A. B. CALKINS.

COP WINDING MACHINE.

APPLICATION FILED APR. 29, 1914.

1,236,906.

Patented Aug. 14, 1917.

3 SHEETS—SHEET 1.

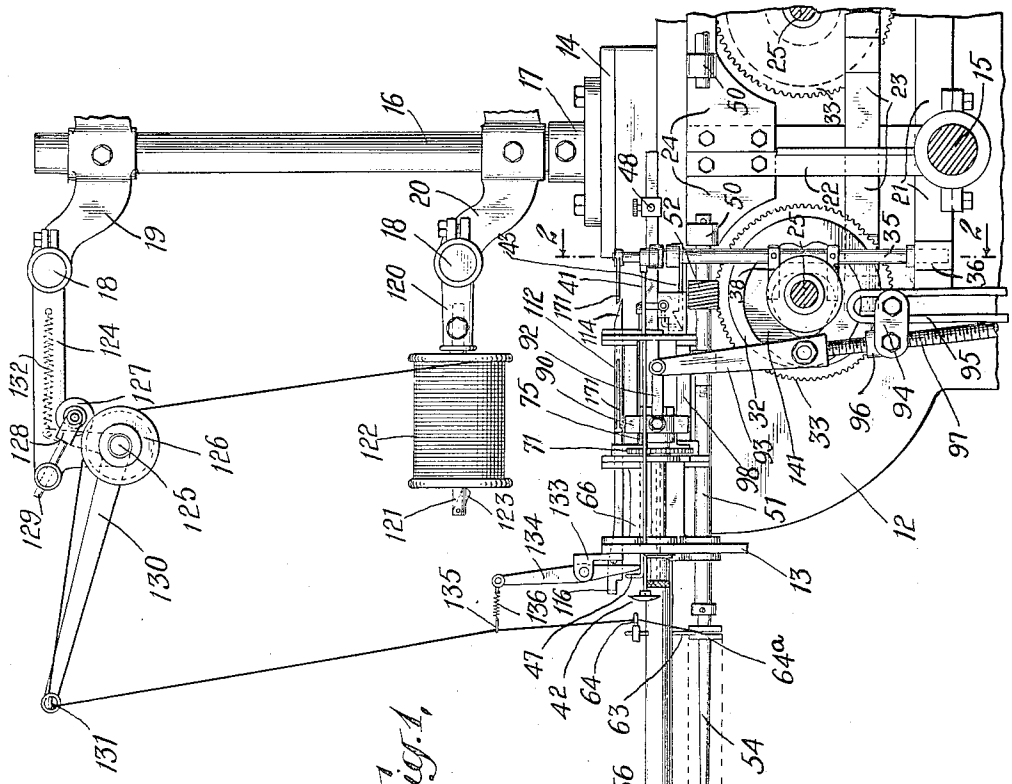


Fig. 1.

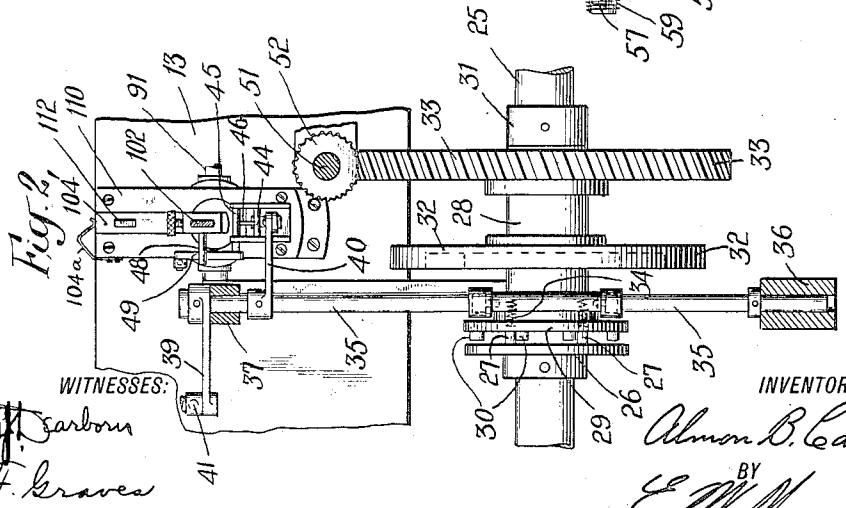


Fig. 2.

WITNESSES:

F. Carbon

F. Graves

INVENTOR

Almon B. Calkins

BY

E. W. Marshall

ATTORNEY

A. B. CALKINS.

COP WINDING MACHINE.

APPLICATION FILED APR. 29, 1914.

1,236,906.

Patented Aug. 14, 1917.

3 SHEETS—SHEET 2.

Fig. 3.

