

No. 682,770.

Patented Sept. 17, 1901.

S. W. WARDWELL, JR.
WINDING MACHINE.

(Application filed Feb. 17, 1899.)

(No Model.)

4 Sheets—Sheet 1.

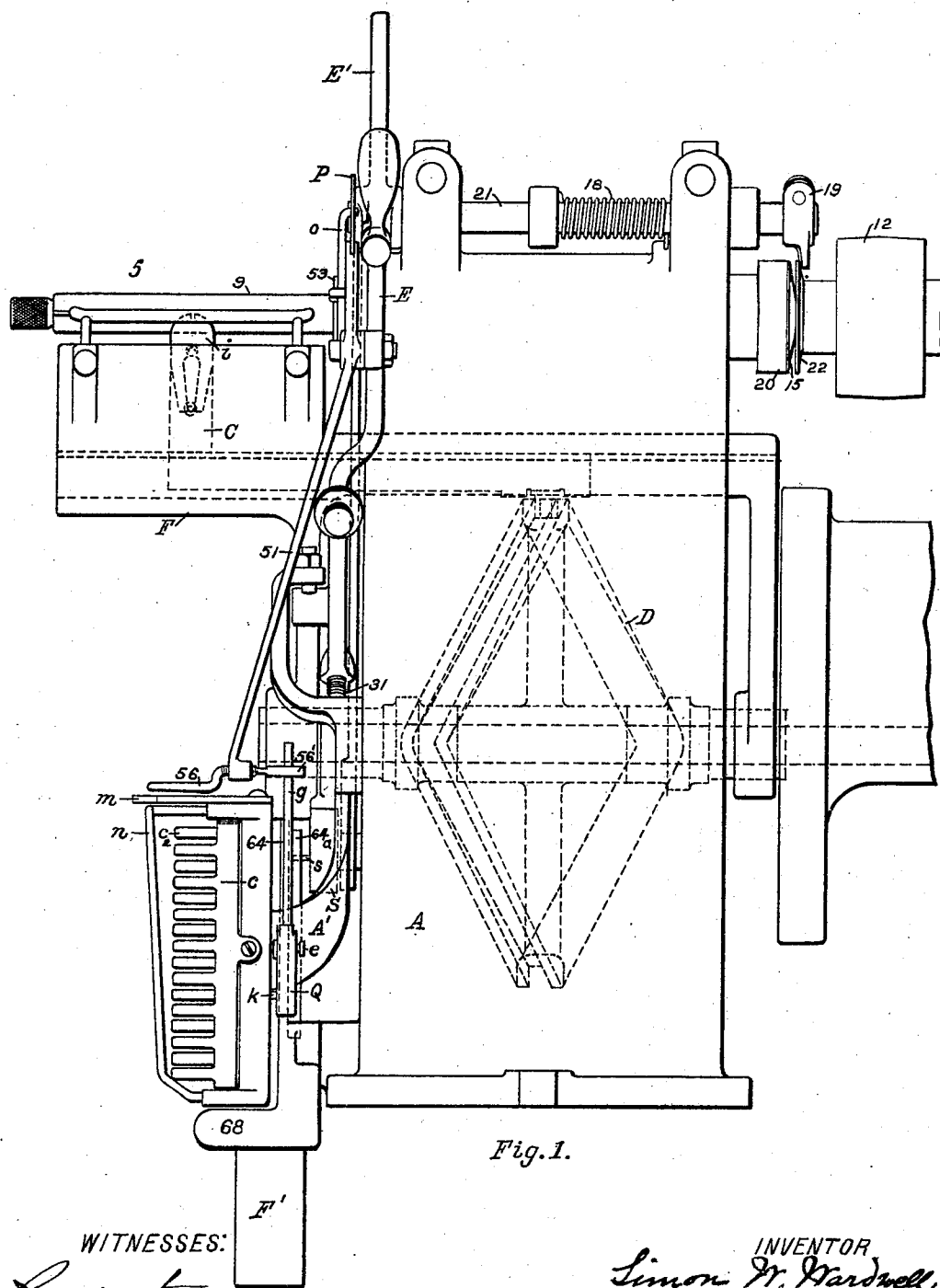


Fig. 1.

