

C. RYDEN & F. D. BABCOCK.
WINDING MACHINE.
APPLICATION FILED FEB. 10, 1911.

1,062,930.

Patented May 27, 1913.
3 SHEETS—SHEET 1.

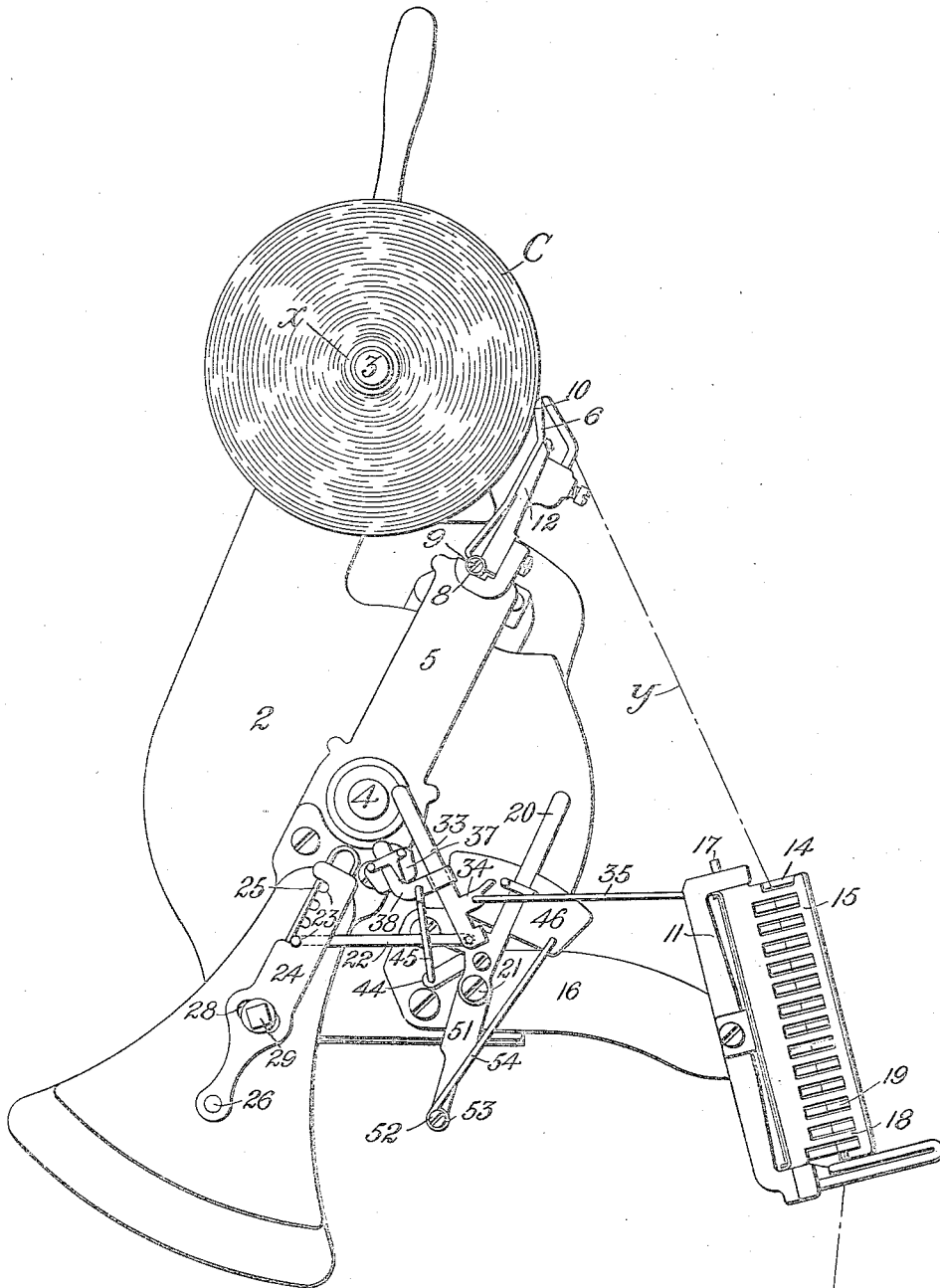


Fig. 1.