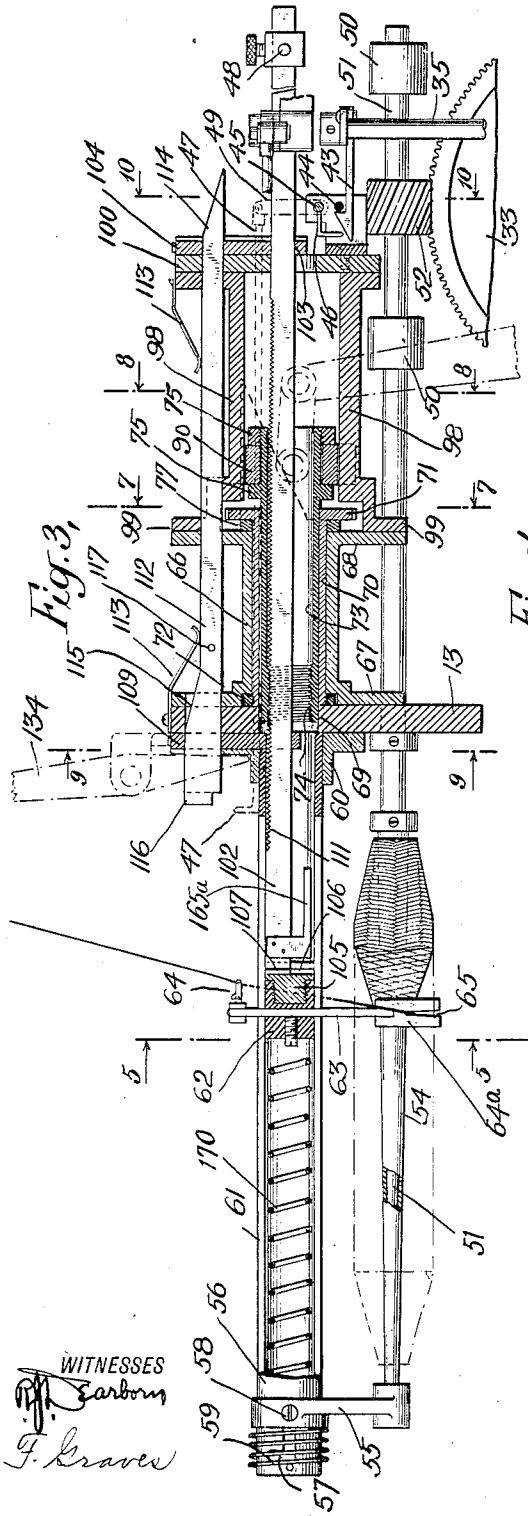
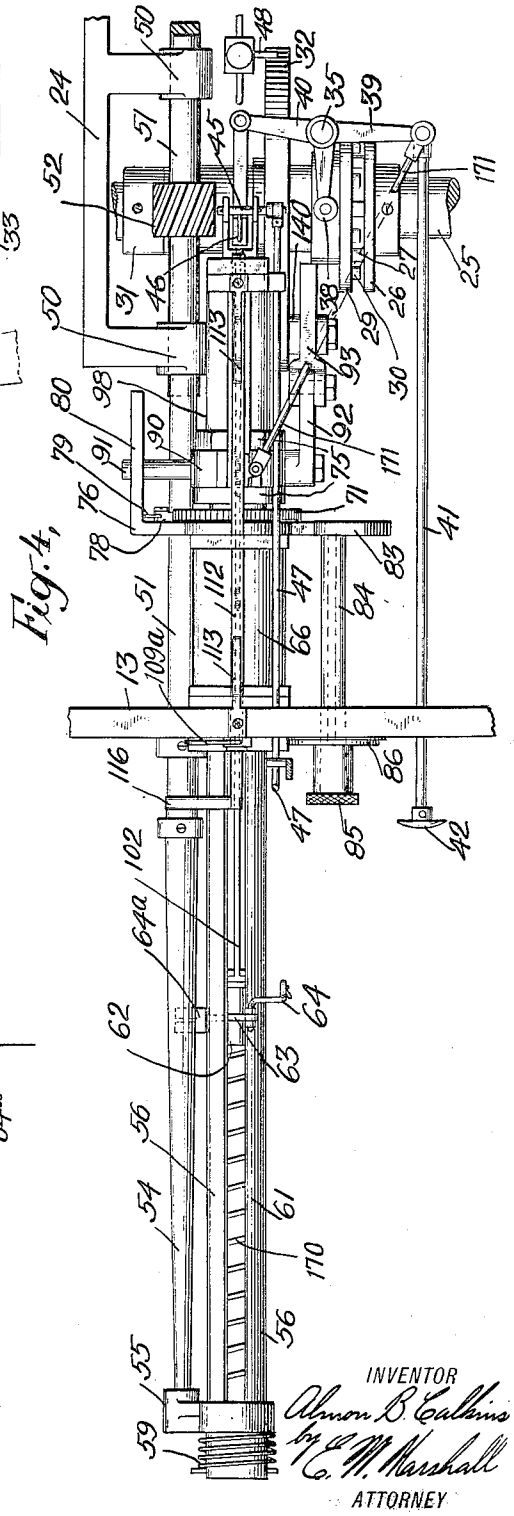


Fig. 4.



