June 30, 1931. E. R. SWANSON 1,812,382

TRAVERSE MECHANISM FOR WINDING MACHINES

Filed Nov. 3, 1928 3 Sheets-Sheet 1

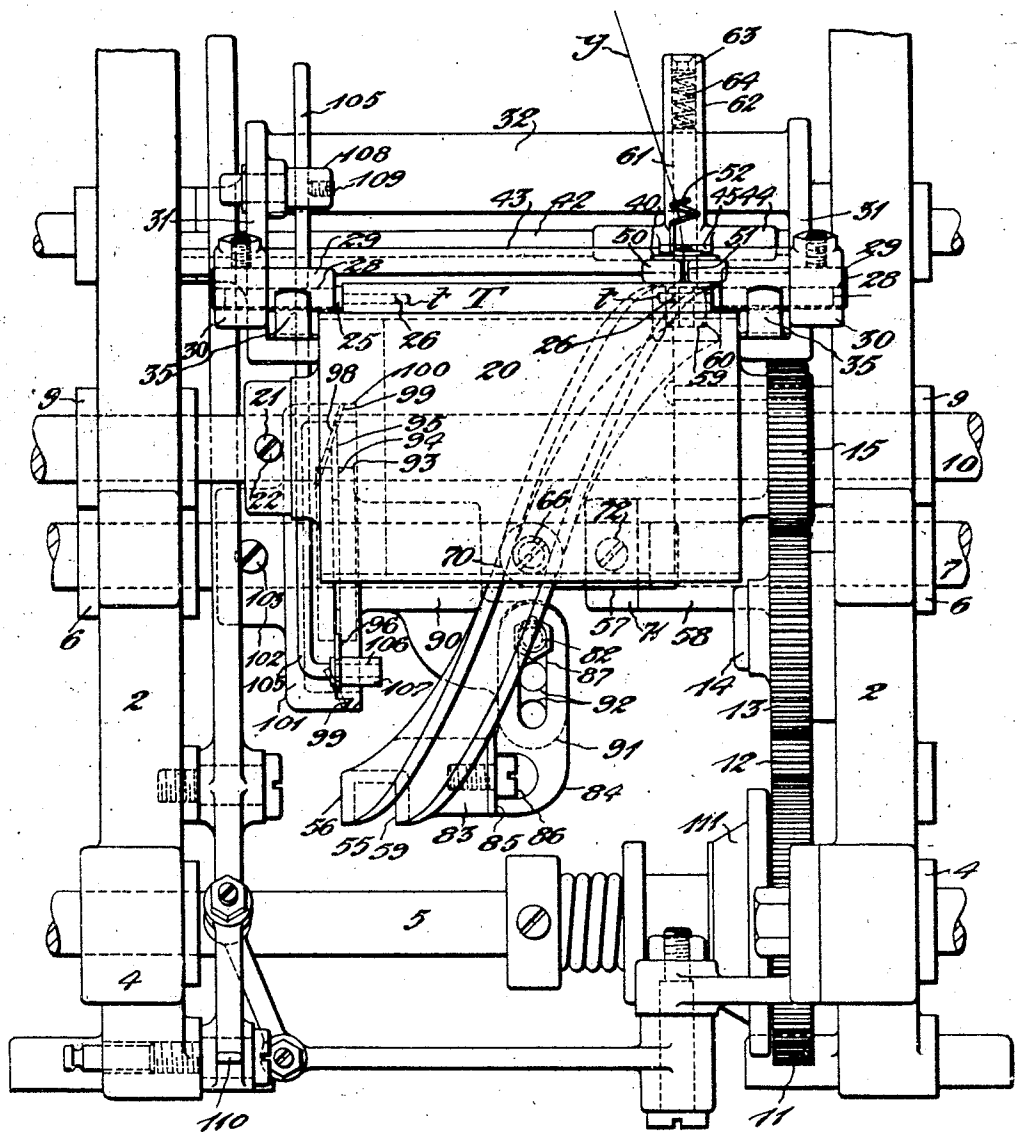


Fig. 1.