WITNESSES:

W. C. Bender.
C. S. Brown.

INVENTORS:

Claes Ryden and
Frank D. Babcock

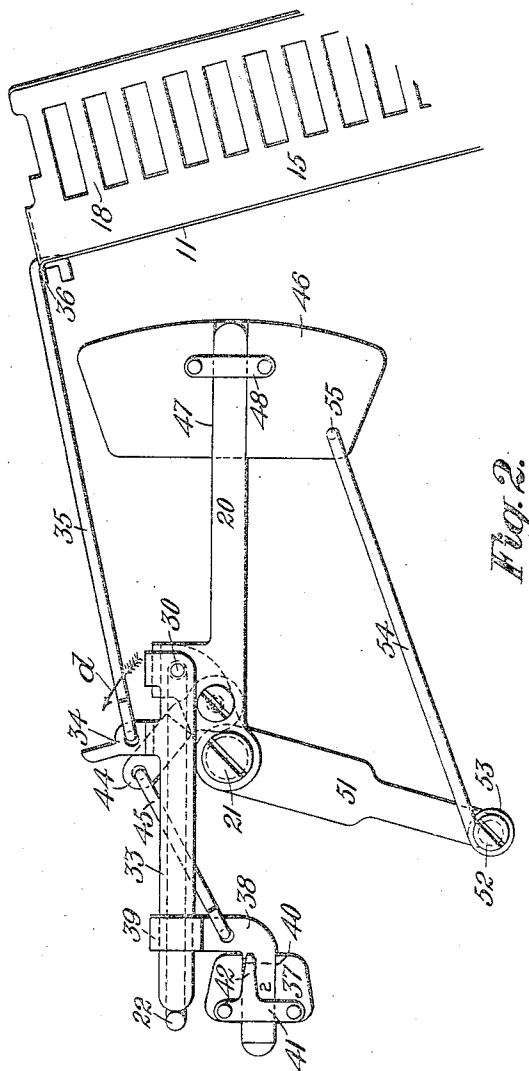
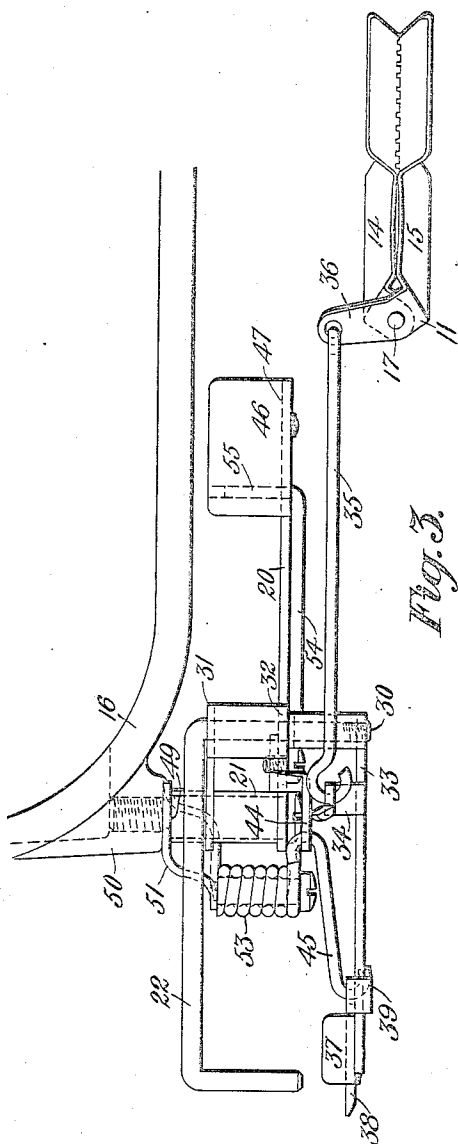
By J. Peter Freeman Watson & Co.
ATTORNEYS

C. RYDEN & F. D. BABCOCK.
WINDING MACHINE.
APPLICATION FILED FEB. 10, 1911.

1,062,930.

Patented May 27, 1913.

3 SHEETS—SHEET 2.



WITNESSES:

