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S. W. WARDWELL, Jr.

MACHINE FOR WINDING COPS.

No. 506,959. Patented Oct. 17, 1893.

Fig. 1.

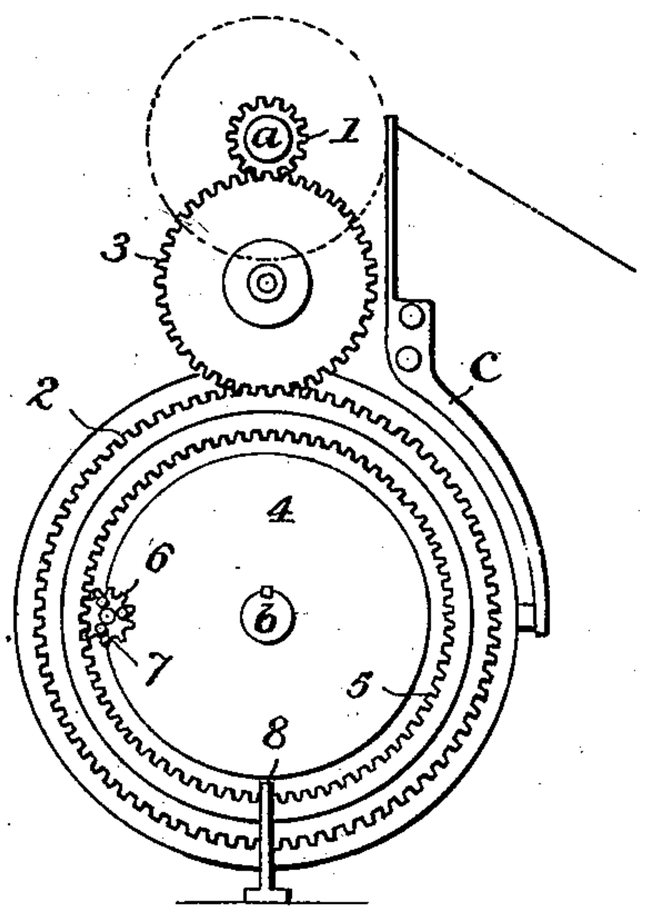
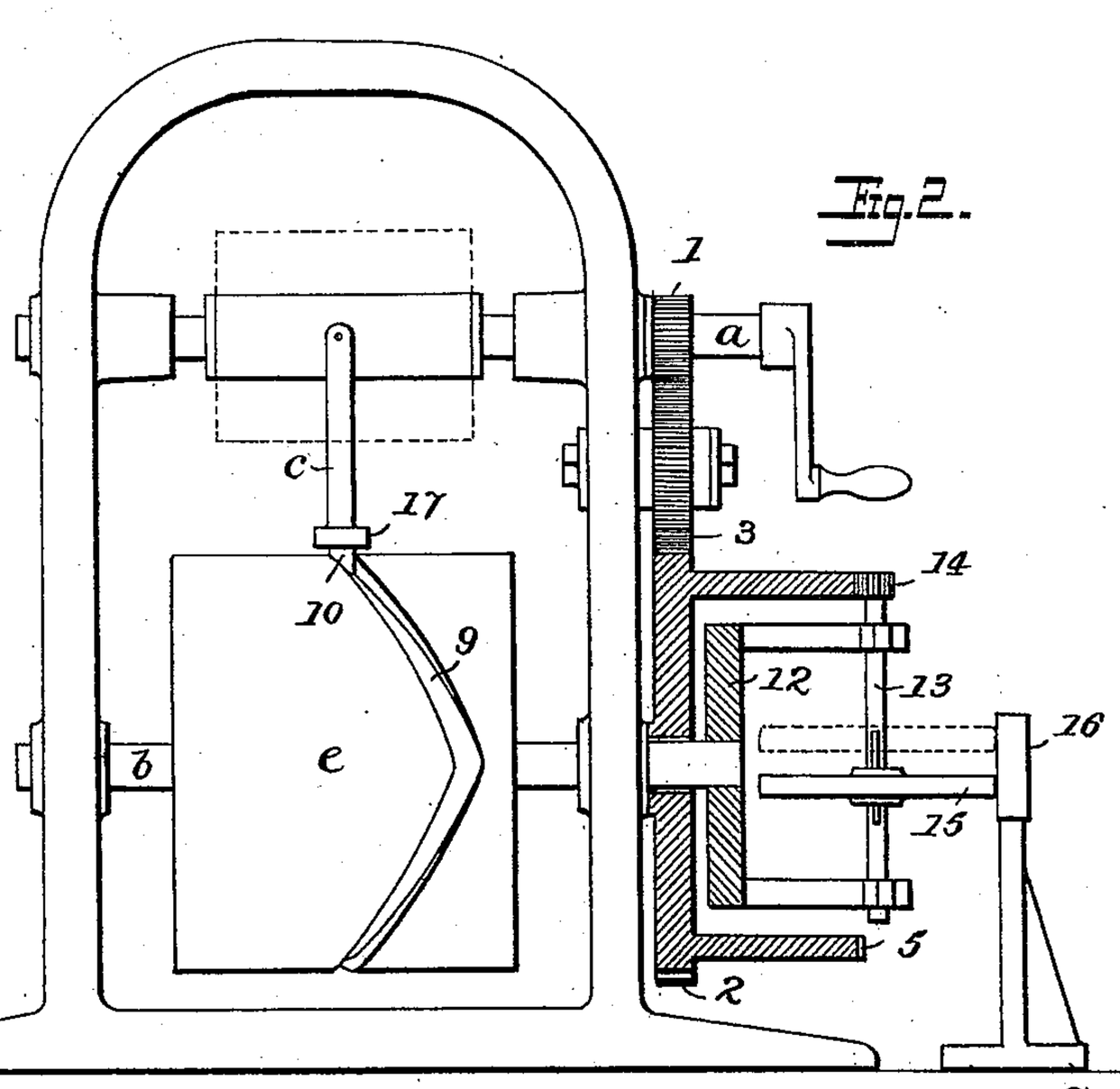


Fig. 2.