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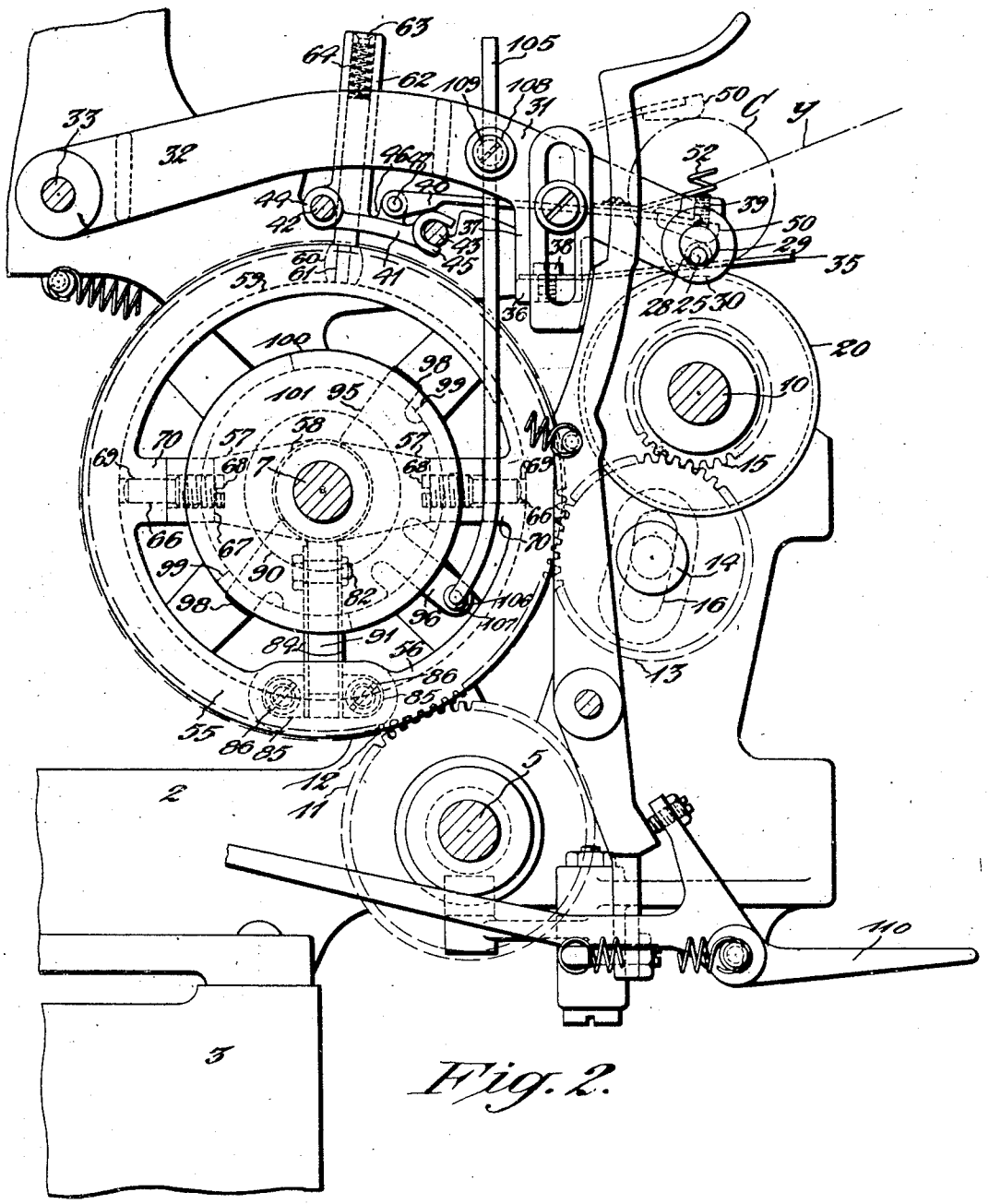


Fig. 2.

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TRAVERSE MECHANISM FOR WINDING MACHINES

