No. 881,210. PATENTED MAR. 10, 1908.

S. W. WARDWELL.

WINDING MACHINE.

APPLICATION FILED JULY 11, 1906.

3 SHEETS—SHEET 1.

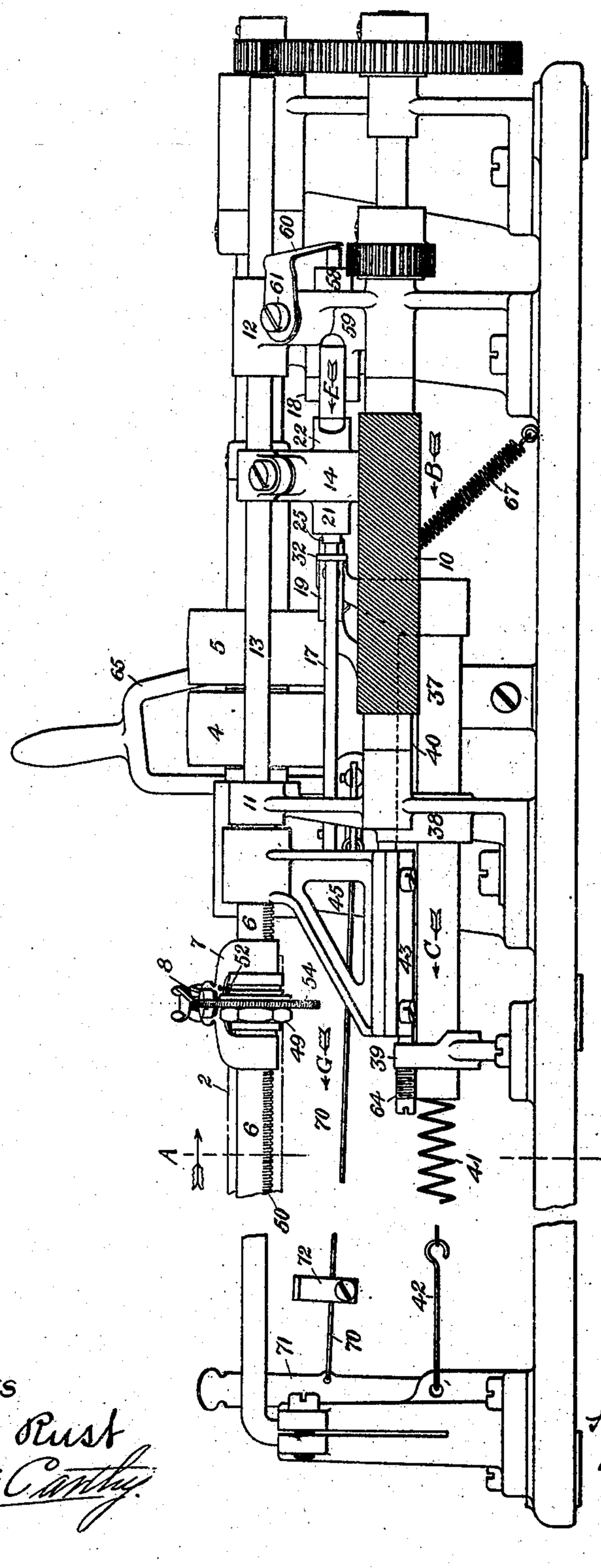

Fig. 1.

WITNESSES

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3 SHEETS—SHEET 2.