Witnesses
Jno. J. Hinkel
Allen N. Dobson

Inventor
Simon W. Wardwell, Jr.
By Foster Freeman
Attorneys

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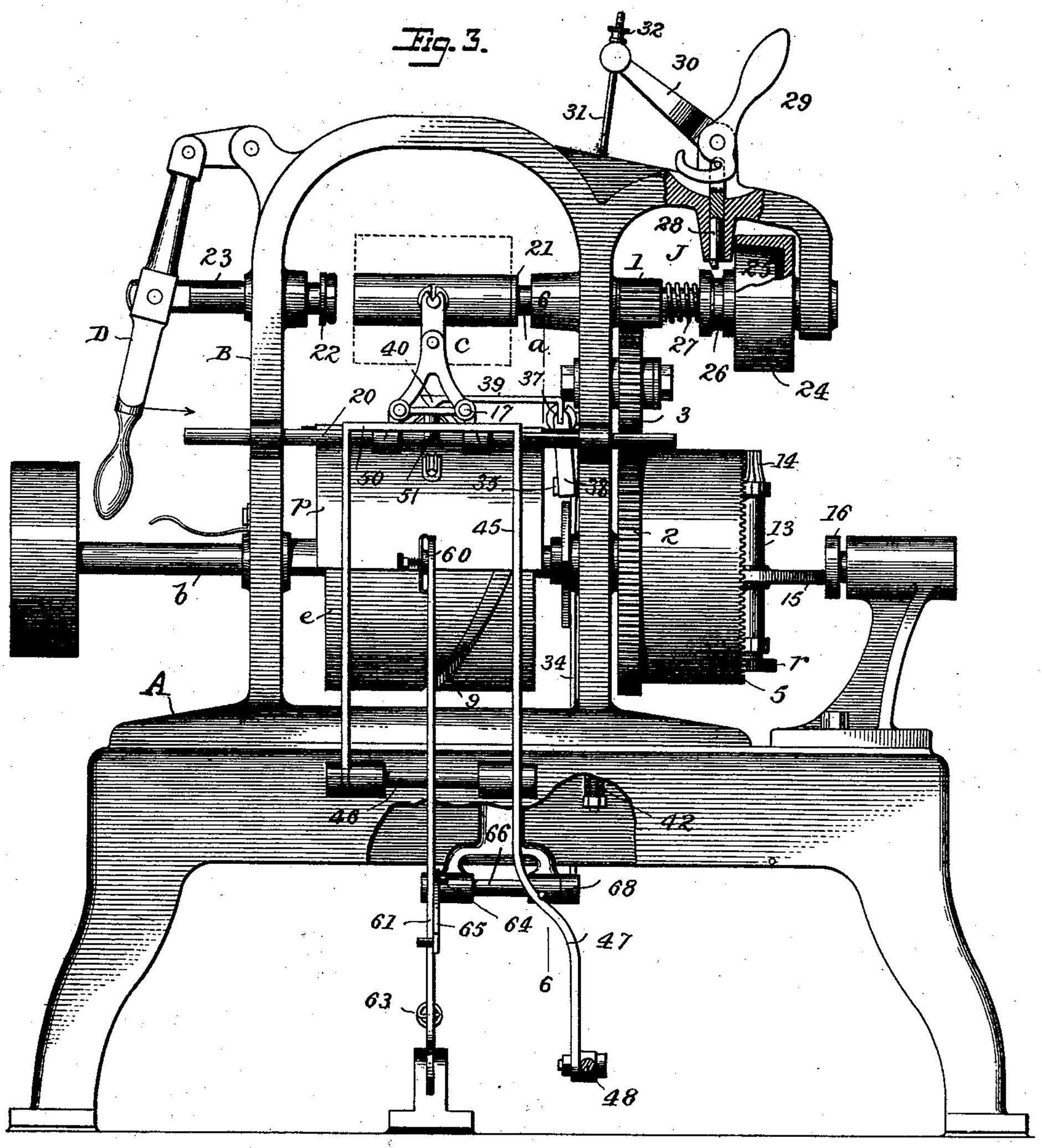
Fig. 3.



Witnesses
Jno. J. Hinkel
Allen N. Dobson.

Inventor
Simon W. Wardwell Jr.
By Foster Freeman
Attorneys

(No Model.)

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S. W. WARDWELL, Jr.

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Fig. 4.