Filed Nov. 3, 1928 3 Sheets-Sheet 3

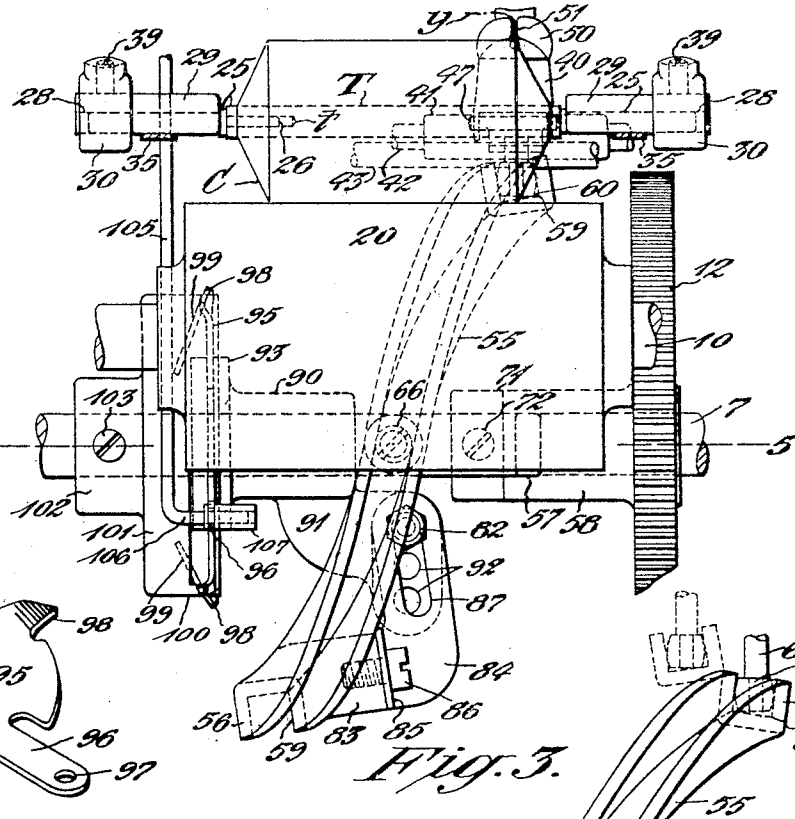


Fig. 3.

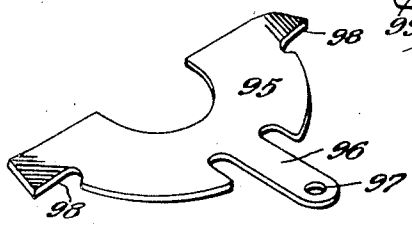


Fig. 6.

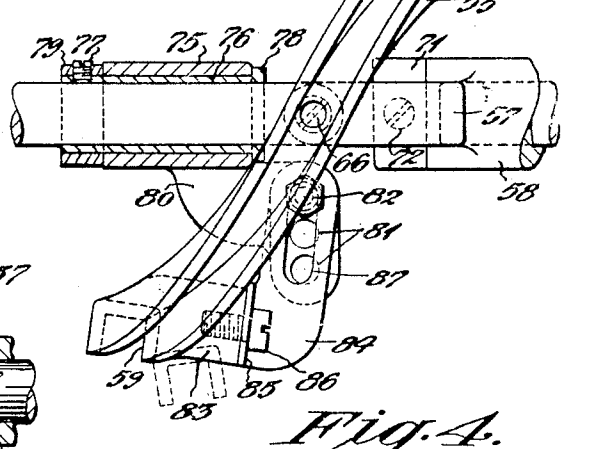


Fig. 4.

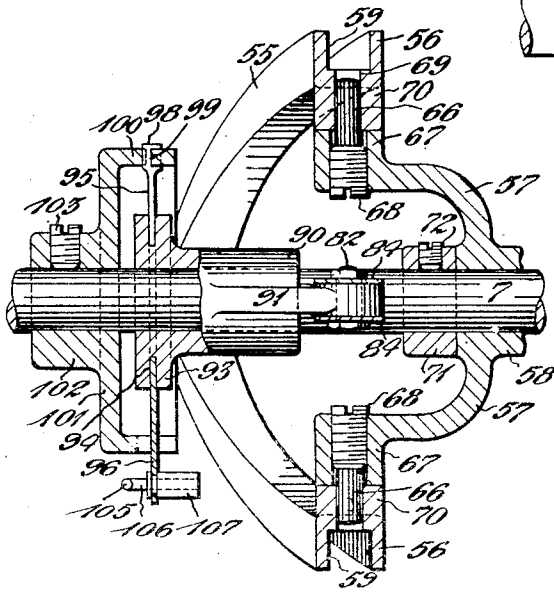


Fig. 5.

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Patented June 30, 1931 1,812,382

UNITED STATES PATENT OFFICE

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TRAVERSE-MECHANISM FOR WINDING MACHINES

Application filed November 3, 1928. Serial No. 316,968.

This invention relates to improvements in winding machines for winding cops, bobbins and packages of yarn, thread or the like, or for producing coils of wire and other strand conductor. The present improvement is directed particularly to the traverse-mechanism of the machine for traversing the strand material longitudinally of the axis of the core or holder on which it is wound.

In the following specification and claims the term "package" is to be interpreted in its broad sense as indicating any form of wound mass such as a cop, bobbin, cheese or coil and the term "strand material" as applying to textile yarns, threads or the like, wire or other conductor and any other attenuated material.

One object of the invention is to provide a traverse-mechanism for winding machines which is adjustable to vary the extent of traverse of the strand material in accordance with the length or shape of the cop, bobbin, package or coil to be produced.

Another object of the invention is to provide means for automatically shortening the traverse of the material during the winding to build a cop, bobbin, package or coil having layers of gradually decreasing length to form it with tapered or inclined ends.

Another object of the invention is to provide an adjustable cam provided with means for altering the extent of its throw to regulate the length of traverse of the strand-guiding means.

Another object of the invention is to provide means operated automatically during the winding to adjust the throw of the cam to gradually shorten the length of traverse of the strand-guiding means.