M. C. Bender
C. L. Brown.

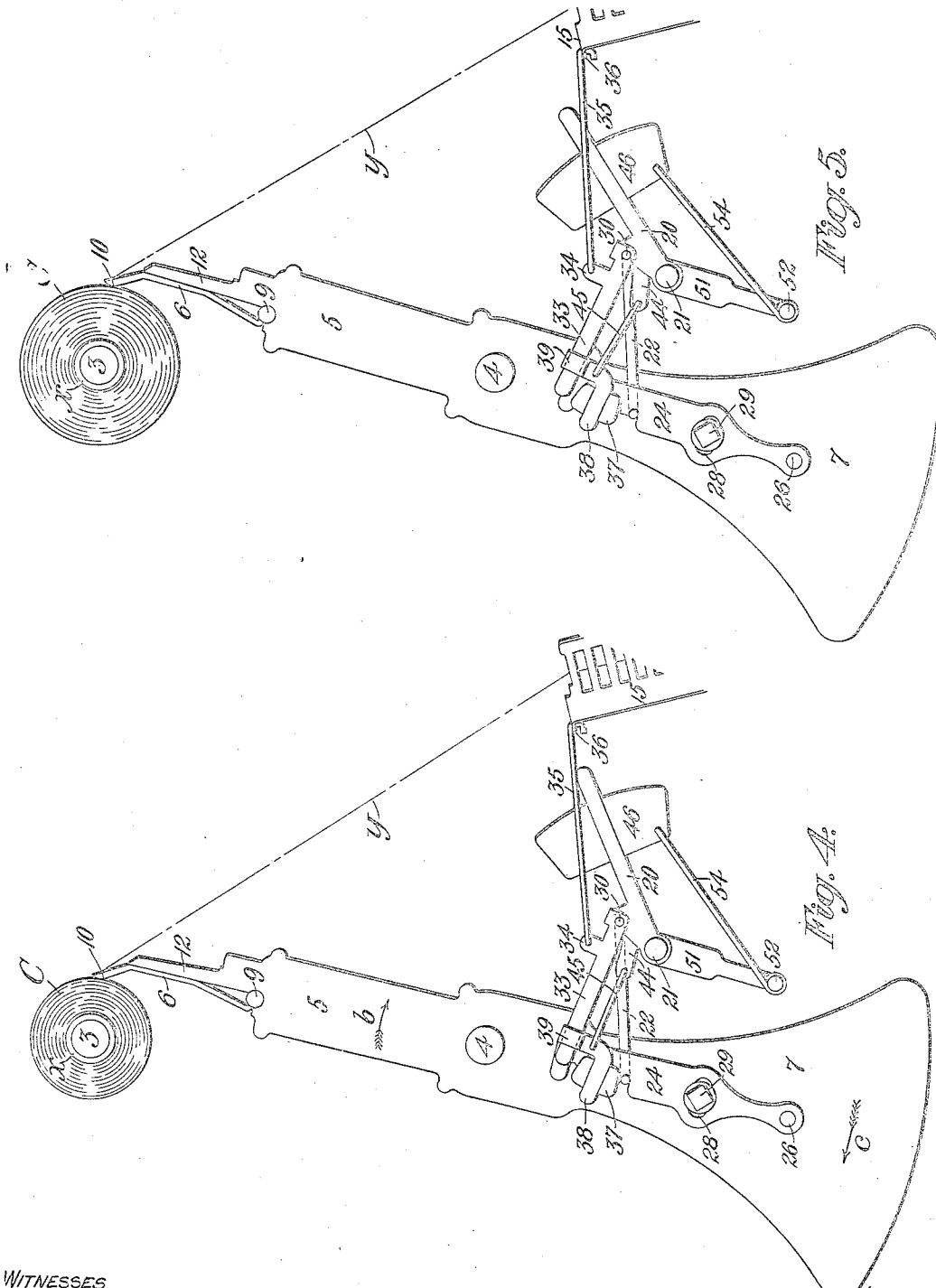
INVENTORS:
Claus Ryden and
Frank M. Babcock
By Foster Furman Watson & Co.
ATTORNEYS

C. RYDEN & F. D. BABCOCK.
WINDING MACHINE.
APPLICATION FILED FEB. 10, 1911.

1,062,930.

Patented May 27, 1913.

3 SHEETS—SHEET 3.



WITNESSES

W. C. Bender
C. L. Brown

INVENTORS
Claus Ryden and
Frank S. Babcock
BY *[Signature]*
Peter Freeman Watson & Co.
ATTORNEYS

UNITED STATES PATENT OFFICE.

CLAES RYDEN AND FRANK D. BABCOCK, OF PROVIDENCE, RHODE ISLAND, ASSIGNORS
TO UNIVERSAL WINDING COMPANY, OF PORTLAND, MAINE, A CORPORATION OF
MAINE.

WINDING-MACHINE.

1,062,930.

Specification of Letters Patent.

Patented May 27, 1913.

Application filed February 10, 1911. Serial No. 607,797.

To all whom it may concern:

Be it known that we, CLAES RYDEN and FRANK D. BABCOCK, citizens 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.

Our invention relates to winding machines and particularly to the devices for controlling the tension on the yarn during its delivery to the winding spindle; and the means for regulating the pressure of the thread-guide against the cop or package as the yarn is deposited thereon.

The purpose of our invention is to automatically vary both the tension under which the yarn is wound and the pressure of the thread-guide against the cop as the latter increases in diameter from start to finish of the winding.

The invention is fully set forth in the following specification, illustrated by the accompanying drawings, in which:—

Figure 1 is a front elevation of a usual form of winding machine, showing our invention applied thereto, and illustrating the parts in the position which they assume at or near the completion of winding a cop; Fig. 2, an enlarged side elevation of the device, showing the position and relation of the parts at the beginning of the winding; Fig. 3, a plan view of the same showing the parts in detail; Fig. 4, a diagrammatic view showing the position of the parts of the device shortly after the winding is commenced when the cop has been built up to about one-third of its full diameter; Fig. 5, a similar view showing the position of the parts at a later period of the winding when the cop is about half completed.

