresponding shoulder on the contact-piece *g*, and is depressed by the spring *t*, so that the two shoulders engage in one position of the parts. The extremity of each detent is beveled and the guide I provided with suitable projections 70 70, adapted to engage with each detent at each end of the traverse to lift the detent and allow the rod *c* to be shifted directly or indirectly to reverse the motion of the screw. With a clutch mechanism of this description, in which the direction of rotation of one member is reversed by throwing it alternately from engagement with one into engagement with another of two other oppositely-rotating members, it is essential that one side of the clutch be disengaged before the other side is engaged. There is, in consequence, during the operation of reversing the motion of the first member, a momentary period during which it is unconnected with the driving mechanism, and hence is neutral, being inoperative to drive the parts to which it is connected.

If the guide I ran at very high speed and any projection from the guide struck directly a contact-piece upon the rod *c*, there might be sufficient momentum in the shifting parts to carry the clutch from one gear into engagement with the other; but this is not positive and sure, especially at slow speeds, and I therefore provide an independent means for shifting the parts, arranged to operate when the detents G G′ are lifted. Thus I arrange on the rod *c*, adjacent to the contact-pieces *g g*, springs 42 42, adapted to be compressed by the ears *a* as the guide I approaches either end of the traverse. By this means sufficient power is stored up prior to each movement of the clutch to throw the latter positively into engagement with one gear after it has been disengaged from the other, and this results regardless of the speed of movement of the guide.

In order to vary the length of the cop, I vary the extent of the traverse of the guide by shifting the position of the parts 24, *g*, and 42, as before described.

Fig. 3 shows the position of the parts just after the clutch has been thrown into engagement with the gear 32. One of the projections 70 of the guide I has lifted the left-hand detent G from engagement with the contact-piece *g*. The ear *a*, pressing against the contact-piece *g* after compressing the spring 42, has forced the clutch out of engagement with the gear 31, and the spring 42, compressed as stated, has carried the clutch into engagement with the gear 32. The guide, as shown, is now moving toward the right. As it approaches the opposite end of its traverse it will compress the spring 42, one of the projections 70 will lift the detent G, and the ear *a* will strike the stop *g* and force the clutch out of engagement with the gear 32, the compressed spring 42 completing and insuring the instant movement of the clutch, throwing it into engagement with the gear 31. As the rod *c* moves to the right the shoulder 3 of the contact-piece *g* at the left-hand end of the traverse will have passed the corresponding shoulder 4 on the detent G, allowing the latter to drop into position to prevent the movement of the rod *c* to the left until the contact is again raised by the approaching guide.

In order to prevent the engaging parts of the clutch device from becoming clogged and ineffective, the clutch-sleeve 53 is covered by a band 53ª, Figs. 3 and 6.

The frame F is provided with a counterweight 59, which swings the frame inward and tends to maintain the contact of the guide and cop or package. In winding any material various conditions are encountered which tend to distort the package. Thus the heavy material for which this character of machine is more especially intended frequently varies in diameter and density. In starting a package the coils sometimes draw back from the ends of the package, and in the course of winding bunches, knots, and splices are encountered in the cord. If the guide pressed at all times with equal pressure against the package, it would follow the irregularities of the latter, sometimes accentuating them and presenting an irregular and unsightly package. These effects may be overcome by preventing the inward movement of the guide after it has been forced outward, and I show in Figs. 6 and 7 an improved device whereby the guide is restrained from returning to the spindle after it has been carried outward. In said figures there is a bearing-bar Q, pivoted or otherwise secured to the frame A and shown as curved concentrically with the axis of the frame F and resting upon a lug 75 of the frame F. Pivoted to the frame is a wedge P, bearing upon the bar Q with its curved edge and weighted to maintain contact therewith, the construction being such that the frame F can move away from the spindle in the direction of the arrow, Fig. 7, without material resistance, but is prevented by the wedge from returning. By pressing upon a finger 76, however, the wedge may be lifted to permit the frame to be swung inward when required.

The position of the above parts might be altered without changing the effect by connecting the part Q to the frame F and the

parts P 75 to the main frame, and it is evident that the wedge could be arranged to bear upon either edge of the bar Q.