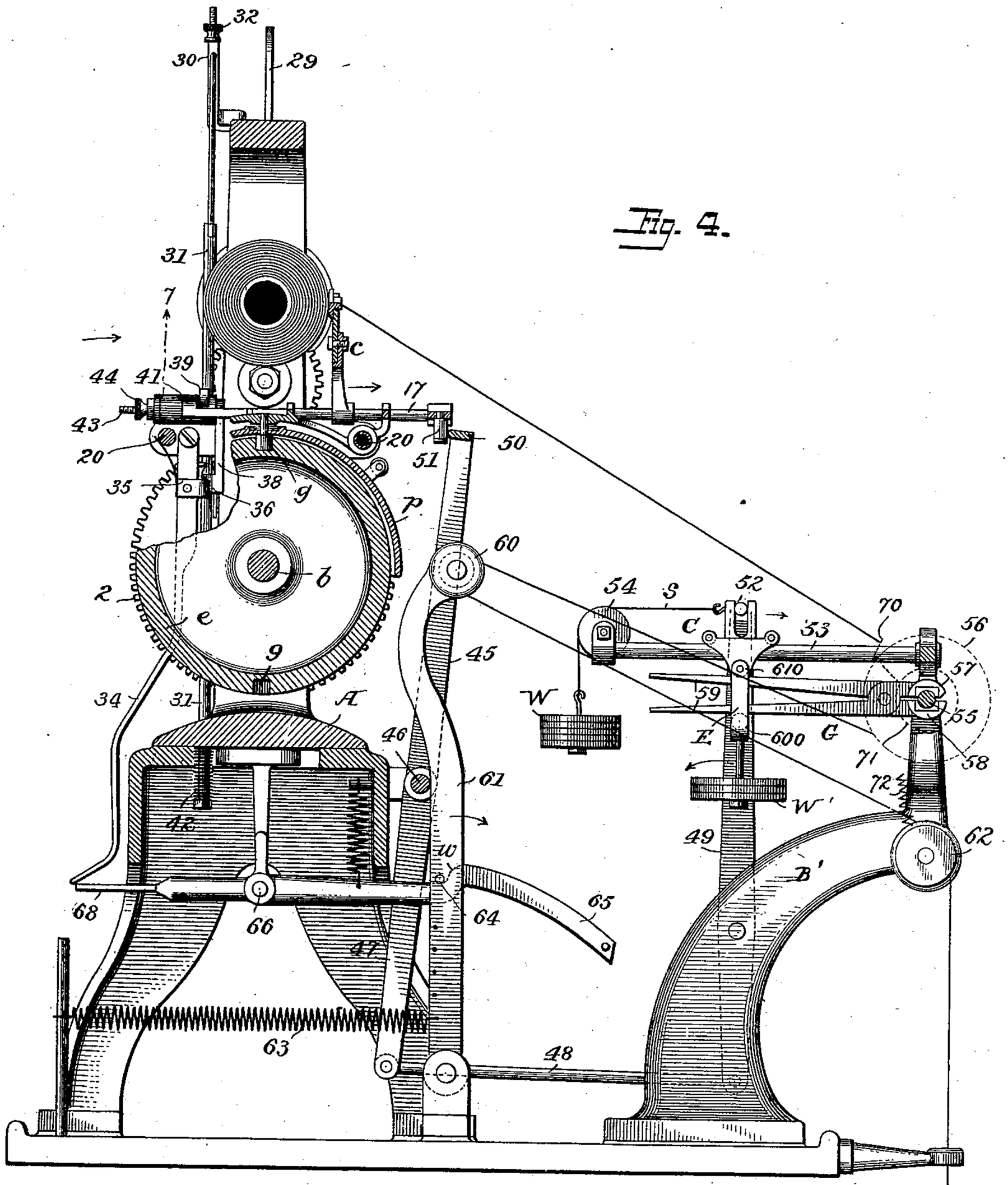
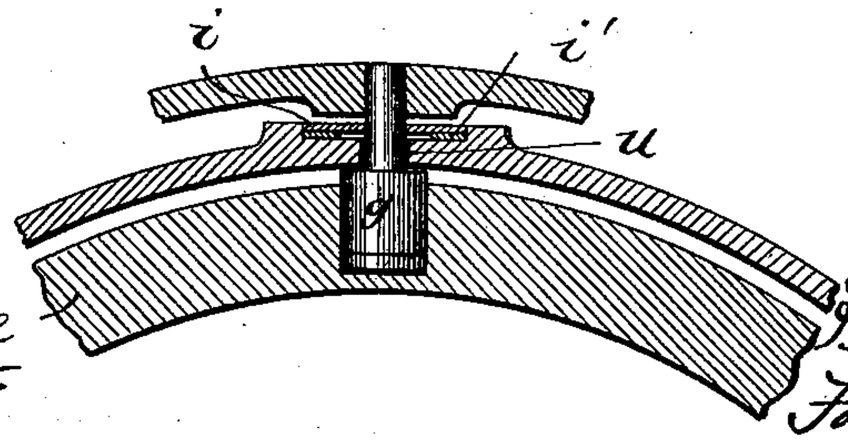


Fig. 9.



Witnesses
Jno. G. Hinkel
Alle N. Dobson.

Inventor
Simon W. Wardwell
Jr.
By
Foster Freeman
Attorneys

(No Model.)

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S. W. WARDWELL, Jr.