Referring to Fig. 1, the winding machine here shown is similar in general respects to that described in U. S. Patent No. 786,862, granted to S. W. Wardwell, April 11th, 1905. It comprises the essential elements of a main frame 2 having bearings for the rotating winding spindle 3 and cam-shaft 4. Pivoted on the cam-shaft 4 is a swinging traverse-frame 5 which carries the reciprocating thread-guide 6. The frame 5 is counterweighted by the depending arm 7 which extends downward from its pivot point and flares out in a substantially fan-shaped end having sufficient weight to coun-

terbalance the upper portion of the frame and the parts which it carries. Near the top of the frame 5 is a groove 8 extending parallel to the axis of the winding spindle and adapted to serve as a bearing for the sliding traverse-bar or rod 9. The traverse-bar 9 is reciprocated back and forth in the groove 8 by the usual traverse-cam, or through any other suitable means, not here shown or described. Secured to the front end of the traverse-bar 9 is the thread-guide 6 which reaches up in position for its rounded face 10 to bear on the surface of the cop. The yarn *y* leads up from the tension-device 11 and passes through a groove or slit in the thread-guide, and thence to the surface on which the winding is being performed. At the beginning of the winding the thread-guide 6 bears on the periphery of the cop-tube *x* which is held on the winding-spindle 3, and as the layers of yarn are built up on the tube the traverse-frame swings out from the spindle with the increase in diameter of the cop. It will be noted that the traverse-frame 5 has a back or guiding-plate 12 which bears on the rear face of the thread-guide 6 to keep the latter pressed against the surface of the winding. By providing means to resist the swinging movement of the traverse-frame, and thereby the outward movement of the thread-guide away from the winding-spindle, the pressure of the guide against the cop is maintained at all times from start to finish of the winding. This insures that the coils of winding will be laid on the cop with accuracy and precision to produce a systematically wound package by the improved method now generally known as the "Wardwell" or "universal" wind.

It will be obvious that in a machine of this character when the winding-spindle rotates at a constant speed, the lineal speed of the delivering yarn will increase constantly as the cop increases in diameter. In other words, as the cop increases in circumference the yarn will be taken up with constantly accelerated speed from start to finish of the winding. Under ordinary conditions this increase in speed of draft on the yarn will cause a corresponding increase in the tension or resistance to delivery of the yarn. That is to say, when a uniform tension is normally applied to the yarn at the tension device to control its delivery to the winding-

spindle, as the lineal speed of the yarn increases and it runs faster through the tensions the amount of tension applied by the tension-device will be correspondingly augmented. It is a well known principle that this condition must be avoided in order to wind at high speed to the best advantage. In fact, it has been found that the best results are obtained by gradually decreasing or relieving the tension on the yarn as the cop builds up to its full diameter. When the first layers of winding are being deposited on the cop-tube it is necessary to apply a strong tension on the yarn to maintain the coils in place and prevent them from slipping. Moreover, as the cop increases in diameter the outer layers will have a considerable constrictive pressure on the inner mass and therefore the central core of the cop must be wound hard and firm to resist this constriction. It is therefore desirable to wind the first layers of the cop with a maximum tension and to gradually decrease this tension so that the outer layers will not have too great a pressure on the inner ones. For the same reason it is also desirable to relieve the pressure of the thread-guide on the cop as the latter grows in diameter. At the beginning of the winding a maximum pressure is required to press the coils firmly on to the surface of the cop; but after the cop reaches a substantial diameter the coils will be more easily maintained in position and the pressure of the guide can be relieved. In other words, there is less tendency of the coils to slip on a large circumference than on a comparatively small one so that less pressure on the guide is required as the cop nears completion. It will therefore be seen that it is desirable, in fact necessary, to relieve both the tension on the yarn and the pressure on the thread-guide as the cop grows in diameter so that the constriction of the outer windings will not disturb the inner layers and cause the cop to bulge at its ends.

In the U. S. Patent No. 869,604 to S. W. Wardwell, granted October 29th, 1907, there is shown a device which acts concurrently with the movement of the thread-guide as it recedes from the winding-spindle to automatically vary both the tension on the yarn and the pressure on the guide. The present invention is an improvement over the device of this patent, and the particular object now sought is: first, to maintain the tension on the yarn at its maximum degree during the winding of approximately one-third of the cop, and thereafter to cause a rapid decrease in the amount of tension; and second, to effect a more rapid relief of the pressure on the thread-guide than is possible with the arrangement previously disclosed. This effect is obtained through the operation of the instrumentalities now described.

The tension device 11 may be of any well

known form and as here illustrated consists of two opposed tension-members or grids 14 and 15 supported in the bracket 16. One member 14 is fixed in position on the bracket and the other member 15 is hinged on the rod 17 to swing toward and away from the fixed member, see Fig. 3. The yarn y draws up between the adjacent faces of the two tension-grids and the alternately spaced bars 18 and 19 overlap each other and press on the yarn to sinuate its course. The yarn is thus given a tortuous course as it passes over the bars of the grids and the degree of tension applied thereto will vary according to the amount of pressure exerted on the hinged member 15 to press it toward the fixed member 14.