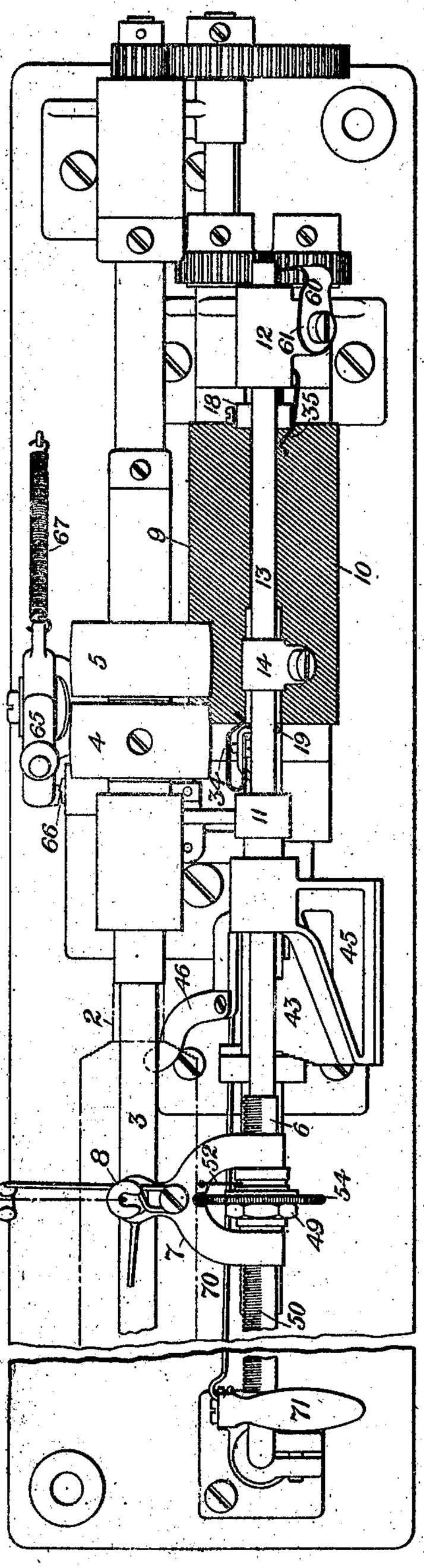

Fig. 2.

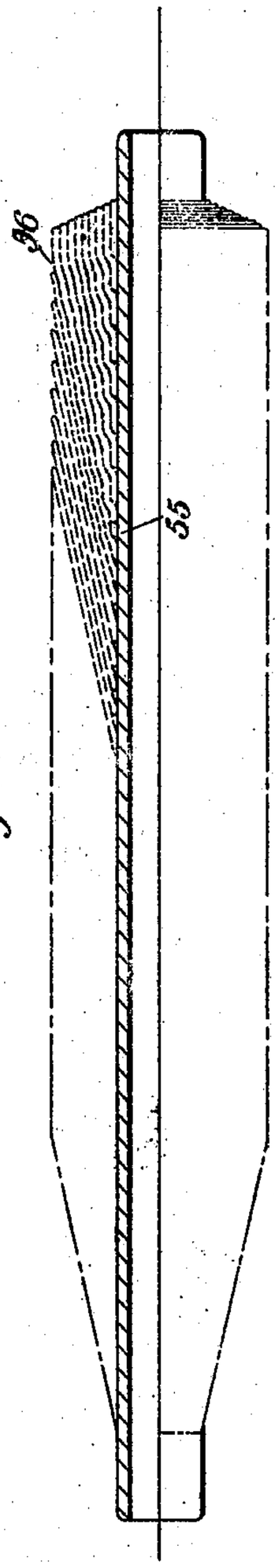

Fig. 3.