WITNESSES

F. Barbour

F. Graves

INVENTOR

Almon B. Calkins

by C. M. Marshall

ATTORNEY

A. B. CALKINS.

COP WINDING MACHINE.

APPLICATION FILED APR. 29, 1914.

1,236,906.

Patented Aug. 14, 1917.

3 SHEETS—SHEET 3.

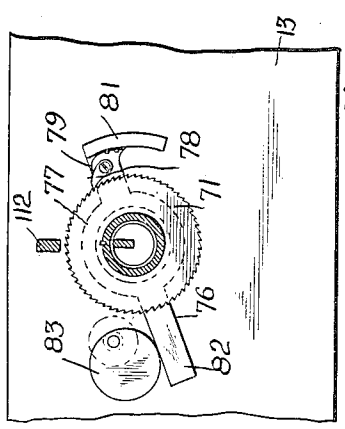


Fig. 7.

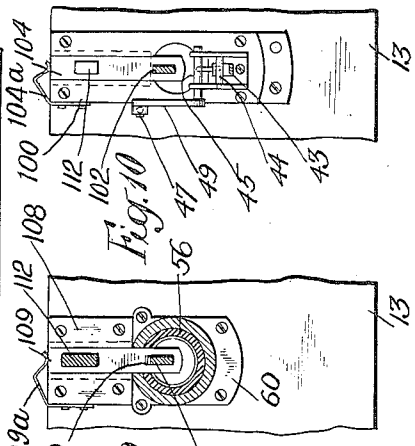


Fig. 10.

Fig. 9.

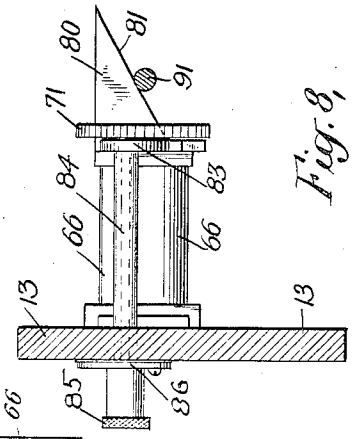


Fig. 6.

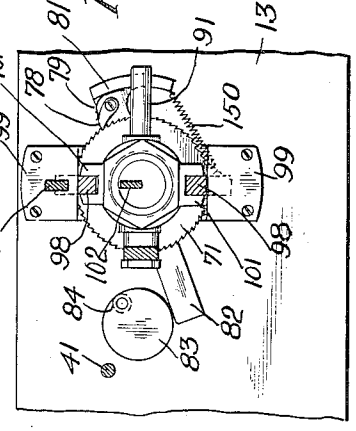


Fig. 8.

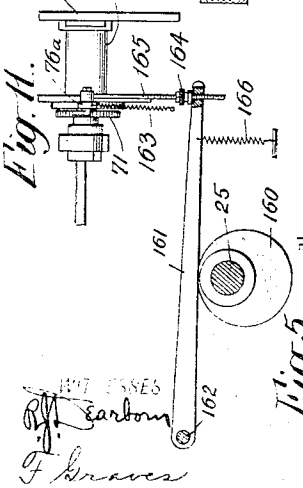


Fig. 11.

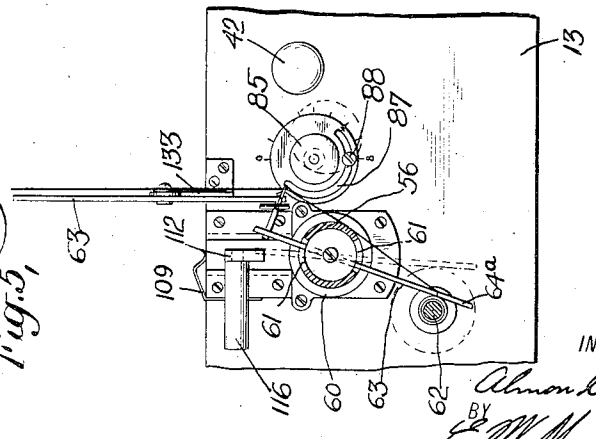


Fig. 5.

WITNESSES

F. F. Earbom

F. Graves

INVENTOR

Almon B. Calkins

BY

E. W. Marshall

ATTORNEY

UNITED STATES PATENT OFFICE.

ALMON B. CALKINS, OF NUTLEY, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, OF TWO-THIRDS TO BRIGHTON MILLS, OF PASSAIC, NEW JERSEY, A CORPORATION OF NEW JERSEY.

COP-WINDING MACHINE.

1,236,906. Specification of Letters Patent. Patented Aug. 14, 1917.

Application filed April 29, 1914. Serial No. 835,060.