The pressure on the thread-guide 6 is applied through the medium of a weighted lever 20 pivoted at 21 on the tension-bracket 16 and connected by a link 22 with the lower arm 7 of the traverse-frame 5, see Figs. 1, 2 and 3. The end of the link 22 is bent at right angles, as shown in Fig. 3, and is adapted to hook into one of the notches 23 in the plate 24 which is fastened to the arm 7 of the traverse-frame. A spring wire 25 extends from the upper end of the plate 24 downward along its notched edge to retain the link 22 in position in the notch into which it has been hooked. Pressure on the link against the wire 25 will raise the latter to allow the link to be snapped into a different notch to provide for adjusting its point of connection along the plate 24. Preferably the plate 24 is pivoted at 26 on the arm 7 and has a slot 28 through which projects a screw 29 screwed into the arm. By loosening the screw 29 the plate 24 can be turned on its pivot to adjust its notched edge toward or away from the fulcrum of the lever 20 for a purpose later described.

Referring to Fig. 3, the opposite end of the link 22 is bent in the right-angled portion 30 which extends through a double bearing 31—32 on the lever 20 and projects therefrom to form a pivot for the tension-lever 33. Preferably the end of the portion 30 of the link is threaded and screws into the forward bearing of the lever 33 to retain the latter in position; but the threaded parts are made with a loose fit so as not to interfere with the turning of the lever on its pivot. Extending upward from the lever 33 is an ear 34 having a hole into which is hooked one end of a link 35. The opposite end of the link 35 is hooked into a hole at the end of the arm 36 which extends laterally from the hinged tension-member 15. It will be obvious that pressure on the lever 33 tending to swing it downward will act through the link 35 to press the hinged tension-member 15 toward the fixed member 14 to apply tension on the yarn. Pressure is applied on the lever 33 through the medium

of a weight 37 which is arranged to slide along the lever as hereafter described. Preferably the weight 37 is supported on an elbow-shaped arm 38 reaching down below the lever 33, see Fig. 2. The arm 38 is here shown as constructed of sheet metal bent to form a bearing 39 surrounding the lever 33 and adapted to slide thereon. The weight 37 has a slot 40 which receives the horizontal portion of the arm 38 and a clamp 41 holds it in position thereon. The clamp 41 is formed with a projecting finger 42 the end of which is adapted to engage notches along the arm 38. Through this arrangement the weight 37 can be slid along the arm 38 and the finger 42 will engage one of the notches to hold it in its adjusted position. Secured to the lever 20, or formed thereon, is an arm or extension 44 reaching up above the pivot point 21, and a wire link 45 connects its extremity to the arm 38. This connection between the lever 20 and weight 37 acts to slide the latter on the lever 33 when the two levers are rocked as hereinafter more fully explained.

The lever 20 carries a weight 46 which is adapted to slide along its length. Preferably the weight 46 is slotted at 47 to receive the lever 20 and the clamp 48 holds it in position thereon. Referring to Fig. 3, the stud 21 which serves as a pivot for the lever 20 is formed with a shoulder 49, and held between this shoulder and the boss 50 on the tension bracket 16 is a downwardly extending arm 51. The arm 51 reaches down some distance below the lever 20 and carries a screw 52 at its lower end. Coiled around the screw 52 is a wire 53 formed with its outer end extending in the link 54. The opposite extremity of the link 54 is bent at right angles at 55 and hooks into a hole at the bottom of the weight 46, see Figs. 2 and 3.

Having now described the parts of our device in detail the method of operation of the complete mechanism will next be explained: As before stated, the winding is started with the thread-guide 6 bearing on the surface of the cop-tube *a* and the traverse-frame 5 will be in a substantially vertical position. The lever 20 which is connected with the lower arm 7 of the traverse-frame will then assume a horizontal position as shown in Fig. 2. With the parts in this position the arm 51 is set so that the link 54 maintains the weight 46 at the outer extremity of the lever 20. As the yarn is laid on the cop-tube and the cop 6 builds up, layer by layer, the thread-guide 6 will be pushed out from the winding-spindle as shown in Fig. 4. This action swings the traverse-frame 5 on its pivot 4 in the direction indicated by the arrow *b* and the lower arm 7 of the frame moves in the opposite direction as indicated by the arrow *c*, Fig. 4. The movement of the traverse-frame is re-