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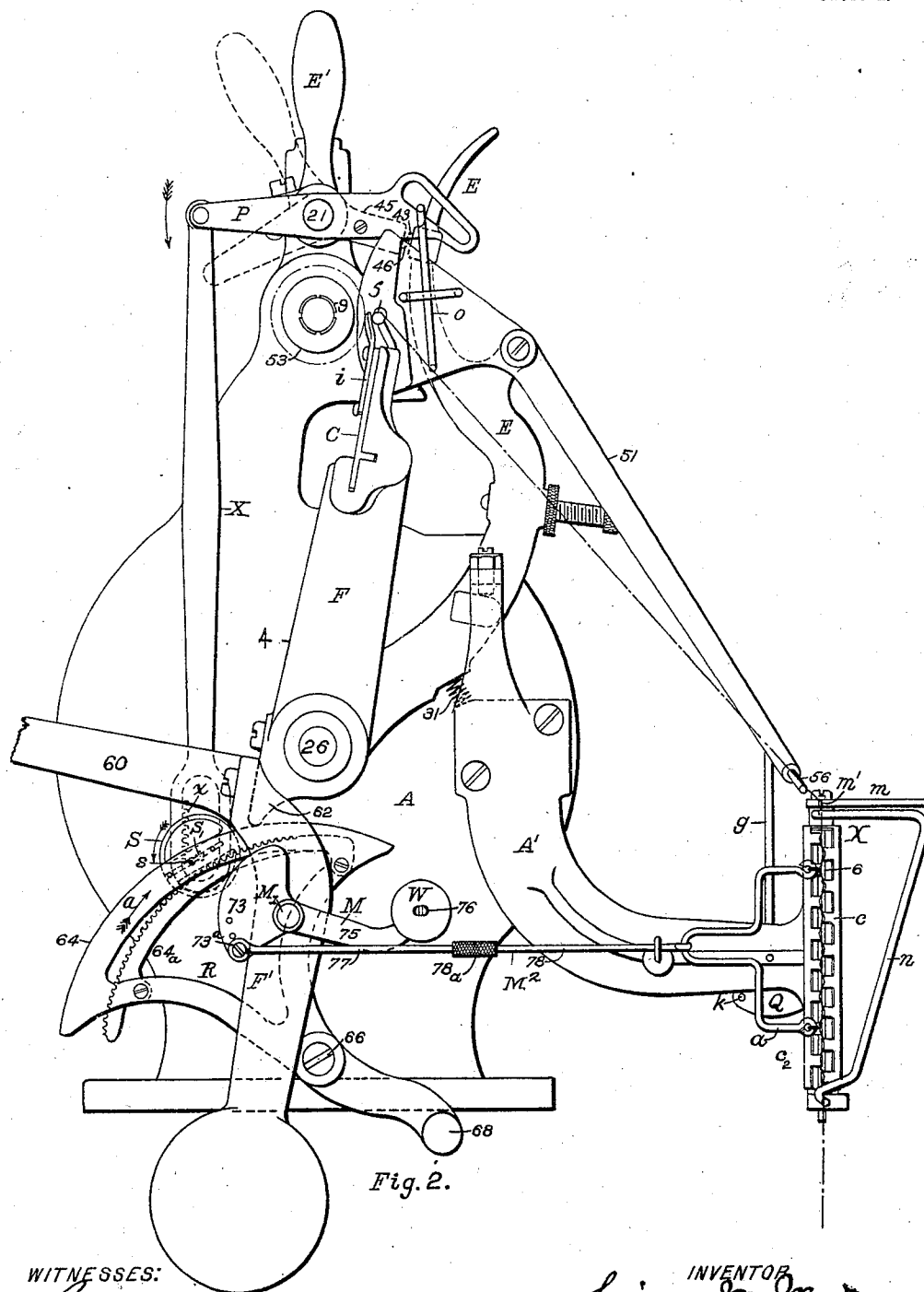
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4 Sheets—Sheet 2.