To all whom it may concern:

Be it known that I, ALMON B. CALKINS, a citizen of the United States of America, and a resident of Nutley, Essex county, and State of New Jersey, have invented certain new and useful Improvements in Cop-Winding Machines, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to winding machines, and particularly to such as are adapted for winding thread or yarn onto bobbins and are known as "cop-winders."

One object of my invention is to provide a durable and reliable machine for the aforesaid purpose that shall comprise a relatively few number of simple parts and shall be inexpensive to construct and easy to assemble.

Another object is to provide a cop-winder, by which accurate and uniform cops may be closely and automatically wound in an improved manner.

Another object is to provide a winding machine which is capable of careful adjustments to accommodate thread or yarn of varying sizes and to produce cops of varying lengths.

Other objects and advantages of my invention will be set forth hereinafter, and in order that my invention may be thoroughly understood, I will now proceed to describe the same in the following specification, and then point out the novel features thereof in appended claims.

Referring to the drawings:

Figure 1 is a partial end elevation of a multiple spindle machine, each unit of which is complete in itself and embodies my invention.

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1, but drawn to a larger scale.

A sectional elevation taken longitudinally of the winding machine unit is shown in Fig. 3.

Fig. 4 is a plan view of the same unit.

Fig. 5 is a sectional view taken transversely of the winding machine unit on the line 5—5 of Fig. 3.

A sectional detail of the feed adjustment mechanism is shown in Fig. 6.

Figs. 7, 8, 9 and 10 are views corresponding to Fig. 5 but taken respectively on the lines 7—7, 8—8, 9—9, and 10—10 of Fig. 3.

A modified operative connection for the feed pawl carrier is shown in Fig. 11.

Like characters of reference are designated by corresponding parts in all the figures.

Frame.

The machine illustrated comprises a frame having spaced uprights or legs 12 (only a part of one of which is shown), longitudinal connecting plates or webs 13 and 14, a longitudinal shaft or bar 15, vertical standards 16 mounted upon the plate or web 14 over the uprights or legs, and longitudinal rods or bars 18 supported in brackets 19 and 20 on the standards 16. Secured to the longitudinal shaft or bar 15 are a plurality of brackets 21 and 22, each of the brackets 22 being provided with supporting arms 23 and 24.

Mounted in suitable bearings on the bracket arms 23 are longitudinal driving shafts 25 which are continuously actuated when the machine is in operation by any suitable means (not shown).

The standards 16 are mounted in sockets 17 and the brackets 19 and 20 are adjustable on the standards and may be fixed in any suitable position by set-screws as shown in Fig. 1.

Clutch.

The operating mechanism will now be described as if the whole machine comprised only a single unit. Secured to the driving shaft 25 is a clutch collar 26 (see Fig. 2) having actuating lugs 27 projecting laterally therefrom. A sleeve 28 which is rotatively mounted on the shaft has mounted upon it a clutch collar 29 with lugs 30 which are adapted to coöperate with the lugs 27. The sleeve is prevented from sliding longitudinally of the shaft by the clutch collar 26 and a collar 31 at its opposite end. The clutch collar 29 is splined or otherwise mounted to slide on the sleeve and to turn with it. Integral with or secured to the sleeve are a cam 32 and a worm wheel 33.

A pair of springs 34 tend to automatically release the clutch by pulling the collar 29 away from the collar 26 and a vertical

rod 35, which is mounted to turn in bearings 36 and 37, is provided with fingers 38 which are adapted to actuate the clutch collar 29 in opposition to the springs.

A pair of lever arms 39 and 40 are attached to the rod 35 near its upper end and extend laterally thereof in opposite directions. The arm 39 is connected to be actuated by a push rod 41 which extends through the face plate 13, and has a knob 42 on its outer end within easy reach of the operator. To the outer end of the arm 40 is attached a yielding latch 43 which is adapted to engage a pin 44 and hold the clutch set when it is moved to that position by the push rod.

Above the pin 44 is a pivot pin 45 which carries a releasing pawl 46 and a lever arm 49, and may be rocked to actuate the pawl either manually or automatically by a pull rod 47 which is connected to the arm 49, or automatically by means of an adjustable stop 48 as hereinafter explained.

Spindle.

Each of the bracket arms 24 has a pair of spaced bearings 50 which rotatively support a spindle shaft 51. Secured to the shaft between the bearings, and in mesh with the gear wheel 33, is a worm or pinion 52 and removably supported on the tapered outer end of the shaft, which extends through the face plate 13, is a bobbin 54. The bobbin is connected to be driven by the shaft 51 which is supported at its outer end by a bracket 55, mounted near the outer end of a stationary tube 56. The bracket is arranged to both turn and slide on the tube 56 but is limited in its movements by an L-shaped slot 57 in the tube which is engaged by a pin projection 58 of the bracket. A bayonet joint is thus formed which permits the bracket to be moved backwardly in an axial direction and then moved rotatively to permit the ready removal of the bobbin 54 after the cop has been wound upon it. A helical spring 59 is mounted on the tube beyond the bracket and tends to hold the bracket in its operative position.