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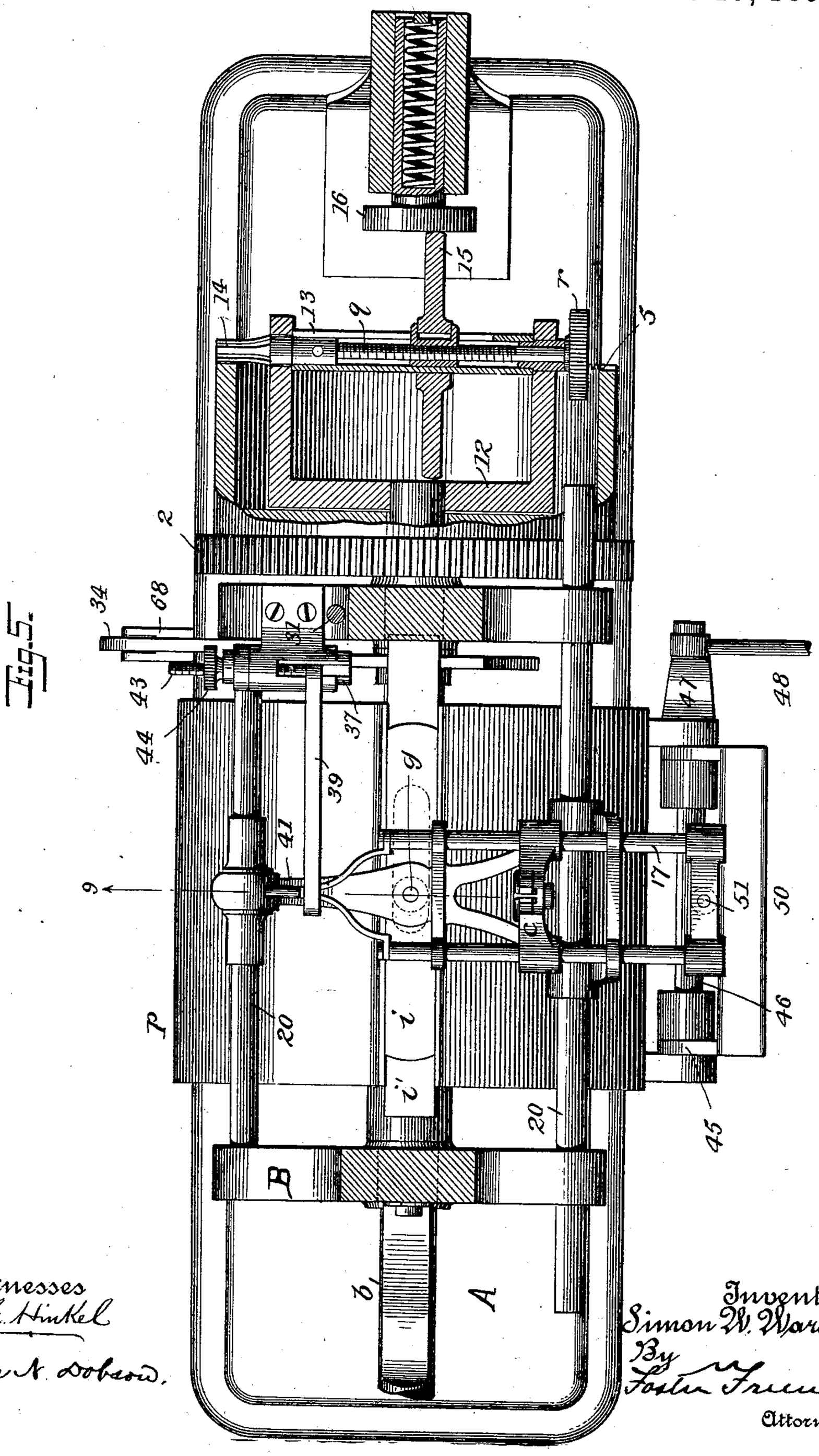

Fig. 5.

Witnesses
Jno. J. Hinkel
Allen N. Dobson.

Inventor
Simon W. Wardwell, Jr.
By Foster Freeman
Attorneys.

(No Model.)

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Fig. 6.

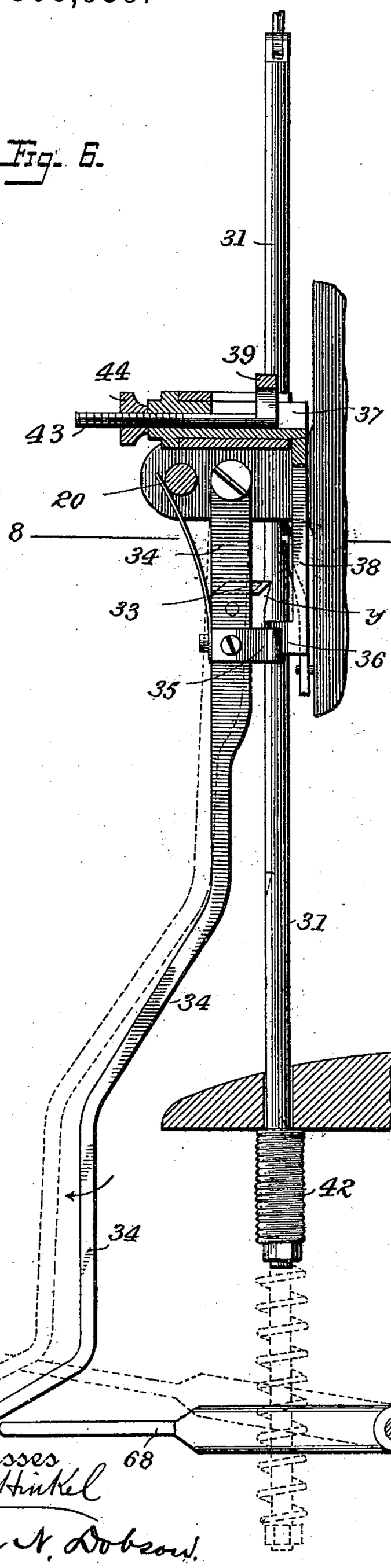

Fig. 7.