sisted by the pressure of the weight 46 on the lever 20, acting through the link 22, and thereby pressure is applied to the thread-guide 6 to maintain the latter constantly in contact with the winding. Now, as the arm 7 recedes from the pivot point of the lever 20 the link 22 exerts a pull on the latter to swing it upward. As the thread-guide moves farther and farther out from the winding-spindle the lever 20 continues its upward movement, as illustrated in Figs. 4, 5 and 1, the latter showing its position when the cop is practically completed. It will be obvious that as the lever 20 swings upward and approaches a vertical position its leverage on the traverse frame will be gradually lessened and, hence, the pressure on the thread-guide is correspondingly reduced. So far, the operation of the devices just described is identical with that of the arrangement disclosed in the U. S. Patent No. 869,604, before referred to. It has been found in practice, however, that this relief of pressure accomplished by the turning of the lever 20 on its pivot is not quick enough to give the best results. To render the device quicker and more positive in its action we have now provided the following improvement: Besides reducing the pressure on the traverse-frame through reducing the operative length of the lever 20, we also arrange to reduce the effect of the weight 46 by sliding the latter in toward the pivot point or fulcrum of the lever. This is accomplished by means of the arm 51 and connecting link 54. It will readily be seen from Figs. 2, 4, 5 and 1 that as the lever 20 swings upward the link 54 will act to draw the weight 46 in toward its pivot, and thereby the resistance to the movement of the traverse-frame will be gradually reduced. In this way we provide for a rapid and complete relief of pressure on the thread-guide so that as the cop grows to its maximum diameter there will be less and less tendency to cause constriction of the outer layers on the inner mass and bulging at the ends of the package is prevented. In practically the same manner a quick relief of tension on the yarn is accomplished. It has been demonstrated in practice, however, that it is not advisable to reduce the tension on the yarn until the cop has attained at least a third of its diameter. As before stated, it is necessary that the core of the cop be wound very hard and firm to provide a stable support for the outer layers. This is particularly true in the case of cops used in warping and creeling. When warp-yarns are wound into cops and delivered from a creel it is seldom that the yarn is completely unwound from all of the cops. When one cop is exhausted all of the other cops are doffed and returned to the winding machines. New cops are then wound on the

same tubes with the new yarn laid on top of whatever old yarn remains. In this way the cops are rewound many times over and the inner layers of yarn may never be entirely unwound. It is therefore important that the inner layers or core of the cop should be wound particularly hard and firm to resist the strain and stress of subsequent rewindings. To attain this object our invention provides for maintaining a maximum tension on the yarn throughout a definite period of the winding. This is accomplished as follows: As the lever 20 swings upward on its pivot 21, under the influence of the swinging movement of the traverse-frame 5, the pivot 30 of the lever 33 will be carried around in the direction indicated by the arrow *d*, Fig. 2. Now, since the lever 33 is connected to the tension-member 15 by the link 35 the portion 34 of the lever must remain in substantially fixed relation to the tension-device. Therefore, since the lever 33 is held at the point 34, when its pivot point 30 is displaced the lever will be rocked to accommodate itself to this movement. The direction of movement of the lever 33 is clockwise, or, in other words, it rocks upward and the upward tilting of the lever will gradually reduce the effect of its action on the hinged tension-member and thereby the tension on the yarn is relieved. This operation is the same as in the Wardwell invention previously referred to. To quicken this relief of the tension on the yarn we have provided a device similar to the one previously described as used in connection with the lever 20. That is, the weight 37 is arranged to slide in toward the pivot point of the lever 33 to reduce its operative force acting through the lever and the link 35. It will be noted, however, that the weight 37 does not start to move in toward the pivot point of the lever 33 until the latter has been raised some distance. On the contrary, the first movement of the weight 37 is in the opposite direction toward the outer end of the lever 33. This first outward movement of the weight takes place on account of the position of the arm 44 which extends upward some distance above the pivot point of the lever 20.

Referring to Fig. 2, it will be seen that when the levers 20 and 23 are in their horizontal positions, at the beginning of the winding, the arm 38 which supports the weight 37 is positioned some distance in from the end of the lever 33. Now, as the levers 20 and 33 are tilted upward the arm 44 and link 45 act in toggle fashion to move the arm 38 and weight 37 out toward the end of the lever 33. This action continues until the arm 44 and link 45 are practically in line as illustrated in Fig. 4. At this point the cop is of substantial diameter, about one-third of its full size, and this

portion of the winding has been done with a maximum tension on the yarn to insure a hard, firm core on which the subsequent layers are deposited. It will be observed that the movement of the weight 37 out toward the end of the lever 33 is relatively slight; but this movement is provided for in order to counteract the effect of the constant upward movement of the lever 33. In other words, since the lever 33 begins to tilt upward at the very start of the winding the weight 37 is first moved outward along the lever to prevent the shortening of its leverage. In this way the maximum tension pressure is exerted on the yarn during the building up of a considerable number of layers in the cop. After the required diameter has been attained the weight is then slid in toward the fulcrum of the lever 33 to accelerate the relief of tension on the yarn, as now described. Referring to Fig. 4, after the levers have reached the positions here shown, the continuance of their upward movement will cause the arm 44 on the lever 20 to move downward and recede from the lever 33, see Fig. 5. This results in a toggle action between the arm 44 and link 45 which draws the weight 37 in on the lever 33 and reduces the operative effect of the latter on the tension device, see Fig. 1. In this way the tension on the yarn is maintained at its maximum degree during the winding of the core of the cop; but when this core is completed the tension is quickly and constantly reduced as the cop grows to its full diameter.