The stationary tube 56 is substantially parallel to the axis of the shaft 51 and the bobbin 54 and is supported at its inner end by means of a socket 60 mounted on the face plate 13. The tube is provided with a longitudinal slot 61 as clearly shown in Fig. 5, and a cylindrical block 62 is mounted to slide in the tube and carries a thread guide 63 which extends through the block and through the longitudinal slot 61 as shown in Fig. 3. An eyelet 64 is secured to the thread guide near its upper end, the lower end being enlarged at 64^a and provided with a notch 65. The thread or yarn, as more fully explained hereinafter, extends downwardly through the eyelet 64 and the notch 65 onto the bobbin.

Feed mechanism.

A hollow cylindrical bracket 66 having end flanges 67 and 68 is secured to the face plate 13 on its inner surface and is in alinement with the stationary tube 56, a suitable hole 69 being provided in the face plate, so that there is a continuous opening through the cylindrical bracket and the tube. Within the hollow cylindrical bracket is rotatively mounted a sleeve 70 having a toothed flange 71 at one end and a nut 72 at the opposite end. Within this sleeve and connected to be rotated with it is a sleeve or nut 73 which is internally threaded at 74 and extends beyond the sleeve 70 at one end where it is provided with spaced annular projections 75.

A pawl carrier 76 is rotatively supported on the sleeve 70 and comprises a hub 77 which is interposed between the flange 68 of the hollow cylindrical support and the toothed flange 71 of the sleeve. A pawl 78 is pivotally mounted on the pawl carrier and is adapted to engage the toothed edge of the flange 71 against which it is pressed by a spring 79 as clearly shown in Fig. 7.

The hollow carrier has a cylindrically curved extension 80 which is beveled to provide a cam surface 81 and opposite the extension 80 is an arm 82 which engages an eccentric stop 83. This stop is in the form of a disk eccentrically mounted at the inner end of a shaft 84 which extends through the face plate 13 and has an adjusting knob 85 at its outer end. The knob has an index flange 86 provided with a circumferential slot 87, and a stationary stop or pin 88 extends through the slot into the face plate thereby limiting the adjustment of the eccentric. The eccentric may be set at any desired intermediate position and the flange 86, and the adjacent surface of the face plate are graduated for the guidance of the operator.

A collar 90 forms a bearing for and is mounted near one end of the sleeve 73 between the annular projections 75 and has a laterally projecting pin 91 which coöperates as shown in Fig. 6, with the cam surface 81 of the pawl carrier extension 80. The collar 90 is operatively connected by a link 92 and a rocker 93 with the cam 32, the rocker being pivotally mounted on a vertically adjustable stationary support 94 as shown in Fig. 1. This support is secured to a vertically slotted extension 95 of the bracket 21 and carries a pivoted nut 96 with which a screw-threaded shank 97 of the rocker cooperates.

The collar 90 is prevented from rotating by a stationary frame which comprises a pair of spaced rods or bars 98 having overturned ends 99 which are bolted or otherwise secured to the flange 68 and are connected at their opposite ends by a plate 100. These

bars engage notched projections 101 of the collar as clearly shown in Fig. 8.

A feed bar 102 extends from the cylindrical block 62 through a portion of the tube 56, the sleeve 73, and through a suitable guide opening 103 in a block 104.

The cylindrical block 62 is provided with a screw plug 105 having a transverse dove-tail slot 106 in its head. The adjacent end of the feed bar 102 is enlarged at 107 to cooperate with the dove-tail slot 106, the plug 105 being screwed into the end of the cylindrical block 62 as shown in Fig. 3. The feed bar is less in width than the diameter of the cylindrical opening of the tube 56, which corresponds quite closely in size to the cylindrical opening of the quill 73, and consequently the bar may be moved transversely within these members as hereinafter explained.

As shown in Fig. 9, the socket 60 has an upwardly extending projection 108, slotted to form a guideway for a block 109 which corresponds to the block 104 and has a rectangular aperture 110 near its inner end through which the bar 102 extends. The bar 102 throughout the greater part of its length, is notched on one edge at 111 and constitutes a rack which is adapted to mesh with the internally threaded portion 74 of the sleeve 73 when the bar is adjusted to one position by the sliding blocks 104 and 109. These blocks are simultaneously adjusted to move the bar 102 into and out of mesh with the threaded sleeve by means of a sliding rod 112. This rod is mounted to slide through suitable openings in the face plate 13, the flanges 67 and 68, and the plate 100. One of its edges is straight and this edge is held in engagement with alining surfaces of the guide openings, by means of springs 113. The opposite edge of the rod 112 has a beveled end surface 114 which is adapted to coöperate with the block 104 and a beveled surface 115 near its opposite end which is adapted to coöperate with the block 109. The blocks 104 and 109 are pressed downwardly by springs 104^a and 109^a and tend to move so as to disengage the rack from the threaded sleeve and consequently when the rod 112 is moved outwardly by means of a handle 116, the blocks follow the beveled surfaces 114 and 115 and disengage the rack from the teeth of the sleeve 73. The movement of the rod 112 in this direction is limited by a pin 117. A reverse movement of the rod 112 simultaneously moves the blocks 104 and 109 outwardly thereby throwing the rack into mesh with the threads of sleeve 73.