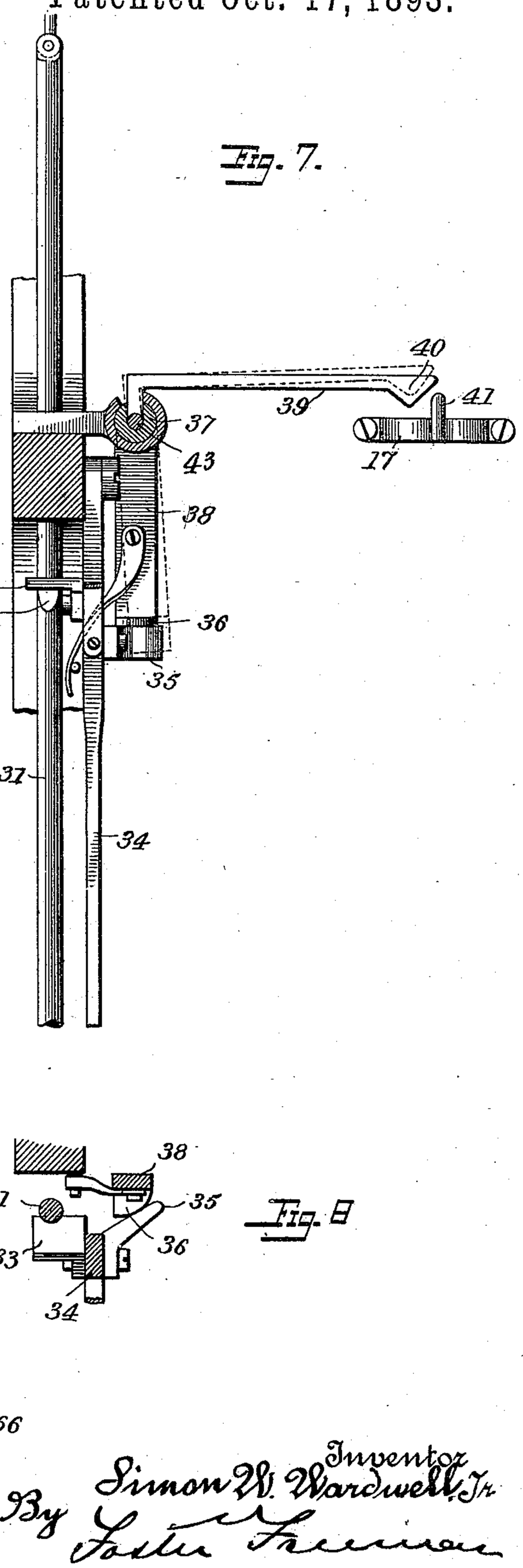

Fig. 8

Witnesses
Jno. G. Hinkel
Alla N. Dobson.

Inventor
Simon W. Wardwell, Jr.
By Foster Freeman
Attorneys

UNITED STATES PATENT OFFICE.

SIMON W. WARDWELL, JR., OF BOSTON, ASSIGNOR TO JOSEPH R. LEESON, OF NEWTON, MASSACHUSETTS.

MACHINE FOR WINDING COPS.

SPECIFICATION forming part of Letters Patent No. 506,959, dated October 17, 1893.

Application filed November 8, 1892. Serial No. 451,384. (No model.)

To all whom it may concern:

Be it known that I, SIMON W. WARDWELL, Jr., a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Machines for Winding Cops, of which the following is a specification.

My invention relates to mechanism for winding cops and bobbins in the manner set forth in my Letters Patent No. 480,157, dated August 2, 1892, and my invention consists of certain improvements of the apparatus, fully set forth hereinafter and illustrated in the accompanying drawings, in which—

Figure 1 is a diagrammatic view illustrating the operating connections between the guide operating devices and the cop shaft. Fig. 2 is a more complete diagrammatic view illustrating the operation of the peculiar connections shown in the other figures. Fig. 3 is a side elevation of an operative device embodying my improvements. Fig. 4 is a transverse sectional elevation of the machine shown in Fig. 3. Fig. 5 is a plan view of said machine in part section. Fig. 6 is an enlarged section in detail on the line 6—6, Fig. 3. Fig. 7 is a section enlarged on the line 7, Fig. 4 looking in the direction of the arrow. Fig. 8 is a sectional plan on the line 8—8, Fig. 6. Fig. 9 is a transverse section of the line 9, Fig. 5.

Before describing the details of the apparatus, I would refer to Fig. 1 which illustrates diagrammatically the principle of operation whereby an increment of movement is imparted to the winding shaft, so that after the thread is carried to either end of the cop completing a coil thereon, it is caused to be laid either a slight distance in advance of the position it would occupy upon the exact completion of a revolution, or a slight distance back of said position so that the return coil of thread is laid upon the cop exactly parallel to one of the preceding coils, either close to or at any determinate distance therefrom, as fully set forth in my Letters Patent before alluded to. In effecting this laying of the thread, I make use of a holder for the cop, shown in the form of a shaft, *a*, carrying the cop tube or bobbin, another shaft, *b*, the rotation of which imparts a reciprocating sliding movement to the thread guide, *c*, which conducts the thread to the cop tube and cop, gears between the two shafts, *a*, *b*, and means for regularly or uniformly advancing or retarding one of the gears independent of the movement whereby motion is imparted from one shaft to the other. Thus a gear, 1, upon the shaft *a*, drives a gear, 2, upon the shaft, *b*, through the medium of an intermediate gear, 3, which may be used or dispensed with, the shaft, *a*, rotating one or more times to each revolution of the shaft, *b*, according to the number of turns in each coil laid upon the cop, and the proportions of the gears vary accordingly.