The movement of the levers 20 and 33 relative to the displacement of the thread-guide can be regulated by adjusting the point of connection of the link 22 on the arm 7 of the traverse-frame. When the link is hooked into the lowest notch of the plate 24, as shown in Fig. 1, the maximum movement will be given to the levers, and this movement can be made less by adjusting the link upward toward the pivot point of the traverse-frame. The plate 24 is adjustable on the arm 7, as before described, in order that the levers 20 and 33 may be adjusted to a horizontal position at the start of the winding. The size of the cop-tubes on which the cops are wound is variable and, as the position of the traverse-frame is determined by the outside diameter of the tube, it is sometimes necessary to shift the position of the plate 24 according to the position of the arm 7. This is accomplished by loosening the screw 29 when the plate 24 can be swung to left or right as required.

It will be seen that our new device provides a simple and efficient means for maintaining the maximum tension on the delivering yarn during the first part of the winding and for thereafter quickly relieving the tension.

while the pressure on the thread-guide is constantly decreased in force from the start to the finish of the cop.

Various modifications might be made in the structure and arrangement of the parts of our device without departing from the spirit or scope of the invention.

Therefore, without limiting ourselves to the exact construction shown, what we claim is:—

1. In a winding-machine, the combination with the winding-spindle and thread-guide arranged to separate from each other as the cop increases in diameter, of a lever acting to resist such separation, a weight on said lever, and means to automatically move the weight along the lever to vary the operative force thereof concurrently with the growth of the cop.

2. In a winding-machine, the combination with the winding-spindle and thread-guide arranged to separate as the cop is built up on the spindle, of a lever acting to maintain the thread-guide in contact with the surface of the cop, a weight on said lever, and means to automatically move the weight along the lever during the winding to relieve the pressure on the guide as the cop increases in diameter.

3. In a winding-machine, the combination with a winding-spindle, of a thread-guide adapted to bear on the surface of the cop throughout the winding, a lever to apply pressure to said thread-guide, a weight on said lever, and means to automatically adjust the weight along the lever to vary the pressure on the guide as the cop increases in diameter.

4. In a winding-machine, the combination with the winding-spindle, of a thread-guide arranged to recede therefrom as the cop increases in diameter, a lever acting to resist the movement of the guide away from the spindle, a weight on said lever, and means to move said weight on the lever concurrently with the movement of the guide to vary the operative force of the weight acting through the lever.

5. In a winding-machine, the combination with the winding-spindle, of a thread-guide arranged to recede therefrom as the cop increases in diameter, a pivoted lever acting to resist the movement of the guide away from the spindle, a weight on said lever, and means to move the weight toward the fulcrum of the lever concurrently with the movement of the guide to reduce the resistance to movement of the latter.

6. In a winding-machine, the combination with the winding-spindle, of a thread-guide arranged to reciprocate opposite the spindle, a traverse-frame supporting said guide to allow it to recede from the spindle during the building up of the cop, a lever connected with said frame, a weight acting on said

lever to resist the movement of the traverse-frame, and means to automatically adjust the weight along the lever to vary the effect of its action on the frame.

7. In a winding-machine, the combination with the winding-spindle, of a thread-guide adapted to recede from the spindle as the cop is built up thereon, a lever arranged to be rocked concurrently with the movement of the guide, a weight on said lever, and means to automatically adjust the weight along the lever as the latter is rocked for the purpose described.

8. In a winding-machine, the combination with the winding-spindle and thread-guide, of a tension-device, a lever to operate said device to apply tension on the yarn, a weight on said lever, and means to automatically adjust the weight in both directions along the lever during the winding to vary its operative effect on the tension-device.

9. In a winding-machine, the combination with the winding-spindle and thread-guide arranged to separate from each other as the cop is built up on the spindle, of a tension-device comprising two members between which the thread draws, one fixed and the other hinged, a lever to operate said device to swing the hinged member toward the fixed member, a weight on said lever, and means operated concurrently with the separation of the winding-spindle and thread-guide to move the weight along the lever to relieve the tension on the yarn as the cop increases in diameter.

10. In a winding-machine, the combination with the winding-spindle and thread-guide arranged to separate from each other as the cop is built up on the spindle, of a tension-device, a lever to operate said device to apply tension on the yarn, a weight on said lever, and means to slide the weight away from the fulcrum of the lever during a predetermined portion of the winding and to move the weight toward the fulcrum of the lever during the remainder of the winding to vary the amount of tension on the yarn.

11. In a winding-machine, the combination with the winding-spindle and thread-guide adapted to separate from each other as the cop is built up on the spindle, of a tension-device, a lever to operate said device, means to rock said lever concurrently with the separation of the spindle and thread-guide, a weight on said lever, and means to move the weight away from the fulcrum of the lever during a predetermined portion of its rocking movement and to move it toward the fulcrum during the remainder of said rocking movement.