The inward movement of the feed bar when disengaged from the threaded sleeve is limited by a stop 165 which is adapted to engage the adjacent end of the threaded sleeve and is secured to the feed bar near its outer end. It extends inwardly therefrom in parallelism with the bar for a predetermined distance, dependent upon the starting point for winding the cop. This stop does not otherwise interfere with the movement or adjustment of the feed bar as set forth herein, since it is adapted to extend below the guide block 109.

In order to make the return movement of the feed bar and thread guide automatically dependent upon the release of the clutch, I provide a suitable spring such as spring 170 which tends to push the bar backwardly and connect the rod 112 to the arm 39 by link 171 as shown in Figs. 1 and 4.

Drag mechanism.

Secured to the longitudinal rod 18 which is carried by the brackets 20, is a socket 120 from which extends outwardly a spindle 121, a spool 122 of thread or cord being mounted thereon. The spool is freely rotatable on the spindle but is prevented from slipping off by a stop 123.

An arm 124 is secured to the longitudinal rod 18 which is carried by the brackets 19, and has a lateral shaft projection or pin 125 near its outer end. A sheave or pulley 126 is mounted on the shaft or pin 125 and has a grooved periphery which is engaged by a drag roll 127. The latter is supported by a trunnion 128 on a short spindle 129 which is supported by the arm 124 and is spring-pressed into engagement with the periphery of the sheave 126, thereby producing a drag on the thread in a well known manner.

A bell crank lever 130 is also pivotally mounted on the shaft 125 and carries an eyelet 131 near the outer end of its longer arm. A spring 132 is connected to its shorter arm and holds the thread under tension.

A small bracket 133 is secured to the face plate 13 and carries a lever 134, to the upper end of which a guide eyelet 135 is connected by a spring 136. The lever is pivoted on the bracket intermediate of its ends and the end opposite the spring is adapted to engage and actuate the overturned end of the pull rod 47 when the tension on the spring 136 is released.

Under operating conditions, as more fully explained hereinafter, the spring is kept under tension by the thread which extends from the spool 122 over the drag pulley 126 through the eyelet 131, the guide eyelet 135 and the eyelet 64 which is attached to the feed mechanism and through the notch 65 to the cop which is wound on the bobbin 54.

Operation.

The operation of the machine is as follows. The bobbin 54 may be formed of wood or paper or other suitable material and tapered slightly toward its outer end in order to

facilitate the unwinding of the cop. It is inserted in the machine on the tapered end of the spindle adjacent to the bracket 55. A spool of thread or yarn is placed on the spindle 121, the thread being passed over the drag pulley and through the eyelets as hereinbefore set forth, its end being started on the bobbin near the larger end thereof in a well known manner. Care of course should be taken that the feed bar is adjusted to such position that the thread guide is opposite the larger end of the bobbin as shown in Fig. 1.

The machine is now ready to start and it may be assumed that the driving shaft 25 is rotating.

Under these conditions it is only necessary to actuate the push rod 41 by pressing on the head 42 to set the clutch and start the spindle shaft. The clutch when set is held in this position by the latch 43 which springs into engagement with the pin 44. The clutch when set connects the sleeve 28 together with the cam 32 and the gear wheel 33 with the driving shaft 25. The gear wheel drives the spindle shaft 51 through the pinion 52 at a relatively high speed and thereby immediately starts the winding operation. At the same time the cam 32 causes the rocker 93 to oscillate, the rocker being provided with a projection 140 which engages a cam slot 141.

This oscillatory movement produces a reciprocatory movement of the collar 90 which carries with it the sleeve 73 and the feed bar 102. The length of this stroke determines the diameter of the cop as more fully explained hereinafter and may be determined by adjusting the support 94 toward or away from the projection 140 of the rocker. The reciprocatory movement is uniform but in addition to this backward and forward movement of this bar 102 there is a step by step advancement or translatory movement of the bar, each stroke being advanced a little farther than the last by reason of a rotative adjustment of the sleeve 73 which acts like a stationary nut in effecting a relative movement between the sleeve 73 and the feed bar.

The rotative movement of the sleeve is produced at each stroke of the collar 90 by reason of the successive engagement of the pin 91 of the collar, with the cam surface 81 of the pawl carrier 76. This engagement produces a rotative movement of the pawl carrier and causes the pawl to rotatively advance the sleeve 70 by engaging the teeth of the ratchet flange 71. The sleeve 70 is keyed to the sleeve 73 and consequently the movement is transmitted to the latter which is thus subjected to two independent movements.