Further objects of the improvement are set forth in the following specification which describes a preferred form of construction of the invention, by way of example only, as illustrated by the accompanying drawings. In the drawings:

Fig. 1 is a front view of a winding machine showing the present improved traverse-mechanism as applied to use thereon;

Fig. 2 is an end elevation of the machine;

Fig. 3 is a detail view of the adjustable traverse-mechanism showing the thread-guide connected to be operated therefrom;

Fig. 4 is a detailed view of the adjustable traverse-cam shown as adapted for fixed adjustment;

Fig. 5 is a sectional view of the cam taken on line 5—5 of Fig. 3; and

Fig. 6 is a perspective view of one element of the adjusting-means for the cam.

The present drawings illustrate a certain type of winding machine comprising the usual elements of a friction drum or drive-roll for rotating the cop, bobbin or package being wound; a thread-guide for traversing the strand material to deposit it in turns or coils extending helically from one end of the cop to the other; and a cam for reciprocating the thread-guide. In other cases, however, the cop, bobbin, package or coil may be wound on a positively-rotated winding-spindle and different forms of strand-guiding means may be employed in place of those herein shown and described.

Referring to Figs. 1 and 2 of the present drawings, the winding mechanism is supported from a pair of side frames or brackets 2, 2 which may be mounted on a suitable table or bed 3 shown in Fig. 2. The frame-members or brackets 2 may be arranged in series along the bed 3 to support a plurality of winding units in gang form, as is usual in machines of the present type, but as all of the units are of substantially identical construction only one is herein shown and described.

Journalled in bearings 4 at the bottom of the frame-members 2 is a horizontal drive-shaft 5, from which power is derived for driving the various elements of the winding mechanism. The power shaft 5 may be driven from a belt or directly connected to a motor, these connections not being herein shown or described as they form no part of the present invention. Fixedly held in bearings 6 on the frame-members 2 is a horizontal cam-shaft 7, and above and forward of the cam-shaft 7 is a non-rotatable drum-shaft 10 held in bearings 9.

A gear 11 on the drive-shaft 5 meshes with a larger gear 12 which is free to turn on the shaft 7 and connected to drive the cam 55 to be later described. The cam-gear 12, in

turn, meshes with an idler pinion 13 which is journalled on a stud 14 projecting from the side of the frame-member 2. The idler pinion 13 meshes with a gear 15 connected to the drive-roll or drum 20 to rotate the latter on the shaft 10. It will thus be observed that through the train of gearing above described the drive-shaft 5 is caused to rotate the cam-gear 12 and rotation is imparted therefrom to the drum 20 through the pinion 13 and gear 15. Preferably, the stud 14 on which the pinion 13 is mounted is adjustable in a slot 16 so that different gears may be substituted for the gear 15 to change the ratio of speed between the cam and the drum to vary the character of the wind. As shown in Fig. 1 the drum or drive-roll 20 is mounted on the shaft 10 with one of its hubs abutting a collar 21 secured fast to the shaft by a set-screw 22 and with the gear 15 suitably secured to its opposite hub and abutting the bearing 9.

In the present embodiment of the invention the machine is illustrated as adapted to wind a cop, bobbin or package of yarn, or a coil of wire, indicated at C in Fig. 3 as being of generally cylindrical form with tapered ends. This type of yarn package may be used as a filling bobbin for loom shuttles or as a supply for other purposes, and its ends are made tapered or inclined to prevent the yarn or other strand material from sliding or slipping out of place. That is to say, the layers of winding are gradually shortened in length as the cop, bobbin or package is built up from its core to its outer periphery to give the windings greater stability so that the end coils of the outer layers will not fall down or slough off when the package is handled. This type of cop, bobbin or package is usually wound on a small wooden tube or quill T which serves as a support or core for the windings.

As herein shown, the tube or quill T is adapted to be held rotatably by means of gudgeons 25 inserted into its ends. The gudgeons 25 are in the form of spindles having reduced end-portions or pins 26 adapted for insertion into bores *t* at the ends of the tube or quill T. The main or larger portions of the gudgeons 25 are adapted to be received in circular recesses 28 on the under side of bushings 29. The bushings 29 are held in hubs 30 at the ends of the arms 31 of a yoke-like frame or support 32. The yoke or support 32 is pivoted at 33 to adapt its outer ends to swing upwardly to allow the tube or quill T to recede from the periphery of the drum or drive-roll 20 as the layers of winding are built up on the quill.

A pair of flat leaf-springs 35 are fastened at their rearward ends to lugs 36 projecting from the side of extensions 37 on the arms 31 of the yoke 32, being secured in place by screws 38. The forward ends of the springs 35 underlie the recesses 28 in the bushings 29 to retain the gudgeons 25 therein; the pins 26 on the gudgeons being first inserted into the bores in the ends of the tube or quill T and then snapped into place by pressing them downwardly on the outer ends of the springs 35. The bushings 29 are held in place in their hubs 30 by means of set-screws 39 so that they may be adjusted to align their recesses 28 with the axis of the drive-roll or drum 20.