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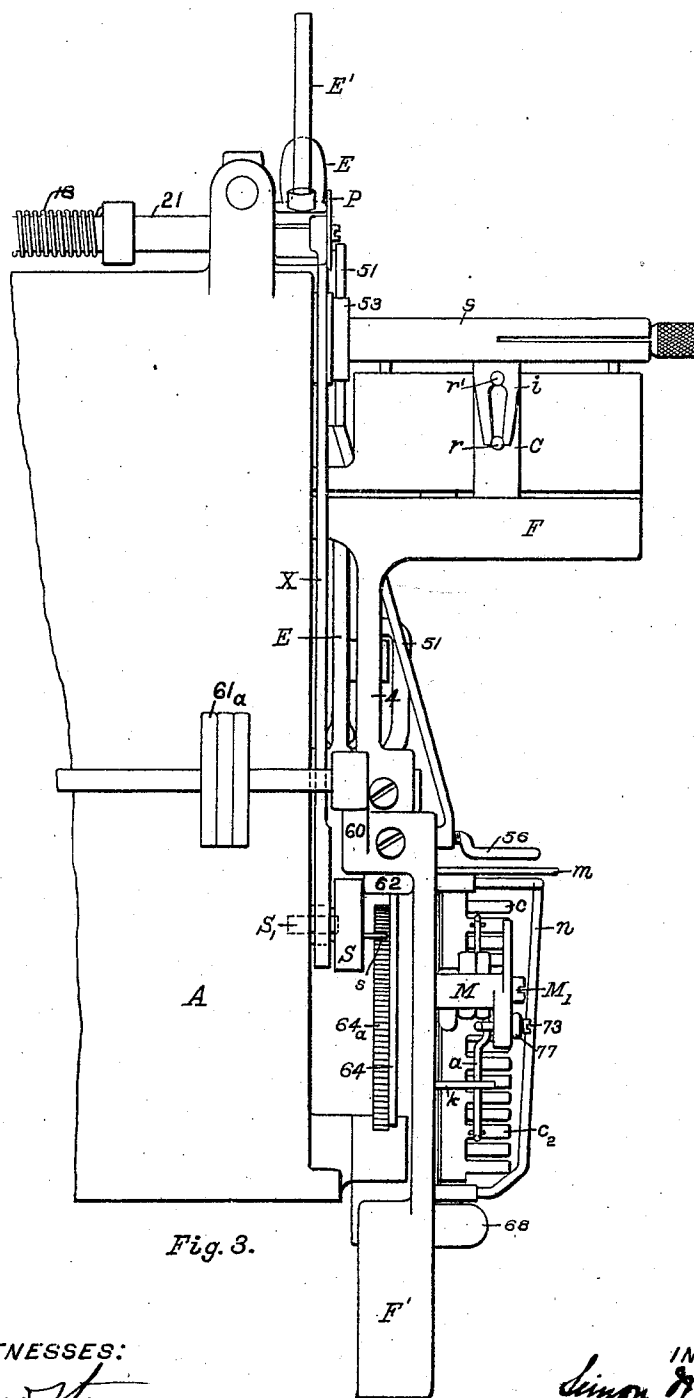
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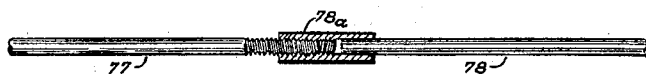


Fig. 4.

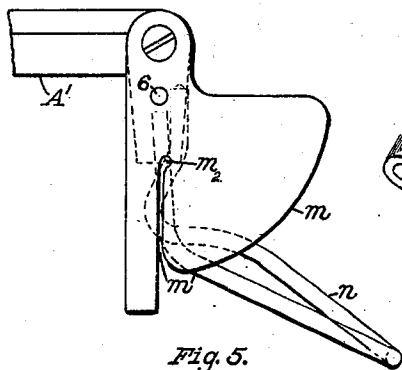


Fig. 5.

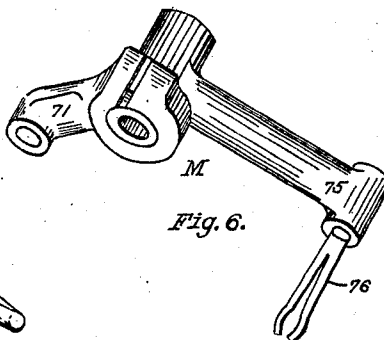


Fig. 6.

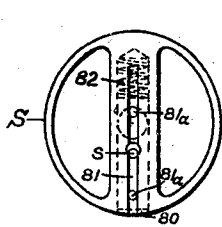


Fig. 7.

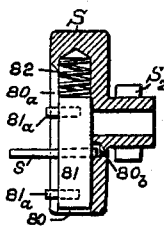


Fig. 8.