It is desirable in this class of machines to provide means for positively and accurately regulating the relative movements of the rotating winding-spindle and the reciprocating guide. I use for this means, in the construction shown, an adjustable expansion-pulley L′ of improved structure. Heretofore, expansion-pulleys have been used, provided with a V-shaped groove adapted to a correspondingly-shaped V-belt. This, while one of the most efficient devices for accomplishing the desired regulation in speed, is open to the following objections: First, the specially-formed V-belt is expensive to manufacture, owing to the fact that it must be accurately formed to uniform cross-section; second, owing to the stiffness of a V-section such a belt is much less flexible than a flat one and does not obtain so good a bearing on the pulley; third, the V-belt is not available for use on machines that wind heavy material, because it is difficult to obtain leather of sufficient thickness for such heavy belts as would be needed; fourth, when the expansion-pulley is adjusted it presents a greater or less surface to the belt, depending on whether the two halves are separated or closed together, and, fifth, as the leather becomes more pliable from use and from the oil absorbed it sinks more deeply into the pulley, thus changing the pitch-line of the pulley and causing the wind to change. In my new and improved construction I overcome these faults by the use of an expansion band or ring whose inner face is fitted to the V-groove in the pulley and having a substantially flat outer face adapted to receive a flat belt. By this means I am enabled to use a thin flexible belt of any desired width which will readily adapt itself to the periphery of the pulley, insuring the maximum surface of contact and of sufficient width to transmit great power. As shown in Figs. 8 and 9, the parts 60 61 are the parts of the expansion-pulley having beveled edges adapted to the beveled inner face of the split ring or band 73, from one end of which a pin 76 projects inward into a hole in a pin 77, extending loosely through both parts of the expansion-pulley. The pin 76 must be so located relative to the movement of rotation of the pulley that the end of the band secured by the pin will first come in contact with the belt, whereby the latter will tend to press the band more firmly into the groove. In other words, the pressure of the belt tends to carry the parts of the band away from the pin. If the reverse was the case, the parts of the band would be pushed toward the pin, causing the band to distend and altering the timing of the machine, or breaking the ring if made of cast metal, as is the cheapest mode of manufacture.

In the construction shown in Figs. 8 and 9 the disk 60 is clamped to the shaft, which may or may not be the winding-spindle, and the disk 61 slides upon the shaft, which is provided with a screw-thread receiving an adjusting-nut 74, the latter having a slot *s* and binding-screw 79, whereby it may be clamped firmly in position upon the shaft.

In the construction shown in Figs. 10, 11, and 12 the hub 63 of the fixed disk 60 is threaded, as shown, and the disk 61 slides upon said hub and is provided with an internally-threaded collar 74^a, which has a slot *s* and binding-screw 79 and serves the purpose of the nut 74, Fig. 8. In the construction of Figs. 10, 11, and 12 the pin 77 of Fig. 8 could not be used, as in adjusting one disk is turned independently of the other, and the pin 76 is therefore extended into a slot 78 in the disk 60.

The belt L, Figs. 1 and 2, passes from the expansion-pulley L′ to a pulley L^2, the shaft of which is carried by a frame K, swinging about the axis 26 as a center and provided with a gear-wheel 8, meshing with a gear-wheel 9, on the shaft of the pulley L^2, the frame K having a weight w^2 connected therewith to maintain the belt taut.

While I have described and shown the band 73 upon the expansion-pulley as consisting of a single split ring, it may consist of sections of a ring, each secured preferably at one end, so as to turn with the disks of the pulley.

I do not herein claim, broadly, any feature herein shown and also shown and claimed in my application Serial No. 714,083.

Without limiting myself to the constructions shown, I claim—

1. The combination with a cord-guide and a driving-screw therefor, of devices for reversing the rotation of the screw, partially but positively operated by the guide, springs to complete and accelerate the operation of said reversing devices, detents for restraining the reversing devices from action, and means for releasing the detent as the guide reaches the limits of its travel, substantially as set forth.

2. The combination with a cord-guide and driving-screw, of devices actuated from the guide for reversing the rotation of the screw, springs to accelerate and insure the operation of the reversing devices, positively-actuating detents to hold the reversing devices out of action, and means for releasing the detents as the guide reaches the limits of its travel, and means whereby the times at which the detents are actuated may be varied to vary the distance between successive helices laid by the guide, substantially as set forth.