In the present form of construction of the winding mechanism the thread-guide 50 which traverses the strand material on to the tube or quill T is mounted on a carriage 41 which slides on rails or rods 42 and 43 extending parallel with the axis of the drive-roll or drum 20 above and at the rear thereof. The two rods 42, 43 are supported at their ends in the frame-members 2, see Fig. 1, and the carriage 41 is provided with a hub 44 enclosing one of the rods and a fork 45 straddling the other rod. The thread-guide 50 is carried at the outer end of an arm 40 constructed as a narrow plate or blade and forked at its rearward end to straddle a lug 46 on the slide 41, to which it is pivoted by means of a pin or stud 47. At its forward end the thread-guide arm 40 is suitably formed to receive and support a porcelain button 50 to adapt the latter to recede from the axis of the cop during the growth in the winding. The thread-guide 50 is formed with a rounded face adapted to bear against the surface of the winding and is provided with a suitable slot or groove 51, see Fig. 3, through which the strand *y* of thread, yarn or other material feeds. A wire pigtail 52 attached to the back of the thread-guide arm 40 is arranged above the guide 50 to direct the strand *y* down through its groove, the tension of the strand drawing through the pigtail tending to maintain the face of the guide constantly bearing against the winding.

The thread-guide 50 is caused to traverse the length of the package being wound under the reciprocating action of the carriage 41 carrying the thread-guide arm 40. For reciprocating the guide the present invention contemplates the use of a novel form of cam 55 which is adapted for adjustment to vary the extent of its throw. As shown most clearly in Figs. 2, 3 and 5, the cam 55 is of generally cylindrical form provided with a circumferential rim 56 supported by arms 57 radiating from a hub 58 on the shaft 7. The rim 56 is provided with a helical groove 59 adapted to engage the sides of a bowl or roller 60 connected to the slide 41.

As shown in Figs. 1 and 2, the roller 60 is journalled on the end of a plunger-pin 61 which slides in the bore of a tubular stem 62 reaching upwardly from the slide 41. The upper end of the bore of the stem 62 is closed by a plug 63, against which is seated

a helical spring 64 pocketed in the bore and arranged to bear against the end of the plunger 61. The spring 64 tends to press the plunger 61 downwardly to maintain the bowl or roller 60 in the groove 59 of the cam 55 while adapting the roller to rise and fall for a purpose as later explained.

As one form of construction of the present invention the rim 56 of the cam 55 is swivelled to rock on trunnions 66 carried at the ends of the arms 57 on the hub 58, whereby the angular relation of the cam groove 59 may be adjusted to alter the length of its throw. As illustrated in Fig. 5, the arms 57 are formed at their ends with hubs 67 which are bored radially and threaded to receive the body-portions 68 of the trunnion pins 66. The trunnion pins 66 project beyond the ends of the hubs 67 to enter holes 69 in bosses 70 on the inside of the rim 56. As herein illustrated the hub 58 of the cam 55 is mounted free to rotate on the shaft 7 and is fast to the gear 12 from which it is driven, the gear 12 being made integral with the hub if preferred. One end of the hub 58 abuts the side of the bearing 6 on the frame-member 2 and a collar 71 secured to the shaft 7 by a set-screw 72 abuts the opposite end of the hub to hold it from sliding on the shaft.

It will be understood that by rocking or tilting the rim 56 of the cam 55 the angular relation of its groove 59 may be altered to vary the extent of its throw within certain limits. Any suitable means may be employed for adjusting the angular relation of the cam-rim, and as one form of construction of the invention the present drawings illustrate a sleeve adapted to be slid on the cam-shaft 7 for this purpose. In Fig. 4 of the drawings, the sleeve 75 is shown as rotatably mounted on a bushing 76 which may be secured in its different positions of adjustment by means of a set-screw 77. One end of the bushing 76 is flanged at 78 to abut the end of the sleeve 75 and its opposite end carries a collar 79, this arrangement providing for holding the sleeve longitudinally of the bushing while adapting it to turn thereon. The set-screw 77 is inserted through the collar 79 to hold the latter in place on the bushing 76 and its end projects through the bushing to bind against the cam-shaft 7 to secure the bushing in its different positions of adjustment. Projecting from the sleeve 75 is an elbow-shaped arm 80 provided with a series of radially disposed holes 81 at its outer end. The holes 81 are adapted to receive a bolt 82 which connects the arm 80 with the rim of the cam 55 through means as next described.