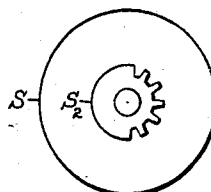


Fig. 9.

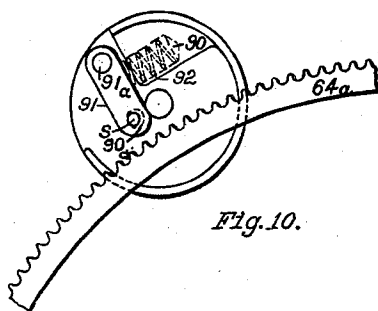


Fig. 10.

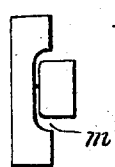


Fig. 11.

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UNITED STATES PATENT OFFICE.

SIMON W. WARDWELL, JR., OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO
UNIVERSAL WINDING COMPANY, OF PORTLAND, MAINE.

WINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 682,770, dated September 17, 1901.

Application filed February 17, 1899. Serial No. 705,802. (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 Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Winding-Machines, of which the following is a specification.

The objects of my invention are to automatically perform certain operations in the process of winding, the neglect of which would cause the production of inferior cops or packages, to provide means for eliminating the adhering bunches of fiber and bits of foreign matter, commonly called "slubs," and to so effect the winding as to prevent the cops or packages of yarn from bulging at the ends.

In producing cops or cones of the character set forth in Patents Nos. 486,745 and 607,202 the thread-guide must at all times be against the surface of the package. In replenishing the supply and at other times in piecing broken ends it is frequently necessary to move the thread-guide away from the cop in order to more easily get at the loose end of the yarn, and when the cop has attained its full size the guide should be moved back away from the cop, so that as the latter is removed the guide shall not abrade the yarn nor displace the outer coils. It is now customary to move the guide away by hand when piecing; but careless operators often neglect to replace the guide against the surface of the cop before restarting the winding, and again when the package is completed as they have no loose end to look out for they frequently neglect to move the guide away preparatory to removing the package from the winding-spindle. The bulging referred to is due to the following cause: With machines in which the winding-spindle has a constant speed of rotation the increasing lineal speed of the material wound due to the increase in diameter of the package causes an increase of tension. This increasing tension, in conjunction with the inherent elasticity of the material, causes the exterior layers of the package to exert a constricting pressure upon the interior mass, thereby forcing the ends outward. To obviate these difficulties, I have invented devices for mechanically with-

drawing the thread-guide from the package whenever the machine stops and, if desired, also for mechanically replacing it again when the winding is started and for mechanically gradually decreasing the tension on the material, so that the constricting pressure of the exterior layers shall never be sufficient to result in bulging.

I shall describe my invention as applied to machines substantially such as are described in Patents Nos. 536,672 and 567,871. It is equally applicable whether the machine winds cylindrical packages or is fitted to wind cones—as, for instance, by means of any of the devices indicated in Patent No. 562,263 or in other machines where the speed of the yarn gradually varies. So far as practicable I shall make use of the same reference characters that are used in the patents cited, and for convenience shall designate the material wound as "yarn" without limiting myself thereto, for my invention is also available in winding other materials.

In the accompanying drawings, Figure 1 is a front elevation of the machine. Fig. 2 is a side elevation. Fig. 3 is a rear elevation. Figs. 4, 5, 7, 8, and 9 show details of the structure. Figs. 6, 10, and 11 show modifications of the structure.

A is the frame of the machine, which supports in suitable bearings the winding-spindle 9 and the shaft 26. To the latter is attached the cam D, which through suitable connections imparts to the guide-carrier C the guide *i*, attached thereto, a reciprocating motion.

F is a swinging frame which sustains and guides the carrier C and which, pivoted concentrically with the cam-shaft 26, permits the thread-guide *i* to bear at all times against the package being wound and to be pressed back away from the winding-spindle with the increasing diameter of the package.

There is also a stopping device of any usual or suitable character—such, for instance, as set forth in Letters Patent No. 536,672—connected with the shaft 21, which is adapted to be turned by the spring 18 in the direction indicated by the arrow, Fig. 2, to stop the winding.