WITNESSES

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3 SHEETS—SHEET 3

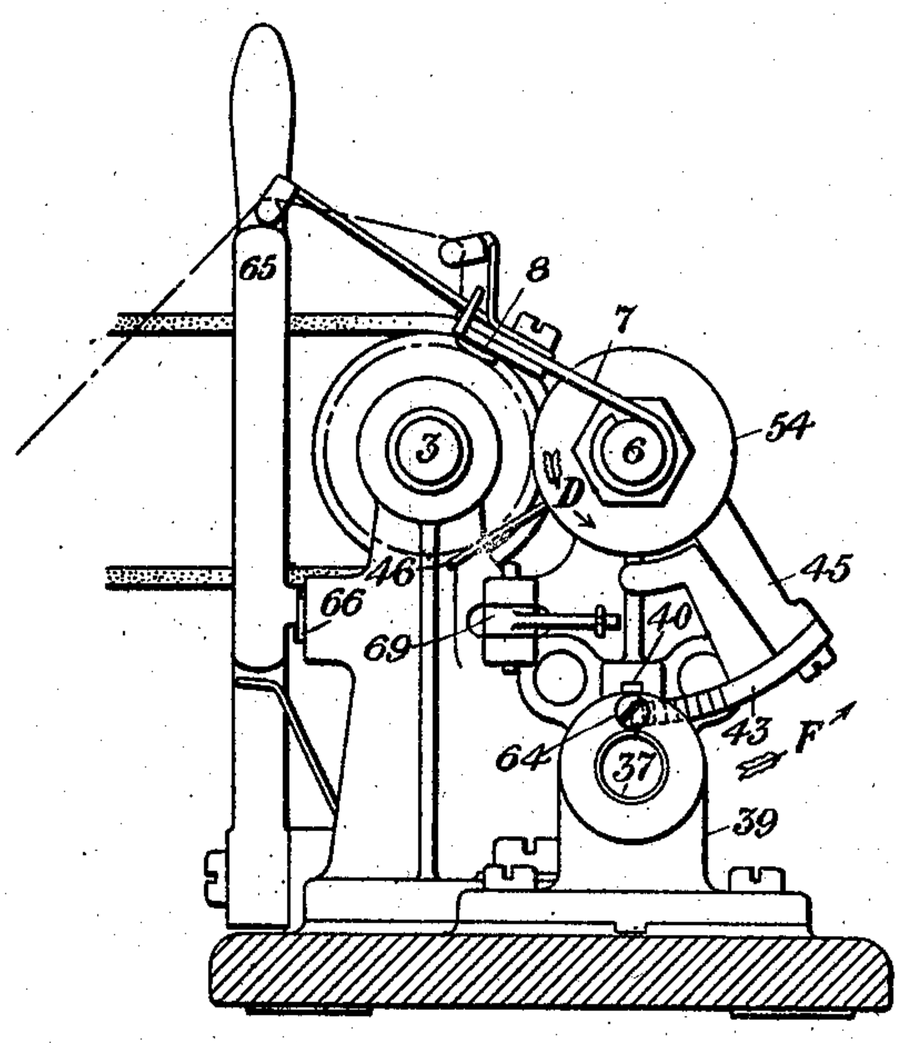

Fig. 4.

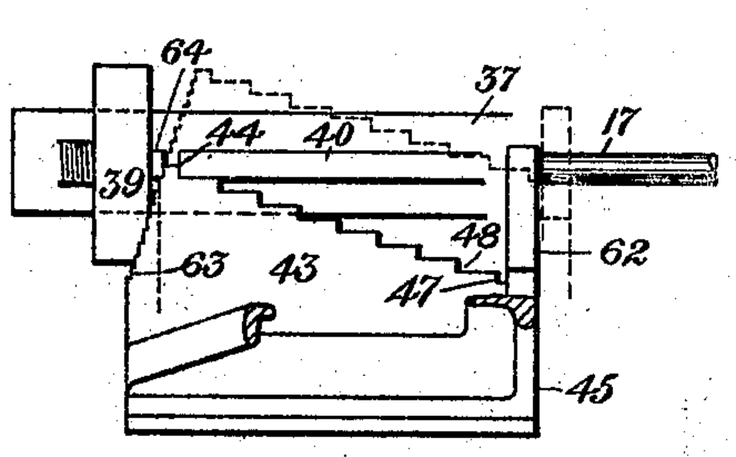

Fig. 5.

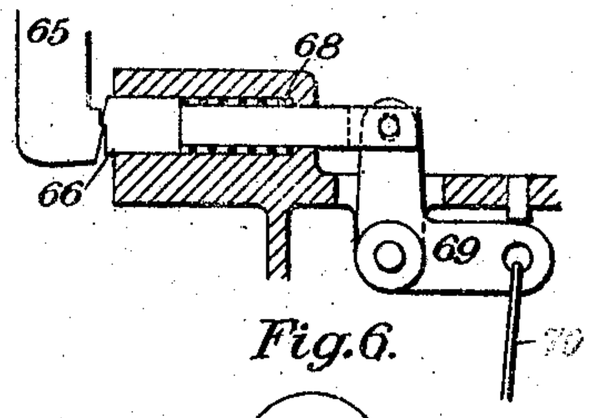

Fig. 6.

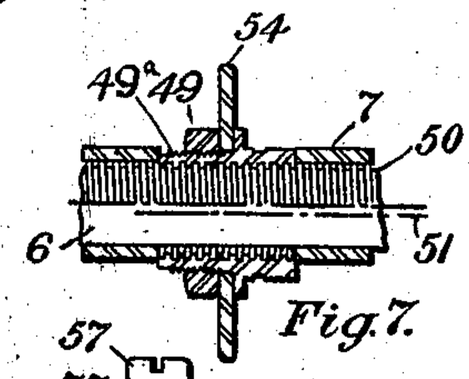

Fig. 7.

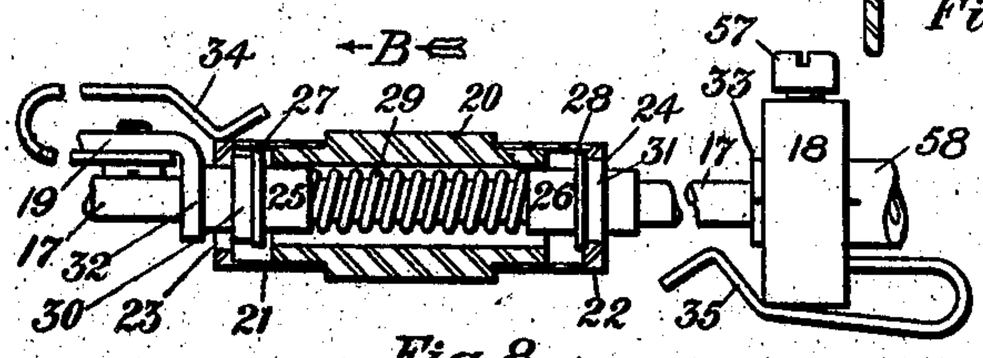

Fig. 8.