As shown most clearly in Figs. 1, 3 and 4, the rim 56 of the cam 55 is formed with a boss 83, to which is attached a double-sided arm 84. This latter element may be constructed from sheet-metal plates of the form shown in Figs. 3 and 4, being provided with ears 85 which are attached to the boss 83 by means of screws 86, see also Fig. 2. The two sides of the arm 84 straddle the sides of the arm 80 on the sleeve 75, see Fig. 5, and are provided with elongated slots 87, shown in Fig. 4, for receiving the bolt 82 which connects the parts together. It will thus be seen that when the sleeve 75, shown in Fig. 4, is slid on the shaft 7 its arm 80 will act through the arm 84 on the cam-rim 56 to rock the latter. By adjusting the bolt 82 in the different holes 81 the ratio of movement between the sleeve 75 and the cam-rim may be varied, it being observed that with the bolt 82 in the hole nearest the axis of the cam the movement of the sleeve 75 will effect a maximum displacement of the cam-rim 56; whereas, with the bolt 82 in the outer hole 81 the proportionate movement of the cam-rim under the sliding action of the sleeve 75 will be less. The construction and arrangement of the device as shown in Fig. 4 is adapted for use to effect a fixed adjustment of the cam-rim when it is desired to set the winding machine for producing a cop, bobbin, package or coil of any predetermined length.

As hereinbefore noted, the present invention may also be employed on the winding machine or other apparatus to provide for an automatic change or adjustment in the length of the throw of the cam during the winding operation. When used for this purpose the means for tilting the cam-rim 56 is arranged as shown in Figs. 1, 2, 3 and 5 and as now described. The cam-rim 56 may be rocked or tilted through the means of a sliding sleeve 90 on the cam-shaft 7 which, like the sleeve 75 previously described, is formed with an arm 91 having spaced holes 92 for receiving the bolt 82 which connects it with the arm 84 on the cam-rim. As shown most clearly in Fig. 5, the sleeve 90 is constructed with a radial flange 93 formed with a peripheral groove 94. Seated in the groove 94 is a substantially flat plate or shift-member 95, shown in perspective view in Fig. 6. The shift-member 95 is of generally arcuate shape to adapt it to be inserted into the groove 94 in the flange 93 on the sleeve 90 whereby it may be rotated about the axis thereof by means of an arm 96 projecting at one side. Projecting diametrically from its opposite ends are two prongs or ears 98 which are bent or twisted to incline them at opposite angles to the plane of the plate 95.

The ears 98 are adapted to engage with inclined slots 99 formed in the overhanging rim 100 of a cup-shaped member 101. The member 101 is provided with a hub 102 held fast on the cam-shaft 7 by means of a set-screw 103. This construction adapts the cam-plate or shift-member 95 to be rotated in the groove 94 of the flange 93 to slide the sleeve 90 one way or the other in an axial direction along

the shaft 7. The sliding movement of the sleeve 90 will thereby act to rock the cam-rim 56 through the connections before described whereby to adjust the angularity of the cam-rim 56 in the manner and for the purpose as later explained.

The cam-plate or shifter 95 is turned rotatively of the axis of the cam through means connecting it with the swinging frame 32 which, as before explained, is carried upwardly as the cop, bobbin, package or coil being wound increases in diameter. As shown most clearly in Figs. 1 and 2 of the drawings, a wire rod or link 105 reaches down from the frame 32 and is bent at right-angles at its lower end to adapt it to hook through a hole 97 at the end of the arm 96 on the cam-plate or shifter 95. Preferably, the end 106 of the wire link 105 is inserted into the bore of a thimble 107 which is riveted through the hole 97 in the arm 96 whereby to provide a longer bearing for the connection at this point. Referring to Figs. 1 and 2, the upper end of the link 105 passes through a hole in the head of a stud 108 projecting from the side of one of the arms 31 of the frame 32, being secured therein by a set-screw 109 which provides for its adjustment in setting the cam-plate or shifter 95 to obtain the proper extent of movement to slide the sleeve 90 to rock the cam-rim 56.

The method of operation of the complete winding mechanism arranged as last described will now be explained. To prepare the machine for winding the tube or quill T is applied to position at the outer end of the swinging frame 32 by inserting the gudgeons 25 in its end bores and seating them in their bearing recesses 28 in the hubs 29. The strand *y* of thread, yarn, wire or other material is led from its source of supply, not herein shown, passed through the pigtail 52 and down through the slot or groove 51 in the thread-guide 50, its end being then attached to the tube T. The frame 32 is then swung downwardly to place the tube or quill T in contact with the periphery of the drum or drive-roll 20 and the machine is ready to start. The winding operation is started by shifting a hand-lever 110 which controls a clutch 111 on the drive-shaft 5, these parts not being herein shown or described in detail as they form no part of the present invention. As the clutch 111 is engaged it imparts rotation to the gear 11 to turn the gear 12 to rotate the cam 55. The gear 12 drives through the pinion 13 and gear 15 to turn the drum or drive-roll 20 and the frictional contact of the latter with the periphery of the tube or quill T imparts rotation thereto. The quill T is thus rotated to wind on the strand *y* which, leading through the groove in the thread-guide 50, is caused to be traversed back and forth along the tube to lay the material in helical turns or coils.