Attached to the shaft 21 is a handle E', hav-

ing an arm 45, provided with a detent-shoulder 46 and with a slotted arm of a lever P. The detent-lever E, forced toward the shaft 21 by means of the spring 31, is also provided with a shoulder 43, which when engaged with the detent 46 resists the tendency of the spring 18 to rotate the shaft 21 to stop the machine.

Pivoted to the lever E is the end stop-bar 51, having at its upper end a cam-formed edge adapted to engage the periphery of a rotating disk 53 on the winding-spindle 9, thereby forcing back the detent-lever E, disengaging the shoulders 43 and 46, and permitting the stopping device to operate to stop the winding. At the lower extremity of the end stop-bar 51 is the thread-bearing bar 56, which, held down by the yarn under tension, restrains the upper end of the bar 51 from engaging with the disk 53 to cause the winding to stop.

A' is a bracket to support the separable tension device and the pivot of a block Q. The tension device, as shown, consists of two separable combs c c^2 , of sheet-steel, one rigidly attached to the bracket A' and the other pivotally attached thereto by means of the rod 6, on which it swings freely. The tension fingers or teeth of the combs are so related that those on the movable comb swing between and through those of the fixed or rigid comb, thereby opening the tensions to receive the yarn. Attached to the movable comb c^2 by means of jointed connections is the wire yoke a .

On the opposite side of the bar 51 projects an extension 56' of the bearing-bar 56. The arm P and the end stop-bar 51 are, through a link o , pivoted at the lower end, so connected that when the shaft 21 rocks in stopping the winding the lower extremity of the bar 51 is depressed, causing the projection 56' to strike against a vertical projection or arm g of the block Q, swinging the latter to one side and bringing an arm k against the yoke a of the tension device T, and thereby forcing the tension open, as set forth in my application Serial No. 696,461.

To the top of the tension-bracket I attach the plate m , suitably formed to guide, in conjunction with the guide-wire n , the yarn to its appropriate place in the tension and into a slit m' in the plate.

The slit m' , Fig. 5, is made of such size that the yarn will just draw freely through it. In the process of spinning bunches of fiber and sometimes of foreign material are incorporated with the yarn, forming what are termed "slubs." The latter detract from the value of the fabric into which the yarn is manufactured, and it is to eliminate them that I employ the plate m . The slit m' , while of size to admit the yarn, will not allow one of these slubs to pass, so that when such a slub occurs the yarn breaks. The operator then removes the slub before tying up the yarn. Incidentally, the plate serves to strip off any loosely-adhering bunches of fiber or of foreign material. The inner end of the slit is wholly open

or communicates with an opening m^2 , which serves as a vent for lint and dirt and prevents them from clogging the slit. The yarn when drawn through the plate m and carried by the guide has a reciprocating movement in the slit corresponding to that of the reciprocating guide i , so that any matter in the slit is pushed out by the thread at either end of the slit. Were it not for this vent the slit would become packed with the lint and dirt and would be extremely difficult to clear. It is essential that the slit be made to join the hole at a tangent on the side toward which the yarn draws, as indicated, for otherwise a shoulder would be formed that, catching the yarn, would hold it, thereby stopping its reciprocating movement in the slit. Instead of the construction shown in Fig. 5 the slit may be formed of two adjacent plates, as in Fig. 11.

In order to vary the tension upon the yarn as the packages increase in diameter, I so connect a tension-weight W or its equivalent with the movable comb that it shall act thereon with constantly-decreasing leverage. This may be effected in different ways. Thus to the frame F, Fig. 3, is attached a counter-weight F', and to the side of the latter I pivotally connect a weighted lever M. Thus the lever may have an arm 75 with pin 76 for receiving one or more weights W and an arm at 73 with an adjustable pin 73^a for attaching a connecting-rod M². The arm 73 preferably balances the arm 75, so that the tension shall be due only to the weight applied. The pin for attaching several weights W is of such formation that weights may be readily added or removed. Thus the outer end of the pin 76 is split and the two portions are spread apart so that they must needs be sprung together in order to receive the tension-weights. The split end is further so formed that the weights can be readily applied, and having been applied the expanded end of the pin restrains them from being shaken loose or otherwise accidentally displaced. A rod M² serves to connect the lever M with the yoke a and is extensible. Thus it consists of the sections 77 78 and sleeve 78^a. The extremity of the rod 77 is provided with a screw-thread adapted to engage with a corresponding internal thread in the sleeve 78^a, Fig. 4. By screwing the section 77 a greater or a less distance into the sleeve 78^a the length of the rod M² may be varied, either to adapt the part 77 to any one of various positions of the pin 73^a or to adjust the position of the weight W. The position of the lever M is such that when the thread-guide i is against the spindle and before the cop is commenced the center of the weight W shall be on or near the horizontal line passing through the center of the pivot M'. As the winding progresses the guide i is pressed back away from the cop, causing the weight W to rise. As the weight rises the leverage about its fulcrum—the pivot M'—decreases, while the leverage of the resistance of the tension about