12. In a winding-machine, the combination with a winding-spindle and thread-guide arranged to separate from each other as the cop is built up on the spindle, of a

lever acting to resist such separation, means to rock said lever during the building of the cop, a tension-lever connected with the first lever and rocked thereby, a tension-device operated by the tension-lever to apply tension on the yarn, a weight on said tension-lever, and means operated by the rocking of the levers, to move the weight along the tension-lever to vary the tension on the yarn.

13. In a winding-machine, the combination with a winding-spindle and thread-guide arranged to separate from each other as the cop is built up on the spindle, of a lever acting to resist such separation, a tension-device, a tension-lever for operating said tension-device to apply tension on the yarn, said lever adapted to rock to change its operative effect, a weight on each lever, and means to automatically adjust the weights along the levers to vary the effect of the latter as the cop increases in diameter.

14. In a winding-machine, the combination with a winding-spindle and thread-guide arranged to separate from each other as the cop is built up on the spindle, of a lever acting to resist such separation, means to rock said lever during the growth of the cop, a tension-lever connected with the first lever and adapted to be rocked from the movement of the latter, a tension-device operated by the tension-lever to apply tension on the yarn, weights on both levers, and means operated from the rocking movement of the levers to slide the weights along the levers to vary their operative effect.

15. In a winding-machine, the combination with a winding-spindle and thread-guide arranged to separate from each other as the cop is built up on the spindle, of a lever acting to resist such separation, means to rock said lever during the growth of the cop, a tension-lever adapted to be rocked from the movement of the first lever, a tension-device operated by said tension-lever to apply tension on the yarn, weights on said levers, and means to automatically adjust said weights along the levers during their rocking movement to vary their operative effect.

16. In a winding-machine, the combination with a winding-spindle and thread-guide arranged to separate from each other as the cop is built up on the spindle, of a lever acting to resist such separation, means to rock said lever concurrently with the growth of the cop, a tension-device, a tension-lever to operate said device to apply tension on the yarn, means to rock said tension-lever as the cop increases in diameter, weights on said levers, and means connected to said weights to slide them on the levers when the latter are rocked.

17. In a winding-machine, the combina-

tion with a moving member thereof, of a tension-lever connected with said member to be rocked thereby, a tension-device operated by said lever to apply tension on the yarn, a weight on said lever and means to automatically move the weight along the lever to vary the tension on the yarn.

18. In a winding-machine, the combination with a moving member thereof, of a lever connected to be rocked thereby, a tension-lever connected to be rocked from the first lever, a tension-device operated from the tension-lever, a movable weight on the tension-lever, and a link connecting said weight with the first lever to cause it to slide on the tension-lever when the levers are rocked.

19. In a winding-machine, the combination with a moving member thereof, of a tension-device, two coacting pivoted levers, means for connecting one lever with the tension-device, means for connecting the other lever with the moving member whereby the relative positions of the two levers shall be varied with the movement of the latter, weights on said levers, and means to slide said weights along the levers when the latter are moved for the purpose described.

20. In a winding-machine, the combination with a winding-spindle and thread-guide arranged to separate from each other during the winding of the cop, of a lever adapted to be rocked during such separation, a tension-lever pivoted on the first lever, a tension-device operated by said tension-lever, weights slidable on said levers, a link connecting the weight on the tension-lever to the first lever, and a link connecting the weight on the first lever to a stationary part of the machine whereby the weights will be caused to slide along the levers when the latter are rocked.

21. The combination in a pressure- and tension-controlling device for winding-machines, of a pivoted pressure lever, means to rock said lever, a tension-lever pivoted on the pressure lever and arranged to be rocked thereby, weights on said levers, means to cause the weight on the pressure lever to move toward its fulcrum when the lever is rocked, and means to cause the weight on the tension-lever to move away from its fulcrum during a predetermined portion of its rocking movement and thereafter to move toward the fulcrum substantially as shown and described.

22. In a pressure- and tension-controlling device for winding-machines, the combination with a lever 20, means to rock said lever, a lever 33 pivoted on the lever 20 and rocked thereby, a weight 46 slidable on the lever 20, a link 54 connected to the weight 46 to cause it to slide inward on the lever 20 when the latter is rocked, a weight 37 slid-

able on the lever 33, and a link 45 connecting the weight 37 to a portion of the lever 20 to cause said weight to slide first outward and then inward on the lever 33 when
5 the two levers are rocked.

23. In a winding-machine, the combination with a moving member thereof, of a pivoted lever 20 connected to be rocked thereby, an arm 51 adjustable about the
10 pivot point of said lever, a weight 46 slid-

able on the lever, and a link 54 connecting said weight with the arm 51.

In testimony whereof we affix our signatures in presence of two witnesses.

CLAES RYDEN.

FRANK D. BABCOCK.

Witnesses:

ARTHUR A. ARMINGTON,

GRACE B. HOOKER.