The differential or increment of motion is obtained by making the shaft, *b*, independent of the gear, 2, to a certain extent (or the shaft, *a*, may be independent of its gears in a like manner) and means are employed for imparting to the shaft *b*, a motion that will cause it to complete its revolution, either slightly in advance or slightly behind that of the revolution of the gear, 2. Thus, as shown in Fig. 1, the gear, 2, is an annular gear sliding round but having a frictional contact with a disk, 4, and having an internal gear, 5, which engages with a pinion, 6, turning upon a stud on the disk, 4, which disk, 4, is secured firmly to the shaft, *b*. Upon the pinion, 6, are studs, 7, in position to make contact with a stationary arm, 8, so that as the disk, 4, revolves, carrying with it frictionally, the gear, 2, if the shaft, *b*, is the driving shaft, or as the gear, 2, revolves and carries with it the shaft, *b*, if the shaft, *a*, is the driving shaft, then as a pin or stud, 7, makes contact with the arm, 8, a partial revolution is imparted to the pinion, 6, so that at each revolution of the shaft, *b*, the ring gear, 2, is moved first by the disk, 4, and then additionally by the pinion, 6, so as to complete its revolution slightly in advance or slightly back of that of the shaft, *b*. It is desirable to provide means whereby this variation of movement may be regulated with extreme nicety, as in laying fine linen and fine silk threads in the building up of cops and bobbins, the increment of movement should be but little if any greater than the diameter of the thread

wound, in a majority of instances, for which reason, I make use of adjustable devices which may be constructed in different ways, a most effective form being illustrated in the remaining figures of the drawings, but most clearly in the skeleton view Fig. 2. In this view, *a*, illustrates the driving shaft, *b*, the shaft carrying the cam, *e*, which imparts motion to the thread guides, *c*, through the medium of the cam groove, 9, and pin 10, on the carriage, 17, of said guide. The gear wheel, 2, is mounted to turn independently upon the shaft, *b*, and has an annular flange with a gear, 5, that meshes with the pinion 14, upon a shaft, 13, carried by a yoke, 12, on the end of the shaft, *b*, and a friction wheel or disk, 15, is mounted to slide on but turn with the shaft, 13, with its edge frictionally in contact with a suitable stationary friction plate, 16. If the wheel, 15, is set directly opposite the axis of the shaft, *b*, the gears, 2, and the shaft, *b*, are turned together the same as if the gear was fixed permanently to said shaft. If, however, the friction wheel be set to one side or the other of the center, as shown in dotted lines, Fig. 2, then in that case the rotation of the gear, 2, will cause the wheel, 15, to travel upon a circular path on the plate, 16, and a slow rotary motion will be imparted to the shaft, 13, and its pinion, 14, which will cause the rotary motion imparted to the shaft, *b*, to be slightly greater or slightly less than that imparted to the gear, 2, accordingly as the wheel, 15, is set upon one side or other of the axial line of the shaft, *b*.

It will be evident that by the adjustment of the wheel, 15, it is possible to vary the extent of the difference between the motion of the gear, 2, and that of the shaft, *b*, to any extent desired, so as to regulate these movements with the most extreme nicety. Any suitable means may be employed for shifting the wheel, 15, for instance a screw shaft, *q*, having a knob, *r*.

In the operative machine illustrated in the remaining figures of the drawings, there is a base or platform, A, supporting and forming part of the frame, B, which has bearings for the operating parts of the machine, those parts bearing the same letters and figures of reference as are to be found in Fig. 2, corresponding to the parts shown and described in said figure. The carriage, 17, slides upon guides, 20, and the holder for the bobbin, spool, or tube, consists of heads, 21, 22, adapted to enter the ends of the cop tube, the head, 21, being upon the shaft, *a*, while the head, 22, is upon a sliding rod, 23, the said head, 22, turning independently of said rod, which can be moved back and forth in its bearings in the frame, B, by means of a lever, D, so as to permit the heads to be separated to insert or withdraw the cop tube and then be brought into the ends of the tube to support the latter in place. The driving pulley, 24, driven from a belt or in any other suitable manner, turns loosely upon the shaft, *a*, but may be clutched thereto through the medium of any suitable clutch device J. As shown, the said wheel, 24, forms one part of a clutch, the other part of which is a tapering disk, 25, mounted so as to slide on but turn with the shaft, *a*, and fitting an opening in the wheel, 24, a spring, 27, tending to throw the clutch wheel, 25, into contact with the wheel, 24, so that the two will turn together. Means for withdrawing the wheel, 25, from the wheel, 24, is a pin, 28, having an inclined end that enters a groove in a hub, 26, of the wheel, 25, so that when the pin is forced toward the shaft, *a*, its bevel side will make contact with one side of the groove, 26, and will carry the wheel, 25, away from the pulley, 24. The pin is elevated and depressed by means of a lever, 29, pivoted to an ear on the frame with a hook or cam end entering a slot or opening in the pin, 28.

It is desirable to automatically arrest the operation of the machine as soon as a cop has reached its proper size. As the thread guide, *c*, bears against the surface of the cop at all times, it must slide outward with the latter as the size of the cop increases, and I therefore interpose connections between the thread guide, *c*, and the clutch device whereby the latter is shifted as soon as the thread guide reaches a determinate position, determined by the size of the cop that it is desired to wind.