the same fulcrum increases, so that the actual pressure on the tension diminishes gradually until the package has attained its full diameter.

- 5 It is sometimes desirable to vary the rate at which the tension shall change or to cause a greater or less variation between the initial tension applied at the commencement of the cop and the final tension at its completion.
- 10 This can be attained in several ways. I prefer to adjust the position of the pin 73^a. Thus I provide a series of holes in the arm 73, in which holes the connecting-pin 73^a may be suitably inserted. It can also be accomplished by making one arm of the lever M adjustable in respect to the other, so as to be set at any desired angle. As shown in Fig. 6, the arm 71 is adjustable on a collar of the arm 75.
- 20 As the top of the frame F swings back away from the spindle 9 it is prevented from returning thereto by a suitable detent R. As shown, the detent is pivoted at 66 to the frame and provided with a cam 64. This latter member is so arranged that its cam-surface constitutes a bearing for a toe 62, projecting from the frame F. The cam 64 is suitably counterweighted at 68, so that as the frame F moves back the cam is kept constantly in contact with the toe 62. When it becomes necessary to bring the guide *i* back to the spindle in order to start a new cop, the cam 64 is withdrawn, allowing the guide *i* to resume its initial position. In order to mechanically move the guide *i* away from the package when the winding is stopped and, if desired, to also mechanically replace it against the surface of the package before the winding is again started, I interpose suitable connections between the cam 64 and the starting and stopping device or other part of or on the machine, which connections during the operation of stopping cause the cam 64 to force the guide *i* away from the package, and during the starting said connections withdraw the cam 64 from under the toe 62, allowing the guide *i* to return to the surface of the package, and, finally, disengaging from the cam 64, leave the latter free to follow up the toe 62 during the subsequent winding to prevent a return movement of the guide *i*.

I will now describe certain connections which have proved effective.

- 55 A rotatable disk S is pivotally attached to the frame A by a pin S'. From said disk projects a small pin *s*. The latter is located at a slight distance from the center of the disk, so that as the latter rotates the pin *s* moves in the arc of a circle, intersecting the pitch-line of a curved rack or sector 64^a, attached to the cam 64. The disk S is so related to this sector that as the disk is moved through a partial rotation the pin *s* enters into engagement with the teeth of said sector and after slightly moving the latter emerges from said engagement, leaving the sector and the cam 64, to which it is attached, entirely unimpeded.

This feature is essential, for the cam 64 must at all times during the winding be free to follow up the toe 62 to prevent the return of the guide *i* inward toward the spindle from any position to which it has been forced by the increasing diameter of the package. Further, when the machine is stopped to remove a completed package the pin *s* must be out of engagement with the sector, so that the cam 64 can be moved back to return the thread-guide *i* to the spindle preparatory to winding a new cop. Attached to the disk S on the side opposite that from which the pin *s* projects, is the toothed hub S². Meshing with the teeth on this hub is a toothed rack *x* on a rod X, which is connected with the lever P or otherwise operated from some part of the stopping and starting device. When the stopping device operates, the starting-lever arm P, moving in the direction indicated by the arrow, Fig. 2, imparts to X a downward movement, causing the disk S to make a partial rotation. By this partial rotation pin *s* is forced into engagement with the sector 64^a, pushes it in the direction indicated by the arrow *a*, Fig. 2, thereby moving the thread-guide *i* away from the package being wound, and disengaging itself from the sector 64^a leaves the cam 64 free to be moved in either direction. When the handle E' is moved to start the winding, the disk S is rotated in the opposite direction and the pin *s* enters into engagement with the sector 64^a, withdraws the cam 64 from under the toe 62, thereby allowing the frame F, acted on by the weights 61^a, Fig. 3, on the arm 60, to swing in and carry the guide to the surface of the cop, when the pin *s* again disengages itself from the sector, leaving the cam 64 free to follow the toe 62 as the guide *i* is pushed back by the increasing diameter of the cop. It is obvious that the machine may be stopped at such a time that the pin *s*, instead of properly engaging with one of the teeth of the sector 64^a, will strike directly on top of a tooth in such a manner as to prevent the action of my device and also the operation of the stopping device to stop the winding. Moreover, the teeth on the sector 64^a are of necessity quite fine, so that great depth of tooth is inadmissible. It would then be necessary, unless otherwise provided for, that the pin *s* and the sector 64^a be very carefully fitted to insure their working properly. Were the sector 64^a located too far from the pivot 66 of the cam 64 the pin *s* would, if rigidly connected with the member S, "bottom" in the sector with substantially the same result as when striking on the top of the tooth, as above set forth. I therefore so connect the pin *s* with the member S that it can yield slightly radially, and I round the tops of the teeth of the sector 64^a, so that the pin *s* instead of striking dead on top of a tooth will yield and passing over the obstructing tooth enter into the adjoining tooth-space.