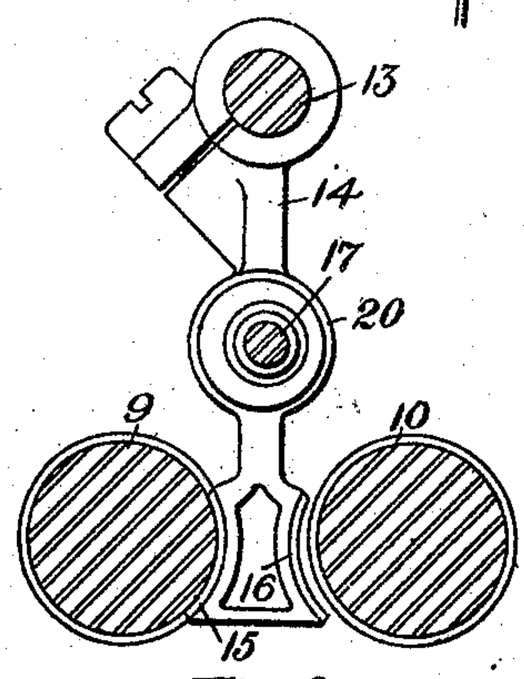

Fig. 9.

WITNESSES

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UNITED STATES PATENT OFFICE.

SIMON W. WARDWELL, OF PROVIDENCE, RHODE ISLAND.

WINDING-MACHINE.

No. 881,210. Specification of Letters Patent. Patented March 10, 1908.

Application filed July 11, 1906. Serial No. 325,676.

To all whom it may concern:

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

My invention is a winding machine for producing "universal" wound cops or yarn packages, of cylindrical form, with taper ends, the winding being done in advancing conical layers, so that the growth of the package is by longitudinal extension instead of diametrically. These cops are employed as "filling" or "weft" in weaving cloth and their form is fully disclosed in my pending application, Serial No. 323137, filed June 23, 1906.

The following specification is a complete description of the invention, illustrated by the accompanying drawings, representing, respectively: Figure 1, a front elevation of the machine; Fig. 2, a plan view; Fig. 3, an enlarged diagrammatic sectional view of the cop, showing the disposition of layers; Fig. 4, a part sectional view on the line A—A, Fig. 1, looking in the direction indicated by the arrow; Figs. 5, 6, 7, 8 and 9, details of the structure.

The machine herein described is designed to produce cops having a substantially flat base end and a tapered nose or delivery end.

Referring to Figs. 1 and 2, the tube or bobbin 2 on which the yarn is wound is carried on a winding spindle or cop holder 3 which is adapted to be driven by a suitable agency, as the tight and loose pulleys 4 and 5. Adjacent and parallel to the winding spindle 3 is a reciprocating member or bar 6 on which is mounted the guide holder 7 which carries the yarn depositing guide 8, and during the winding travels along the member 6.

To produce a substantially flat-based cop of the character described, it is necessary to deposit the yarn in superimposed cone-like layers of different length of traverse, as indicated in Fig. 3, until a base or core, composed of yarn and having the requisite form, is secured. Then the winding proceeds with a uniform but shifting traverse until the desired length of cop has been secured.

Reciprocation of the guide is performed by two oppositely rotating threaded screws 9 and 10 of fine pitch and coarse lead, best shown in Fig. 2, driven from the spindle 3 through a suitable train of gears shown in Figs. 1 and 2.

In bearings 11 and 12 is a longitudinally reciprocatable rod or bar 13 to which is secured a depending arm 14, near whose lower end are two screw threaded portions or partial nuts 15 and 16, made to respectively engage the screw 9 or the screw 10, see Fig. 9. The arm 14 has a slidable bearing on a rod 17, running parallel to the rod 13, and this bearing is adjustable laterally to allow the arm 14 to oscillate when the nut portion is thrown from one screw to the other. Mounted on the rod 17 are the instrumentalities for controlling the shifting of the arm 14, one of them, 18, fixed on the rod and adjusted by the longitudinal movement of the rod sliding in its bearings, and the other, 19, slidable on the rod and adjusted by separate means hereafter described.

Fig. 8 is an enlarged detail view of the controlling and locking mechanisms for the arm 14. Between the rod 13 and the ut portion, the arm 14 is formed with a cylindrical sleeve 20 having a relatively large bore, to provide clearance for the rod 17 which extends through it. The ends of the sleeve 20 are turned down and forced onto them are the thimbles 21 and 22 having offset bores, 23 and 24, at their ends, eccentric to each other and to the bore of the sleeve. Slidable on the rod 17 are two flanged bushings or plungers 25 and 26 arranged with their flanges, 27 and 28, projecting into the recesses between the ends of the sleeve 20 and the ends of the thimbles, so that the movement of the plungers is limited. Surrounding the rod 17, between the plungers, is a coiled spring 29 tending to press both of the plungers outward through the bores of the thimbles. The plungers are formed with shouldered portions 30 and 31 which exactly fit the said eccentric bores. It will be seen that as the bores 23 and 24 are not coaxial, only one plunger at a time can be engaged with its bore in the thimble. The engagement of one of the plungers with its appropriate bore locks the sleeve 20 in position to engage the arm 14 with one or the other of the screws 9 and 10, and to release it, the plunger must be pressed in, compressing the spring 29. When the sleeve 20 is then shifted laterally, the spring acts to force the opposite plunger

into its bore, and the sleeve 20 is thus locked in its other position, with the arm 14 engaging the opposite screw.