At the start of the winding the cam 55 has its rim 56 held in normal position as illustrated in Fig. 1, whereby it imparts a maximum extent of throw to the slide 41 which reciprocates the thread-guide 50 carried on its arm 40. As the strand material is deposited on the tube or quill T the increase in diameter of the successive overlying layers will cause the tube to recede from the drum or drive-roll 20 and the frame 32 will therefore be swung upwardly on its pivot 33. As the frame 32 rises in this manner during the growth in the winding it acts through the link 105 to rotate the cam-plate 95 in the groove 94 of the sleeve 90, turning it in a contra-clockwise direction as viewed in Fig. 2. This rotative motion of the cam-plate or shifter 95 causes its inclined ears 98 to slide in the angular slots 99 of the rim 100 on the member 101 which, as has been previously explained, is held in fixed relation on the non-rotating shaft 7. The engagement of the ears 98 with the inclined slots 99 is therefore caused to act in the manner of a cam or screw to slide the sleeve 90 to the right as viewed in Figs. 1 and 5. This sliding movement of the sleeve 90 acts through its arm 91 in the manner as previously explained to gradually rock the cam-rim 56 to reduce its inclination or angular pitch whereby the extent of its throw is shortened. Consequently, as the winding builds up on the tube T the cam-rim 56 is rocked to gradually diminish the extent of traverse of the thread-guide 50 reciprocated therefrom so that each layer of winding deposited on the cop, bobbin, package or coil will be slightly shorter than the one previously wound.

Fig. 3 shows the cam-rim 56 as tilted to the position which it assumes when the cop or bobbin is finally completed and it will be noted that the extent of traverse imparted to the thread-guide at this point in the winding is considerably less than that at the beginning of the package. By thus progressively shortening the length of the traverse of the strand-traversing means the cop, coil or package is built up with layers of gradually diminishing length so that its ends assume an inclined or tapered contour as shown in Fig. 3, the change in the length of the traverse being effected automatically during the winding as influenced by the movement of the frame 32.

It has been explained that by adjusting the bolt 82 in the different holes 92 of the arm 91 the degree of change in the angularity of the cam may be regulated as required. With the bolt 82 in the inner hole the mechanism will be caused to operate with a maximum range to produce a pronounced taper at the ends of the package; whereas when the bolt is in the outer hole the leverage will be less on the arm 84 so that the extent of movement

of the cam will be diminished to form the ends of the package with less taper.

It should be noted that as the cam-rim 56 is rocked on its gudgeons its circumferential diameter will change, the diameter increasing as the throw is shortened and vice versa. It is for this reason that the roller 60 is adapted to move up and down under the sliding action of the plunger 61 in the stem 62 on the slide or carriage 41, with the spring 64 maintaining the roll properly engaged in the groove 59 of the cam. It is further noted that the bowl or roller 60 is convexed on its sides or substantially ball-shaped to insure its engagement with the sides of the groove in all portions of adjustment of the cam.

It will be observed from the foregoing that my invention provides a particular simple and ingenious device for regulating the extent of traverse of the thread-guide or other means for depositing the strand material on the cop, bobbin, coil or package. The device may be used to secure a fixed adjustment of the traversing-means to wind the cop, bobbin, coil or package to any predetermined length within certain limits, as explained in connection with the showing in Fig. 4 of the drawings; or it may be employed with automatically operated mechanism to gradually alter the extent of traverse to build the cop, bobbin, coil or package with tapered ends in accordance with a preferred practice for certain types of winding.

The mechanism of the device is simple in construction, compact in form and efficient in use for the purposes described without danger of the parts becoming deranged or getting out of order.

While the device is herein shown and described by way of example in a preferred form of construction, various changes may be made in the structure and arrangement of the parts of the mechanism without departing from the spirit or scope of the invention. Therefore, without limiting myself in this respect, I claim:

1. In a winding machine, the combination of a reciprocable thread-guide for traversing strand-material to wind a package, a rotatable cam for reciprocating the thread-guide, and means to adjust the cam to vary its angular relation with respect to its axis of rotation to alter the extent of its throw.

2. In a winding machine, the combination of means for traversing strand-material to wind a package, a rotating cam for actuating the traversing-means, and means automatically operative during the winding to adjust the cam to vary its angular relation with respect to its axis of rotation to alter the extent of its throw.