It will be obvious to any skilled mechanic that different intermediate connections may be employed and according to the clutch device that is used. In the construction shown, where the lever, 29, is a means of putting the clutch into and out of operation, I connect the thread guide with the said lever which has a second arm 30, through the slotted end of which extends a rod, 31, threaded at the upper end and having a nut 32, the said rod, 31, passing through suitable guides upon the frame, and having a notch, *y*, which engages a lug, 33, upon a lever, 34, hung to any suitable portion of the frame. From a rock shaft, 37, extends an arm, 38, having at the lower end a beveled projection, 36, engaging with a beveled projection, 35, upon the lever, 34, so that when the shaft, 37, is rocked in one direction, the projections, 35, 36, are brought together so as to swing outward the lever, 34, in the direction of the arrow (Fig. 6); and an arm, 39, extends from the rock shaft, 37, and has a double beveled projection, 40, which when the carriage, 17, supporting the thread guide, *c*, is drawn out to a proper extent is engaged by a lug, 41, upon the said carriage. It therefore follows, that when the cop is of such a size, (which is the predetermined size,) that the carriage, 17, is drawn out sufficiently to cause the lug, 41, to make contact with the lever, 39, as the carriage reciprocates, then the end of the lever, 39, will be raised, the rock shaft, 37, will be rocked, the lugs, 35, 36, will be brought into engagement so as to swing outward the lever, 34, and carry the lug, 33, from engagement with the shoulder, *y*, when

the rod, 31, will be caused to descend by a spring, 42, and the clutch lever, 29, will be rocked so as to disengage the clutch and put the machine out of operation.

In order that the machine may be arrested at the proper time, according to any predetermined size of cop, the lug, 40, or the arm, 39, should be made adjustable. As shown, the arm, 39, is adjustable upon the rock shaft, 37, by means of a screw rod, 43, and a thumb nut, 44, the threaded portion of the shaft entering the nut.

I have found that in building up or winding cops of elastic threads, such for instance, as silk, that if the tension upon the thread is maintained uniform throughout the winding, the stricture upon the outer layers acting upon the elastic body beneath causes the cop to bulge out at the ends. I therefore combine with the winding devices means whereby, in regular proportion as the cop increases in diameter, the tension upon the thread is decreased.

It will be evident that different kinds of variable tension devices regulated according to the increasing size of the cop may be employed. I will now describe those that have proved to be effective: 45 is a swinging frame pivoted to the frame of the machine at 46, and having an upper cross-bar, 50, which bears against a lug, 51, on the thread guide frame, 17, whatever may be the lateral position of the latter, and an arm, 47, extending from the lower part of the frame, 45, is connected by a rod, 48, with a lever, 49, pivoted to a supplemental frame B′ and a lug, 52, at the upper end of the lever, 49, enters a slot in a carriage, C, sliding upon a guide rod, 53, supported rigidly by the frame B′ and a cord, *s*, is connected with the carriage, C, and passes over a guide wheel, 54, and carries a weight, W, so as to normally swing the lever, 49, in the direction of its arrow and thereby tend to maintain the frame, 45, and its cross-bar, 50, in contact with the lug, 51, on the guide frame, 17, and maintain the guide in contact with the face of the cop while permitting the carriage to yield as the cop increases in size. It will be apparent that as the cop increases in size and the frame, 45, swings outward, the carriage, C, will be moved in the direction of its arrow and I make this movement in the carriage the means of gradually decreasing the tension.

It will be evident that the carriage may be connected in any suitable manner with different kinds of tension devices so as to vary the action of the latter. Thus a shaft, 55, of a tension wheel, 56, which is a plain disk with a groove at the edge receiving the thread to be wound, is acted upon by a friction brake in the form of the jaws of a tongs, G, the said jaws, 57, 58, being curved to fit the face of the shaft and being pivoted together and extended to form diverging shanks, 59, which extend between lugs 600, 610, the latter weighted at W′ and both carried by the carriage, C. It is therefore evident that as the carriage, C, moves in the direction of its arrow toward the pivot of the shanks the pressure to bring them together and the friction upon the shaft, 55, of the tension will be decreased in proportion as the pressure approaches the fulcrum of the tongs. The lug or pin, 610, is hung to a loose frame, E, carried by the carriage, C, capable of moving vertically thereon, and the said frame is provided with weights, W′, which may be increased or diminished at pleasure so as to vary the pressure as may be required, according to the different character of threads to be wound.

As the threads sometimes are knotted or occasionally will get caught so as to fail to feed, I make provision whereby any such arrest in the movement of the thread will automatically arrest the action of the machine. Thus the thread passes over a guide pulley, 62, and around a pulley, 60 which is connected to the stop devices. As shown, the said pulley, 60, is carried by a lever, 61, which is moved in one direction by a spring, 63, and which yields in the other direction whenever the thread is caught. A stud, 64, upon the lever, 60, engages an arm, 65, connected with a rock shaft, 66, from which extends an arm, 68, in position to make contact with the inclined lower end of the lever, 34, and on the arm 65, is a shoulder, *w*. When the lever, 61, is drawn outward in the direction of its arrow, the stud, 64, bearing upon the shoulder, *w*, depresses the outer end of the arm, 65, rocks the shaft, 66, lifts the arm, 68, and forces outward the lower end of the lever, 34, so as to remove the lug, 33, from beneath the shoulder, *y*, and thereby throw the clutch out of operation as before described. The lever, 61, is so arranged that it can have a very extended movement to allow it to supply the thread to the ball or cop after the thread has been caught or arrested thereby preventing the breaking of the thread which would occur if no provision was made for a slight movement of the machine or cop after the thread has been arrested in its travel.