3. The combination with the cord-guide, actuating-screw, and reversing devices, of a shifter-rod constituting a part of said reversing devices, contact-pieces on said rod adapted to be struck by the guide to partially shift the rod, detents, each arranged to engage with one of said contact-pieces to prevent the shifting of the rod and to be disengaged therefrom by said guide at the end of its travel, and springs bearing on the contact-pieces

and arranged to be compressed, as the guide reaches the limit of its movement in either direction, to complete the movement of said rod after it has been partially shifted, substantially as described.

4. The combination with the cord-guide, actuating-screw and reversing devices, of a shifter-rod constituting part of the reversing devices, adjustable contact-pieces on said rod arranged to be directly struck by the guide to partially but positively shift said rod, adjustable detents each arranged to engage one of the contact-pieces and to be disengaged therefrom by contact with the guide, and springs having bearings on the rod and arranged to be compressed as the guide reaches the limit of its movement in either direction to complete the movement of said rod after it has been partially shifted by said guide, substantially as described.

5. The combination with the cord-guide, actuating-screw and reversing devices, of a rod provided with contact-pieces for engaging the guide to partially shift the same, springs to complete the movement of the partially-shifted rod and detents for temporarily preventing the shifting of the rod in either direction and adapted to be disengaged from said rod as the guide reaches the limit of its movement in either direction, substantially as described.

6. The combination in a winding-machine with a guide-actuating screw, a guide carried on and propelled by the screw, devices for reversing the screw and a rod forming part of the reversing devices, of contact-pieces *g g* carried on the rod, and adapted to be struck by the guide to partially but positively shift the rod, detents G G, one of which engages one of the contact-pieces to prevent the shifting of the rod and is adapted to be disengaged as the guide approaches the end of its travel while the other is adapted to engage the contact-piece *g* at the opposite end of the rod as soon as the latter is shifted, and springs, adapted to be compressed by the guide to further shift the rod after it has been positively moved by the guide, substantially as described.

7. The combination in a winding-machine of a guide, a driving-screw, gears 31 and 32 turning loosely on said screw and in opposite directions, a clutch adapted to be thrown into engagement with either one of said gears, contacting devices and connections whereby the guide, at the end of its travel, positively disengages the clutch from one of the gears, and springs to complete the movement of said clutch, to engage it with the opposite gear, substantially as set forth.

8. The combination in a winding-machine of a screw, a reciprocating guide carried on and propelled by said screw, two gears rotating in opposite directions, a clutch for connecting the screw with either one of the gears, contacts and connections for positively shifting said clutch at the end of the travel of said guide, in either direction, detents to temporarily prevent the shifting of the clutch until the guide has reached the end of its travel, means whereby the guide, at each end of its travel, raises one of the detents and positively engages the corresponding contact to push the clutch out of engagement with one of the gears and springs to further move the clutch into engagement with the opposite gear, substantially as set forth.

9. The combination with the frames A and F and cop-holder and guide and guide-driving devices upon the frame F, of shafts W and 26, a frame K swinging about the axis of the shaft 26, and carrying a pulley L^2 geared with the shaft 26, and a pulley L' on the shaft W, and belt L, all substantially as set forth.

10. The combination in a winding-machine of a guide-actuating screw D, a guide I carried on and propelled by the screw, gears 31 and 32 turning loosely on said screw and in opposite directions, a clutch 53^a intermediate the two gears and connected to drive the screw, a rod *c* connected with the clutch, contact-pieces *g g* attached to the rod and adapted to be struck by the guide to positively shift the rod to disengage the clutch from one of the gears and springs 42 42 to be compressed by the guide to further move the clutch, into engagement with the other gear, substantially as described.

11. A thread-guide carried on and propelled by a screw, and having a groove substantially concentric with said screw and at right angles to the path of the guide and flat face parallel to the path of the guide, substantially as set forth.

12. A thread-guide carried on and propelled by a screw, having a flat face parallel to the path of the guide, and substantially tangent to the surface of the package being wound, a groove substantially concentric with said screw, at right angles to the path of the guide and terminating in a delivery-point at the line of tangency between the flat face and the cop or package being wound, substantially as described.

13. The combination in a winding-machine, of a screw, a cord-guide carried on and reciprocated by said screw, a square-ended helical block of screw section fitting through its length and adapted to travel between the threads of the screw and provided with a radial hole, and a screw carried in said guide and having a teat or projection adapted to the hole in said block for the purpose and in the manner set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

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Witnesses:
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G. S. ARMSTRONG.