The instrumentalities for controlling the shifting of the arm 14 consist of the contact pieces 32 and 33 of the members 19 and 18 and the springs 34 and 35 also mounted on said members and adapted to engage opposite sides of the sleeve 20 and shift it one way or the other. The operation of these devices is as follows: Assume that the arm 14 is engaged with the screw 9, and under action of the latter is moving in the direction indicated by the arrow B, Fig. 8. The plunger 25 will then be in engagement with its bore 23, but when near the end of its traverse, the contact piece 32 strikes the plunger 25 and forces it from its bearing in the thimble 21, compressing the spring 29. At the same time the spring 34 contacts with the thimble 21 and oscillates the arm 14, thereby throwing the nut portion into engagement with the screw 10. This brings the bore of the thimble 22 concentric to the plunger 26, and the latter, under action of the spring 29, is forced into its bearing in the thimble, thus locking the arm 14 in contact with the screw 10, the parts then in position shown in Fig. 8. The arm 14 is now traversed in the opposite direction, the rotation of the screw 10 being opposite to that of screw 9; and when the arm reaches its other extreme of travel, the same action occurs as previously described, this time the contact piece 33 acting on the plunger 26.

It has been explained that the cop is wound by first producing a yarn base of tapered or conical form, and further that this was secured by commencing the cop with winding of short traverse and then gradually or intermittently changing the length of traverse until the desired taper and diameter of cop is secured. This is indicated in Fig. 3, showing how the cop base is built up.

The mechanism whereby the building is effected is as follows: It has been stated that the member 19 is shiftable along the rod 17. From the foregoing it is obvious that any change in the position of the member 19 longitudinally of the rod must affect the length of traverse of the arm 14, because it changes the distance relation of the contact piece 32 and the contact piece 33, which effect the reversal of movement of the arm 14. The shiftable member 19 is preferably formed as an arm or bracket fastened at its lower end to a rod or preferably a tube 37 mounted in the machine frame at 38 and in a stand 39. To the top of the tube 37 is fastened a key or spline 40 which extends through the bearings 38 and 39. Under the influence of the tension spring 41 the tube 37 tends to move in the direction indicated by the arrow C, said spring extending from the tube 37 to the holding piece 42. Movement under influence of said spring is, however, prevented by the stepped detent or ratchet 43 which, mounted to rock on the rod 6, engages the end 44 of the spline 40, see Fig. 5. The ratchet 43 is secured to a rocking frame 45 having an arm 46 Fig. 4 which bears on the base of the cop being wound and by which it is rocked on the rod 6 as said cop increases in diameter at its base, or rather as the core increases in diameter, see Fig. 4. Winding is started with the member 19 in the position indicated in Fig. 1, when the end 44 of th spline 40 engages the first step, 47 of the ratchet, and the guide 8 has its shortest throw. As the yarn is deposited on the tube or bobbin, it presses on the arm 46, gradually moving it in the direction indicated by the arrow D, Fig. 4, until the step 47 has been moved away from the spline 40, which immediately moves, under action of the spring 41, to the step 48. This reoccurs, the spline successively moving from one step to another, each time increasing the length of traverse an amount equal the extent of the step, until the last step is reached. At this time the full diameter of the cop has been reached, and it is necessary to so continue the winding with the extent of traverse attained that the cop shall grow by longitudinal extension and not by diametrical increase: that is, the reciprocating thread guide 8 must be caused to feed slowly along the reciprocating rod 6.

Connected with the reciprocating rod 13 is the member or bar 6, on which is mounted the guide holder 7. The latter is forked, each branch of the fork embracing the bar 6, and between the branches is a rotatable nut 49 which engages said guide holder 7 with the bar 6 and feeds it along said bar.

Formed in the bar 6 are partial screw threads 50, having an axis 51 which is eccentric to that of the bar 6, see Fig. 7. The nut 49 might be formed to engage the rod 6 directly, but, preferably, it has a bushing or sleeve 49^a screwed into its bore, said sleeve being formed with internal screw threads which are maintained in engagement with said partial threads on the bar 6 by the spring 52 attached to the guide holder 7, see Fig. 2. By turning the guide holder on the bar 6, a sufficient distance rotatively, the action of the spring 52 forces the nut out of engagement with said partial threads leaving the guide holder free to be slid by hand along the bar 6 without hindrance.