The extent of rotative movement effected by each stroke of the collar depends upon the setting of the eccentric 83 which determines the position to which the pawl returns during the return stroke of the collar which is effected by a spring 150 (see Fig. 8). This adjustment determines the relative position of each layer of the cop to the preceding and is set with reference to the size of the thread of yarn which is being wound. The winding process continues as indicated, as long as the thread or yarn is not broken, unless the operator releases the clutch by actuating the pull rod 47 or unless the latch 43 is released in some other way, as, for example, when the pin 48 engages the arm 49 at the end of the cop. If the thread breaks, the reaction of the spring 136 will cause the lever 134 to rock on the bracket 133 and its lower end will then release the clutch by actuating the pull rod.

The projection 48 which constitutes a stop, is adjustable on the feed bar 102 and consequently may be set to determine the length of the cop.

When the cop is completed and the machine is stopped, the operator swings the bracket 55 out of the way, removes the cop, and puts in a new bobbin. The feed bar 102 is returned to its initial position as hereinbefore set forth by the action of the arm 39 upon the rod 112 which releases the rack teeth from the threads of the sleeve. The feed bar is then pushed inwardly by the spring 170 until the stop 165 engages the adjacent end of the sleeve 73. The operator therefore only has to reset the bar 112 and the clutch which may be accomplished simultaneously by actuating the push rod 41. If the spring 170 and the link 171 are omitted the operator manually returns the feed bar to its initial position after it has been released from the teeth of the threaded sleeve by pulling on the rod 112.

The oscillatory movement of the pawl carrier may be effected as shown in Fig. 11 instead of depending upon the cam surface 81. In this modification the driving shaft is provided with an eccentric cam 160 with which an actuating lever 161 coöperates. This lever is pivoted at 162 and is connected at its free end, by an adjustable link 165, with the pawl carrier 76ª, which is similar to the carrier 76 except that the cam projection 80 is omitted. The link 165 is pivotally connected to the pawl carrier 76ª, extends loosely through a hole in the lever arm 161, and has an adjusting nut 164 which is held in engagement with the lever arm by a spring 163. Consequently the pawl carrier is oscillated with the lever arm 161 in response to the movement of the eccentric cam. The lever arm may also be provided with a spring 166 to hold it in engagement with the cam surface. This form of operative connection is believed to be preferable.

The block 62 which slides in the tube 56 is also arranged to be rotatively moved

through a sufficient arc to permit the notched end of the thread guide to swing, as clearly indicated in broken lines in Fig. 5 when the guide moves back and forth over the tapered surface of the cop in process of formation, as shown in Fig. 3. In order to avoid a continuous rubbing of the thread or yarn as it passes through the notch the eyelet 64 is arranged to extend outwardly from the upper end of the thread guide for a considerable distance. Since it swings with the guide and always maintains its position relative to the notch, it holds the thread at a fixed angle to the guide and permits it to pass through the notch without rubbing.

It is evident that various modifications may be effected within the spirit and scope of my invention, and I intend that only such limitations be imposed as are indicated in the appended claims.

What I claim is:

1. A winding machine comprising a rotatable bobbin spindle, a driving shaft, an interposed clutch, a thread guide, a feed bar operatively connected to the thread guide, a cam connected to be driven by said driving shaft when the clutch is set, an adjustable operative connection between the cam and the feed bar for producing a reciprocatory movement and a step by step translatory movement to the thread guide and means for adjusting the extent of each step of the translatory movement.

2. A winding machine comprising a rotatable bobbin spindle, a driving shaft, an interposed clutch, a thread guide, a feed bar operatively connected to the thread guide, a cam connected to be driven by said driving shaft when the clutch is set, a single means coöperating with the feed bar and adapted to be rotated step by step and reciprocated to impart a reciprocatory movement and a step by step translatory movement to the feed bar and means for adjusting the extent of each step of the translatory movement.

3. A winding machine comprising a driving shaft, a sleeve rotatable thereon and having a driving gear and a cam secured to it, a clutch biased to release, interposed between the driving shaft and the sleeve, a bobbin spindle connected to be driven by said gear, a thread guide, means for restricting the thread guide to a straight line movement in substantial parallelism with the axis of said bobbin spindle, a feed bar operatively connected to the thread guide and having a toothed rack surface, a screw-threaded rotatable member adapted to cooperate with said toothed rack, and means dependent upon said cam for reciprocating and rotatively moving said screw-threaded member.

4. A winding machine comprising a thread guide, a spindle, a toothed rack constituting a feed bar, an internally threaded sleeve adapted to actuate the feed bar, and means for imparting a step by step rotative movement to the threaded sleeve.

5. A winding machine comprising a thread guide, a spindle, a toothed rack constituting a feed bar, an internally threaded sleeve adapted to actuate the feed bar and having a ratchet flange, a rotatively supported pawl carrier, a pawl thereon adapted to coöperate with the ratchet flange, and means for oscillating the pawl carrier.