Extending diametrically across the mem-

ber S and nearly through the same is the circular channel 80, in which moves a slide 81, guided by the pins 81^a, working in the slot 80^a. The pin *s* is attached to 81, extending through the slot and projecting into the recess 80^b. The latter is enough larger than the pin *s* to permit the requisite movement of the pin *s*. Behind the member 81 is the spring 82, which forces the pin *s* outward from the center of S against the opposite side of the recess 80^b and permits it to yield inward toward the center when it strikes an obstruction, as before described. Fig. 10 shows another construction of the member S, by which the same result is attained. In this case the slide 81 is replaced by the swinging arm 91, pivoted on the pin 91^a. The pin *s* extends through the arm 91 into a pocket or recess 90^a, which limits its motion. The spring 92, held in the circular pocket 90, presses the pin *s* outward.

Having described in detail my improved construction and indicated the relation of its various members to those of an existing structure of winding-machine, I will now describe its action.

The machine being ready for winding, the handle E' stands in the position indicated by the dotted lines, Fig. 2. The pin 56' depressed and in contact with the arm *g* holds the tension open. The yarn is drawn through the tensions, and guided by the wire *n* and the curved edge of the plate *m* finds its position in the tensions and the slit in the aforesaid plate. Thence it is drawn over the pick-up bar 5 and attached to the winding-spindle. The winding is started by turning the handle E' to the right, Fig. 2, until the detent-shoulders 43 and 46 engage. The thread-guide *i*, passing under the yarn, picks it up and lays it in place on the surface of the package. The end stop-bar 51 tends to assume its position of equilibrium, and in so doing its lower end rises until the bearing-bar 56 comes in contact with the yarn, which under tension prevents the cam-surface of the upper end of 51 from coming into contact with the rotating disk 53 on the spindle 9 to stop the machine. Coincident with this action the member Q, freed from the restraint of the member 56', assumes a vertical position, and carrying the pin *k* away from the yoke *a* allows the tensions to close under the action of the weight W, acting through the intermediate connections. The movement of the handle E' to start the winding also raises the connecting-rod X, causing the member S to make a partial rotation, carrying the pin *s* into connection with the sector 64^a, withdrawing the cam 64 from contact with the toe 62, and causing the pin *s* to emerge again from the sector, leaving the cam 64 free to return to contact with said toe 62 on the frame F. During the process of winding as the cop increases in diameter the frame F is pressed back from the spindle, this action causing the weight

W to rise, diminishing its effect on the tension. In the meantime the plate *m* cleans from the yarn most of the slubs. If one occurs which is too firmly incorporated with the yarn to be eliminated, the yarn breaks, and as the restraint is removed from the bearing-bar 56 it flies up, causing the machine to stop. In the action of stopping the upward movement of the slotted end of the arm P lifting the upper end of the bar 51 causes the tension to open, forces the connecting-rod X downward, causing the disk S to make a partial rotation, and through the pin *s*, the sector 64^a, and cam 64 swings back the guide-frame F and moves the guide *i* back away from the package. This permits the operator to tie up the loose ends without touching the frame F. When the machine is again started, the same cycle of operations occurs, the tensions being mechanically closed and the thread-guide *i* brought back against the cop.