The partial screw threads 50, the nut 49 and the spring 52 are so related that when the guide holder 7 is in winding position—toward the spindle—the nut 49 through its sleeve 49^a is engaged with said partial screw threads, and any extent of oscillation of the guide holder incident to following the taper of the cop nose, will be insufficient to withdraw the nut from such engagement. In this position, whatever rocking movement

the guide holder has is automatic, derived from the action of the machine. But if it is desired to move the guide holder manually, as when it is moved back to its starting point to commence a new cop, it is only needful to rock the guide holder back from the winding spindle through about a half turn and then slide it along the spindle to any desired position, as described.

The automatic feeding of the guide holder 7 along the bar 6 is secured by action of the cop. On the rut 49 is a wheel 54 of such diameter as to be engaged by the surface of the cop at its full diameter, as indicated in Figs. 2 and 4. Every time, therefore, that the guide 8 returns from the point 55 of the cop's nose, in any layer Fig. 3, and reaches the portion of the winding of largest diameter 56, the wheel 54 is engaged and rotated slightly, causing the guide holder 7 to advance slightly along the rod or bar 6, which actually occurs at each reciprocation of the guide 8.

As previously stated, the cop may be wound with a substantially flat base, but it has been found preferable to give a very slight taper to the base in order to make it more stable. When formed with a perfectly flat base, if the cop is subjected to rough usage, the outer coils are liable to be pushed over the end and in delivering the yarn will drag across the edge, causing abnormal tension. By forming the base slightly tapered, as shown in Fig. 3, the outer layers are more firmly supported and are less liable to derangement.

The mechanism for controlling the traverse of the thread guide to effect the taper of the base consists of means for automatically adjusting the position of the contact member 18. It will be evident that, if the member 18 is shifted gradually in the direction indicated by the arrow E, Fig. 1, the starting point of each layer of yarn will be correspondingly adjusted toward the outer end or nose of the cop, so that the yarn will be built up on an angle instead of perpendicularly to the tube.

As before described, the member 18 is secured to the rod 17, being fastened by a set screw 57 extending through it and binding it on the split bushing 58, which, in turn, binds on the rod 17. The bushing 58 extends through the bearing 59, being slidable therein, and the rod 17 projects slightly beyond the end of the bushing. Bearing on the end of the rod is a spring 60 fastened at 61. The spring 60 tends to force the rod 17 in the direction indicated by the arrow E, but the movement of the rod is controlled by an arm 62 of the rocking frame 45 against which the end of the rod bears, see Fig. 5.

The frame 45 rocks outward in the direction indicated by the arrow F, Fig. 4, under the influence of the growing cop, acting on the arm 46, and the frame also has a lateral movement sliding on the rod 6. This latter movement is caused by the rod 17 bearing on the arm 62 under tension of the spring 60, and is regulated by the ratchet member 43. Opposite the series of steps 47 and 48 the member 43 is formed with a finer ratchet having steps 63, etc. These steps are engaged by the extremity of a screw 64 adjustable in the bearing 39 on the frame of the machine. It will be evident that after a certain thickness of layer of yarn has been deposited on the tube 2, the frame 45 will be rocked under the influence of the arm 46 until one step 63 is removed from the screw 64. The spring 60 then acts, through the rod 17, to slide the frame 45 laterally on its bearing until the next step of the ratchet is engaged by the screw 64, and this action continues during the building up of the base of the cop. The member 18 is thus shifted gradually to vary the starting point of the successive layers of winding, so that the base of the cop is given a slight taper as before explained.

The operation of the winding machine, as a whole, has been described as effected through the tight and loose pulleys 4 and 5. When the belt is on the loose pulley 5, the machine is stopped. When the belt is thrown upon the tight pulley 4, the machine is in operation.

The position of the belt is controlled by the belt shifter 65 which is movable manually into engagement with the lock 66 to shift the belt to the tight pulley; and when released by the lock 66, is moved automatically by the spring 67 to shift the belt to the loose pulley. The lock 66 is held in its engaging position by the spring 68, see Fig. 6, and its non-engaging end is connected with a bell crank lever 69, to which is also connected a rod 70 which extends substantially parallel with the winding spindle 3 to a vertical fulcrumed arm 71. By moving either the rod 70 or the arm 71 in the direction indicated by the arrow G, Fig. 1, the lock 66 is withdrawn from engagement with the belt shipper 65. On the rod 70 is a block or member 72 devised to be engaged by the guide holder 7 when the full length of cop has been wound, to stop the winding by disengaging the belt shipper aforesaid.

The "wind" or number of turns to be made by the yarn in the full traverse of the guide 8 is determined by the train of gearing intermediate the winding spindle 3 and the screws 9 and 10. The "gain," or slight change in "wind," to lay succeeding coils closely adjacent is secured by adjusting the member 18.