3. In a winding machine, the combination of means for rotating a package, a reciprocable thread-guide for traversing strand-material thereon, a rotatable cam for reciprocating the thread-guide, means connecting the cam with the thread-guide, and means to adjust the cam in angular relation with respect to its axis of rotation to vary the extent of reciprocation imparted to the thread-guide.

4. An adjustable cam for winding machines comprising a hub having radial arms, a circumferential rim provided with a substantially helical cam-face, pivots connecting the rim to the arms on the hub, and means for rocking the rim on its pivots to adjust the extent of throw of the cam-face.

5. An adjustable cam for winding machines comprising a circumferential rim provided with a substantially helical cam-face, means for rotatively supporting the rim to adapt it to rock on an axis crossing its axis of rotation, and means movable longitudinally of the axis of rotation to adjust the rim angularly to vary the extent of throw of the cam-face.

6. An adjustable cam for winding machines comprising a rotatable hub, a circumferential rim having a substantially helical cam-face, means for mounting the rim on the hub to adapt it to tilt in angular relation with respect to its axis of rotation, a slidable sleeve and means connecting the sleeve to rock the rim to adjust it angularly to vary the extent of throw of the cam-face.

7. An adjustable cam for winding machines comprising a circumferential rim, means for rotatively supporting the rim to adapt it to swivel on an axis crossing its axis of rotation, a slidable sleeve, and means connecting the sleeve to rock the cam rim to adjust it angularly to vary the extent of its throw.

8. In a winding machine, the combination of a shaft, a hub on the shaft, a circumferential rim having a substantially helical cam-face, means for mounting the rim concentrically of the hub to adapt it to swivel on an axis crossing the axis of rotation, a sleeve slidable on the shaft, and means connecting the sleeve to rock the rim to adjust the angularity of the cam-face to vary the extent of its throw.

9. In a winding machine, the combination of means for rotatably supporting a package, means for traversing strand-material thereon, a helical cam for actuating the traversing-means, means for mounting the cam to adapt it to swivel on an axis crossing its axis of rotation, and means operated during the growth in diameter of the package being wound to rock the cam to diminish the extent of its throw to shorten the length of the layers of winding.

10. In a winding machine, the combination of means for rotatively supporting a package, means for traversing strand-material thereon, a helical cam for actuating the traversing-means, means for adjusting

the angular relation of the cam with respect to its axis of rotation to vary the length of its throw, and means actuated from the growth in the winding to adjust the cam to gradually shorten the length of layers of winding from start to finish of the package.

11. In a winding machine, the combination of a rotatable driving-drum, means for rotatably supporting a package to adapt it to be driven from the drum, means to permit the cop-supporting means and the drum to recede one from anotner during the growth in the winding, means for traversing strand-material on the package, a helical cam for actuating the traversing-means, means for mounting the cam to adapt it for angular adjustment to vary the extent of its throw, and means movable during the separation between the cop-supporting means and driving-drum to adjust the cam to diminish the extent of throw of the traversing-means.

12. In a winding machine, the combination of means for traversing strand material to wind a package, a helical cam for actuating the traversing-means, means for adjusting the angular inclination of the cam to vary the extent of throw imparted to the traversing-means, a slidable sleeve connected to rock the cam, a fixed member having inclined faces, a shifting-means rotatable on the sleeve and engaging said inclined faces, and means to rotate said member to slide the sleeve to adjust the cam.

13. In a winding machine, the combination of means for rotatably supporting a package, means for traversing strand-material thereon, a cam-rim having a helical cam-face for reciprocating the traversing-means, means for mounting said cam-rim to adapt it to rock on an axis crossing its axis of rotation, a sleeve connected to rock the cam-rim, a shifter rotatable on the sleeve and formed with inclined cam-portions, a fixed member having inclined faces engaged by the cam-portions on the shifter, and means operated concurrently with the increase in diameter of the winding to turn the shifter to slide the sleeve to rock the cam-rim to shorten the extent of throw imparted to the traversing-means.

14. In a winding machine, the combination of a driving-drum, a movable frame for supporting a package in contact with the drum while adapting its axis to recede therefrom, means for traversing strand-material on the package, a helical cam for reciprocating the traversing-means, means for mounting the cam to adapt it to be adjusted in angular relation with respect to its axis of rotation, means rotatable on the axis of the cam to adjust its rim to shorten the extent of throw imparted to the traversing-means, and means connecting the movable frame to turn said means as the winding increases in diameter.

15. An adjustable traverse-mechanism for winding machines comprising a circumferential rim provided with a substantially helical cam-face, means for rotatably mounting said rim to adapt it to swivel on an axis crossing its axis of rotation, a slidable member, means connecting said slidable member to rock the rim, and means for adjusting the point of connection between the sliding member and the rim to vary the extent of adjustment imparted to the rim by the sliding movement of said member.

In testimony whereof I hereunto affix my signature.

ERNEST R. SWANSON.