While I have shown and described the pivoted or swinging guide-carrier frame F and means for moving it back mechanically on the stopping of the machine, I do not limit myself to this construction, as the guide-carrier may slide back, as shown in my Letters Patent No. 531,081, and any suitable connections may be employed for throwing it away from the cop when the machine is arrested and for releasing it and carrying it back when the machine is started. It will further be evident that different devices may be used to mechanically and gradually shift the relation of the combs *c c'* as the cop increases in size, and that the various parts may be otherwise constructed than as shown; also, that tension devices of different forms may be employed in some cases.

Without limiting myself to the construction and arrangement shown, I claim—

1. The combination with a tension device provided with separable combs, and with a spindle and guide supported to move outward with the increase in diameter of the cop, of means for rotating the spindle and for reciprocating the guide and connections between the guide and the tension device whereby to vary the pressure upon the movable comb as the guide moves away from the spindle, substantially as set forth.

2. The combination with the rotating spindle, guide movable to and from the spindle and tension provided with separable combs, of means for drawing the combs together and connections between the guide and tension device for varying pressure upon the movable comb as the cop increases in diameter, substantially as set forth.

3. The combination with a tension device having separable combs, of means for bringing the combs together and means for automatically and gradually separating the combs to decrease the tension, substantially as set forth.

4. The combination in a winding-machine, of a tension device consisting of two combs for receiving the thread between them, means for moving one of the combs, a reciprocating guide, swinging frame supporting the guide, and connections between the frame and the movable comb arranged to vary the pressure upon the movable comb as the guide moves outward, substantially as set forth.

5. The combination with a thread-guide and pivoted frame carrying the same, and with a tension device, of a weighted lever pivoted to said frame and connected with the tension device, substantially as set forth.

6. The combination with a thread-guide and pivoted frame carrying the same and with a tension device, of a weighted lever pivoted to said frame and connected adjustably with the tension device, substantially as set forth.

7. The combination with a spindle, guide and pivoted frame carrying the guide, of a tension device having separable combs, a weighted lever pivoted to said frame, and connections between the lever and one of the combs, substantially as set forth.

8. The combination with the spindle, guide-frame, a guide carried thereby, means for reciprocating the guide, and a detent for preventing the inward movement of the frame while permitting the free outward movement thereof, of devices arranged to mechanically move said detent as the machine is started to then release the frame, substantially as set forth.

9. The combination of the spindle, guide, frame F and detent 64, and connections arranged to shift the detent as the machine is stopped and started without otherwise affecting its operations, substantially as set forth.

10. The combination of the spindle, guide, pivoted guide-frame, pivoted detent provided with a cam and with a toothed rack or sector, a stopping and starting device, disk provided with a pin to engage the sector and means for rotating the disk on the movement of the stopping and starting device, substantially as set forth.

11. The combination with the pivoted guide-frame and sector, and stopping and starting device, and disk S rotated therefrom,

of a yielding pin s carried by the disk, substantially as set forth.

12. The combination of the spindle, guide, swinging frame F, and tension device, of a weighted lever M pivoted to the frame F and connected to apply and relieve the tension, substantially as set forth.

13. The combination of the spindle, guide, swinging frame F and tension device, of a weighted lever M pivoted to the frame F and adjustably connected to relieve and apply the tension, substantially as set forth.

14. The combination in a winding-machine of a rotating spindle, a frame movable to and from the spindle, a guide-carrier supported and reciprocated entirely on the movable frame, and independent of the rest of the machine so that it shall be moved bodily with the movable frame, a guide, carried by the carrier, devices for starting and stopping the winding, and connections between the starting and stopping devices and the movable frame whereby the latter is mechanically shifted to move the guide away from the surface of the package when the winding is stopped, and to return the guide to the surface of the package when the winding is started, substantially as described.

15. The combination in a winding-machine of a rotating spindle, a frame mounted to swing to and from the spindle, a reciprocating carrier supported and carried on the swinging frame, independent of the main body of the machine, to move with the swinging frame to and from the spindle, a guide carried by the carrier, devices for starting and stopping the winding, connections between the starting and stopping devices and the swinging frame whereby the latter is mechanically shifted to move the reciprocating thread-guide away from the surface of the package when the winding is stopped and return it thereto when the winding is started, substantially as described.

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

SIMON W. WARDWELL, JR.

Witnesses:

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