As before explained, the member 18 is fastened to the rod 17 by means of the set screw 57 binding the split bushing 58. It will be evident that the contact piece 33 can

be moved along the rod 17 and adjusted in relation to the contact piece 32, and this adjustment regulates the length of traverse of the thread guide. In my U. S. Patent #670122, issued March 19, 1901, is fully explained the method of changing the gain by slightly changing the length of traverse of the material depositing guide.

As the winding spindle 3 and screws 9 and 10 have a uniform relation as regards rotative speed, it follows that the change in length of traverse thus effected causes a change in the number of spindle rotations per traverse or reciprocation of the guide. In other words, assume that the guide has a traverse of one inch, in which traverse the winding spindle makes four turns or rotations. The traverse is extended 1/100 in. As no change occurs in the rate of traverse of the guide per minute or in the speed of spindle rotation per minute, it necessarily follows that the spindle must have made 4 4/100 turns while the guide has moved 1 1/100", instead of four turns during 1" travel of the guide, or the number of turns per traverse has been increased 4/100.

Because of the effect of change in length of traverse on the "gain," if the closeness of the wind is to be maintained throughout the "core" of the cop, the number of steps in the ratchet 43 should bear some definite relation to the ultimate number of winds on the nose of the cop, preferably being some aliquot part of that number, and the steps should be made with such exactitude as regards their individual extent, as to insure the requisite degree of closeness in the layers corresponding to each step. For example, the number of "winds" with which the yarn is deposited on the nose of the cop might be nine, and the ratchet has nine steps, so that the first step of the core is wound with one wind, the second with two winds and so on until the core is completed and the winding accomplished with its full nine winds.

It will be evident that modifications might be made in the form and arrangement of the devices herein described without departing from the scope of this invention.

Therefore, without limiting myself to the precise structure and arrangement shown, I claim:

1. The combination in a winding machine, with a rotating spindle, a reciprocating guide adapted to lay the yarn in openly coiled helices, and means to adjust the number of spindle rotations per reciprocation of the guide to control the lay of the yarn, of means to continuously change the position relation of spindle and guide so that the guide winds in a constantly new position on the spindle.

2. The combination in a winding machine, with a rotating spindle, a reciprocating guide adapted to lay the yarn in openly coiled helices, and means to adjust the number of spindle rotations per reciprocation of the guide to control the lay of the yarn, of means to increase the extent of traverse of the guide in one direction.

3. The combination in a winding machine, with a rotating spindle, a reciprocating guide and means to adjust the number of spindle rotations per reciprocation of the guide to control the lay of the yarn, of means to reciprocate the guide with increasing length of traverse until the full traverse is attained and then continue the traverse of uniform extent and means to advance the traverse after it has attained the full extent, to constantly new positions on the spindle.

4. The combination in a winding machine, with a winding spindle, a reciprocating guide and means to adjust the number of spindle rotations per reciprocation of the guide to control the lay of the yarn, of means to change the extent of traverse of the guide in one direction until the full extent of traverse is attained and then continue that attained extent of traverse until the completion of the winding.

5. The combination in a winding machine, with a winding spindle and a reciprocating guide, of means to adjust the number of spindle rotations per reciprocation of the guide, means to change the extent of traverse of the guide until an ultimate extent is attained, and then continue that extent to the completion of the winding, and means engaged intermittently by the cop to shift the reciprocating guide along the spindle to wind in a constantly new position.

6. The combination in a winding machine, with a winding spindle, a reciprocating guide adapted to bear at all times on the package being wound and means to reciprocate the guide, of means to successively change the extent of reciprocation of the guide to wind successive distinct layers of different lengths.

7. The combination in a winding machine, with a winding spindle, reciprocating guide and means to reciprocate the guide, of means to change the extent of reciprocation of the guide in one direction, to wind successive distinct layers, each having one end substantially alining with one end of each other layer in a plane at approximately right angles to the axis of the cop, and its other end overlapping all preceding layers.

8. The combination in a winding machine for shuttle cops with a winding spindle, a guide, and means to traverse the guide, of a substantially fixed contact piece to reverse the movement of the guide in one direction, a shiftable contact piece to reverse its movement in the other direction and automatic means engaged by the cop to shift the second contact piece to change the extent of traverse of the guide.

9. The combination in a winding machine, with a rotating spindle, a reciprocating guide and means to adjust the number of spindle rotations per reciprocation of the guide to control the lay of the yarn, of means to reciprocate the guide, automatic means to vary its extent of reciprocation and automatic means to change its position along said spindle during the winding.