6. A winding machine comprising a thread guide, a spindle, a toothed rack constituting a feed bar, an internally threaded sleeve, a reciprocatory actuator, and means dependent upon the reciprocatory actuator for imparting a step by step rotative movement to the threaded sleeve.

7. A winding machine comprising a thread guide, a spindle, a toothed rack constituting a feed bar, an internally threaded sleeve having a ratchet flange, a reciprocatory actuator, a rotatively mounted pawl carrier, a pawl thereon adapted to coöperate with the ratchet flange, and means dependent upon the reciprocatory actuator for oscillating the pawl carrier.

8. A winding machine comprising a thread guide, a spindle, a toothed rack constituting a feed bar, an internally threaded sleeve having a ratchet flange, a reciprocatory actuator, a rotatively mounted pawl carrier, a pawl thereon adapted to coöperate with the ratchet flange, and a link connection between the reciprocatory actuator and the pawl carrier for oscillating the pawl carrier to impart a step by step rotative movement to the threaded sleeve.

9. A winding machine comprising a rotatable bobbin spindle, a thread guide, a tubular member substantially parallel to the spindle for guiding the movement of the thread guide, a feed bar extending into the tubular member and operatively connected to the thread guide, and means for imparting a reciprocatory movement and a step by step translatory movement to the feed bar.

10. A winding machine comprising a rotatable bobbin spindle, a tubular guide substantially parallel to the axis of the spindle, a thread guide slidably mounted in said tubular member, a feed bar extending into the tubular member and operatively connected to the thread guide and adjustable laterally within the tubular member, independently of the thread guide, a driving shaft, and interposed means for rotating the bobbin spindle and imparting a reciprocatory movement and a step by step translatory movement to the feed bar.

11. A winding machine comprising a rotatable bobbin spindle, a tubular guide substantially parallel to the axis of the spindle, a thread guide slidably mounted in said tubular member, a feed bar extending into

the tubular member and operatively connected to the thread guide and adjustable laterally within the tubular member, independently of the thread guide, a reciprocatory actuator for the feed bar, a power shaft, and interposed means for rotating the spindle and for driving the reciprocatory actuator.

12. A winding machine comprising a rotatable bobbin spindle, a tubular member substantially parallel to the axis of the spindle, a thread guide slidably mounted in said tubular member, a toothed rack extending into the tubular member and operatively connected to the thread guide and laterally adjustable independently thereof, an internally threaded sleeve adapted to actuate the feed bar, and means for imparting a step by step rotative movement to the threaded sleeve.

13. A winding machine comprising a rotatable bobbin spindle, a tubular member substantially parallel to the axis of the spindle, a thread guide slidably mounted in said tubular member, a toothed rack extending into the tubular member and operatively connected to the thread guide and laterally adjustable independently thereof, an internally threaded sleeve adapted to actuate the feed bar, and guide members for the toothed rack.

14. A winding machine comprising a driving shaft, a sleeve rotatable thereon and having a driving gear and a cam secured to it, a clutch biased to release, interposed between the driving shaft and the sleeve, a bobbin spindle connected to be driven by said gear, a thread guide, means for restricting the thread guide to a straight line movement in substantial parallelism with the axis of said bobbin spindle, a feed bar operatively connected to the thread guide, and provided with a toothed rack, a screw-threaded rotatable member adapted to cooperate with said toothed rack, actuating means dependent upon said cam for reciprocating and rotatively moving said screw-threaded member, and guide members for the rack.

15. A winding machine comprising a driving shaft, a sleeve rotatable thereon and having a driving gear and a cam secured to it, a clutch biased to release, interposed between the driving shaft and the sleeve, a bobbin spindle connected to be driven by said gear, a thread guide, means for restricting the thread guide to a straight line movement in substantial parallelism with the axis of said bobbin spindle, a toothed rack constituting a feed bar, an internally threaded sleeve adapted to actuate the feed bar and having a ratchet flange, a rotatively supported pawl carrier, a pawl thereon adapted to coöperate with the ratchet flange, and means dependent upon said cam for oscillating the pawl carrier.

16. A winding machine comprising a driving shaft, a sleeve rotatable thereon and having a driving gear and a cam secured to it, a clutch, interposed between the driving shaft and the sleeve, a bobbin spindle connected to be driven by said gear, a thread guide, means for restricting the thread guide to a straight line movement in substantial parallelism with the axis of said bobbin spindle, a feed bar operatively connected to the thread guide, a toothed rack constituting a feed bar, a screw-threaded rotatable member adapted to coöperate with said toothed rack, actuating means dependent upon said cam for reciprocating and rotatively moving said screw-threaded member, and guide members for the rack.

In testimony whereof, I have hereunto set my hand, this 25th day of April, 1914, in the presence of two subscribing witnesses.

ALMON B. CALKINS.

Witnesses:
E. W. OSTRANDER,
THOMAS P. DAY.