While I have described a gear, 14, in the shape of a pinion for imparting a movement to one of the shafts independently or additional to that of the gears between the two shafts and which is moved continuously, it will be evident that the said pinion may be moved intermittently, if desired.

In order to prevent the flock or fibers from the thread which is being wound from getting into the groove of the cam wheel, *e*, I provide the latter with a hood, *p*, and as the stud *g*, which extends from the guide carriage into the slot of the cam must extend through a slot, *u*, of this hood, I cover this slot with a plate, *i*, which extends from the carriage, 17, in opposite directions. To avoid making the said plate too long that is, double the length of the slot, I use a second plate *i′*, with a slot, *t*, in it with which the pin *g*, makes contact only after the upper slide, *i*, has moved for a certain distance but not far enough for the upper plate

to uncover the slot *t* so that the two slides together will always cover the slot.

I do not here claim the tension and thread take-up devices illustrated in Fig. 4 hereof, as the same constitutes the subject of a separate application for Letters Patent, Serial No. 451,386.

Without limiting myself to the precise construction and arrangement of parts shown, I claim as my invention—

1. The combination of the winding shaft, *a*, thread guide shaft *b* and connections for imparting reciprocation to the thread guide, gears connecting the two shafts, and means for imparting to one of said gears an additional rotary movement independent of that of the shaft, substantially as set forth.

2. The combination of the winding shaft, the thread guide, means for reciprocating said guide, and a shaft operating said means, connections between the two shafts whereby one is driven from the other, and means for imparting an increment of motion to part of the connections independently of the shaft, substantially as and for the purpose set forth.

3. The combination of the winding shaft *a*, driving shaft *b*, intermediate gears, and means for imparting an increment of motion to one of said gears independent of that of the driving shaft, substantially as described.

4. The combination with the two shafts, one for operating the cop and the other the thread guide of a winding machine, of gears connecting the two shafts, and means for moving one of said shafts in one direction independently of the movement of the other shaft to a limited extent, substantially as and for the purpose set forth.

5. The combination with the shafts *a*, *b* one operating the cop and the other the thread guide, of gears connecting the two shafts, a gear connection between one of the shafts and one of the gears, and means for turning said gear connection, to move said shaft independently of said gear, substantially as set forth.

6. In a machine for winding cops, a revolving holder, a reciprocating thread-guide, and means for varying the relative movement of the holder and guide at each rotation and adjusting devices for regulating the extent of the varying movement, substantially as described.

7. The combination of the winding shaft, the shaft driving the thread guide, gears connecting the two, means for imparting an additional rotary movement to one of the shafts, and adjustable devices for regulating the extent of said movement, substantially as set forth.

8. The combination of the cop shaft, thread guide, the shaft driving the thread guide, and gears between the two, one carrying a rack, a pinion carried by one of the shafts, and gearing with said rack, and means for controlling the turning of said pinion, substantially as set forth.

9. The combination of the cop shaft, thread guide, and the thread guide shaft of a winding machine and the gears between the two, of a rack carried by one of the gears, a pinion engaging with said rack and carried by one of the shafts, devices for controlling the turning of said pinion during the rotation of the shaft, and means for adjusting said devices to vary the movement of the pinion, substantially as set forth.

10. The combination of the cop shaft, the thread guide and shaft for driving the same, gears between the two shafts, a rack upon one of said gears, a pinion engaging with said rack and a shaft carrying the pinion, a wheel upon the pinion shaft, and a friction plate for said wheel, substantially as set forth.

11. The combination of the cop shaft, a thread guide, guide driving shaft *b*, intermediate gears, a rack on one of the gears, shaft, 13, carried by the shaft *b* and provided with a friction wheel and with a pinion in gear with the rack, and means for adjusting the said wheel to and from the axis of the shaft *b*, and a friction plate for said wheel, substantially as set forth.

12. The combination of the cop shaft, shaft connected to operate the thread guide, gears between the two shafts, one provided with a rack, a pinion on a shaft carried by one of the shafts, *a*, *b*, a friction wheel upon the pinion shaft, a friction plate for the friction wheel and means for sliding the wheel upon its shaft, substantially as set forth.

13. The combination of the cop shaft *a*, shaft *b* for driving the thread guide, gears between the two, one provided with a flange a rack, a yoke carried by one of said shafts, a shaft carried by the yoke, a pinion engaging with said rack, a friction wheel upon the shaft carried by the yoke and a friction plate for the friction wheel, and means for adjusting said friction wheel to and from the axis of the shaft *b*, substantially as set forth.

14. The combination with the shaft, of a thread winding machine and with the gears for driving the same, of a rack on one of the gears, a friction wheel, 15, and friction plate 16, therefor, a pinion connected with said friction wheel and engaging with said rack, and means for adjusting the wheel to vary the rotation of the pinion, substantially as set forth.

15. The combination of the cam, the slotted hood, the thread guide carriage, and the plate, *i*, of a supplemental slotted plate *i'* beneath the plate *i*, both plates sliding over the slot in the hood, substantially as and for the purpose described.

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

SIMON W. WARDWELL, JR.

Witnesses:

CHARLES E. FOSTER,

C. S. DRURY.