10. The combination with a reciprocating rod having eccentrically cut screw threads, of a guide arm mounted on the rod, a nut to connect the guide arm with the rod, and means to cause the nut to connect the guide arm and rod in one rotative position of the guide arm, and cause it to disconnect the guide arm from the rod in another rotative position.

11. The combination with a winding spindle and a guide to deposit the yarn thereon, of a reciprocating rod to traverse the guide, a holder on the rod to carry the guide, a nut to reciprocally connect the guide holder and rod and to travel said holder on the rod, a wheel engageable with the package to shift the nut, and means to cause said nut to connect the rod and holder in one rotative position of the holder and to disconnect them in another rotative position.

12. The combination with a reciprocating rod having partial screw threads, of a guide arm mounted on the rod, a nut to connect the guide arm with the rod, means to cause the nut to connect the guide arm and rod in one rotative position of the guide arm, and cause it to disconnect the guide arm from the rod in another rotative position, and means to change the extent of reciprocation of the rod.

13. The combination with a reciprocating rod, guide holder, reciprocatable with and travelable along the rod and means whereby said holder, in one rotative position, is reciprocally engaged with the rod, and in another rotative position is reciprocally disengaged from the rod.

14. The combination with a reciprocating rod having eccentrically cut screw threads, of a guide holder mounted on the rod, and means which in one rotative position of the holder effect its engagement with the rod and in another rotative position effect its disengagement.

15. The combination in a winding machine for shuttle cops with a winding spindle, and a thread guide, of a reciprocating rod carrying the thread guide, two oppositely rotating screws to reciprocate the rod, an arm on the rod adapted to engage each of the screws, contact members to shift the arm from one screw to the other, and automatic means engaged by the cop to vary the relative position of the contact members to change the extent of traverse of the guide.

16. The combination with two oppositely rotative screws and an arm adapted to engage the screws successively, of means for shifting the arm from one screw to the other comprising a rod 17, plungers 25 and 26 slidable on the rod 17 to alternately engage the arm, contact members 18 and 19 adapted to release the plungers from the arm and means to shift the arm, upon the release of one plunger, into position to be engaged by the other plunger.

17. The combination with two opposite driving screws, of a member adapted to be shifted from one screw to the other, plungers adapted to alternately engage said member to lock it in engagement with its appropriate screw, contact means to release said plungers and shift the member, and means to automatically adjust said contact pieces.

18. The combination in a winding machine for shuttle cops with a winding spindle, a guide, and means to traverse the guide, of a substantially fixed contact piece to reverse the movement of the guide in one direction, a shiftable contact piece to reverse its movement in the other direction and means engaged by the cop controlled by the growing diameter of the cop to shift the second contact piece to change the extent of traverse of the guide.

19. The combination in a winding machine for shuttle cops with a winding spindle, a guide adapted to move away from the axis of the winding spindle and means to traverse the guide, of means engaged by the cop to automatically vary the extent of traverse of the guide, said means controlled by the diameter of the material on the winding spindle.

20. The combination in a winding machine for shuttle cops with a winding spindle on which the cop is wound, a guide for depositing the yarn, adapted to move away from the axis of the winding spindle, means for traversing the guide, means engaged by the cop for automatically shifting the point of starting the traverse of the guide, and means for varying the extent of said traverse, for the purpose specified.

21. The combination in a cop winding machine with the winding spindle and yarn guide adapted to move away from the axis of the winding spindle, of means for traversing the guide and devices engaged by the cop controlled by the diameter of yarn on the spindle to automatically shift the starting point of traverse of the guide and to vary the extent of said traverse during the building up of the cop.

22. The combination in a cop winding machine with the winding spindle and yarn guide, of means for traversing the guide, means engaged by the cop for automatically shifting the point of starting the traverse of the guide, and automatic devices for extending the length of said traverse at predeter-

mined intervals of the winding in the manner and for the purpose described.

23. The combination in a cop winding machine with the winding spindle and thread guide, of means to traverse the guide, contact members to reverse the traverse of the guide in each direction, and an automatically operated ratchet adapted to adjust the position of the contact members longitudinally of the spindle and to vary the relative positions of said contact members.

24. The combination with a winding spindle and thread guide of means to traverse the guide, a contact member adapted to reverse the traverse of said guide, a slidable rod carrying the contact member, a ratchet engaging the end of said rod and automatic means to shift said ratchet to adjust the longitudinal position of the rod, substantially as shown and described.

25. The combination with a winding spindle and thread guide, of means to traverse the guide, a contact member to reverse the traverse of the guide in one direction, a second contact member to reverse the traverse of the guide in the opposite direction, means to shift the contact members independently of each other, and an automatically operated member having ratchets to control the shifting of each contact member.

In testimony whereof I affix my signature in presence of two witnesses.

SIMON W. WARDWELL.

Witnesses:

CHAS. A. EDDY,

THOS. M. CHILDS.