

1,248,898.

Fig. 1.

INVENTOR
Edward F. Parks
By
Foster Freeman Watson & Co.
ATTORNEYS

1,248,898.

4 SHEETS—SHEET 2.

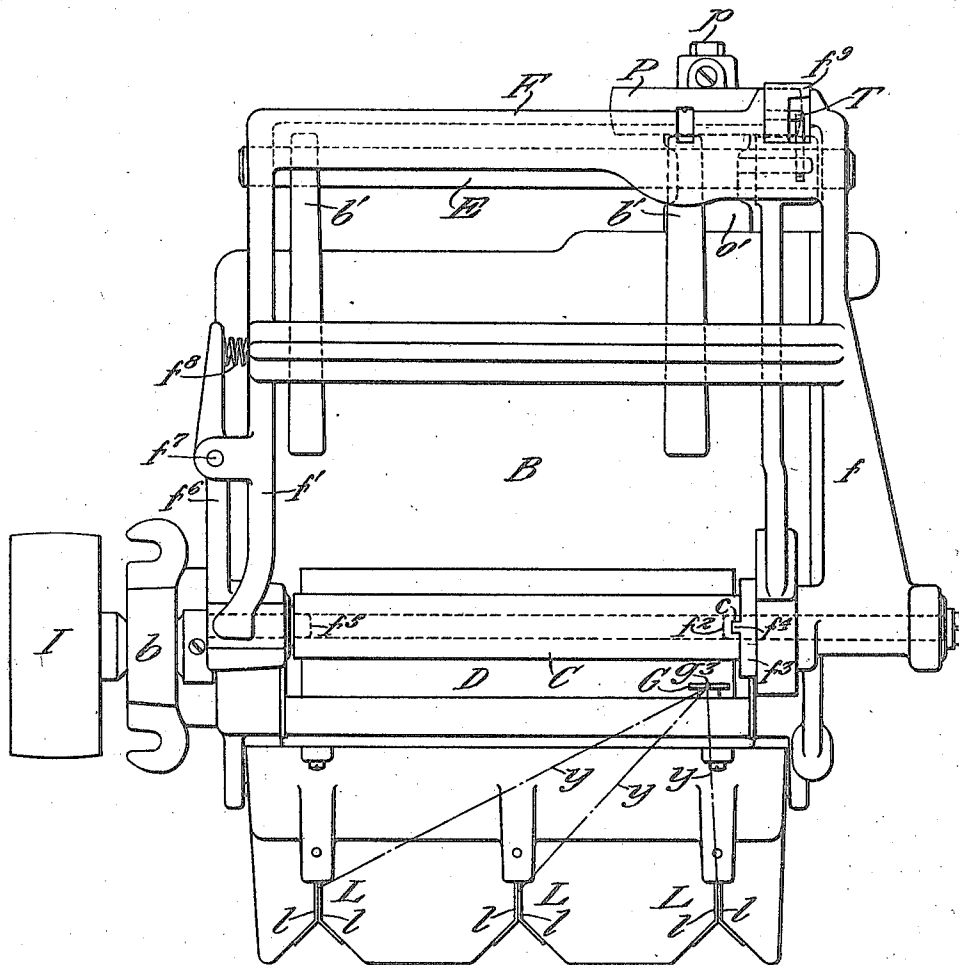


Fig. 2.

INVENTOR

INVENTOR
Edward F. Parks

By

Foster Freeman Watson & Coit
ATTORNEYS

ATTORNEYS

E. F. PARKS.
WINDING MACHINE.
APPLICATION FILED JUNE 23, 1916.

1,248,898.

Patented Dec. 4, 1917.
4 SHEETS—SHEET 4.

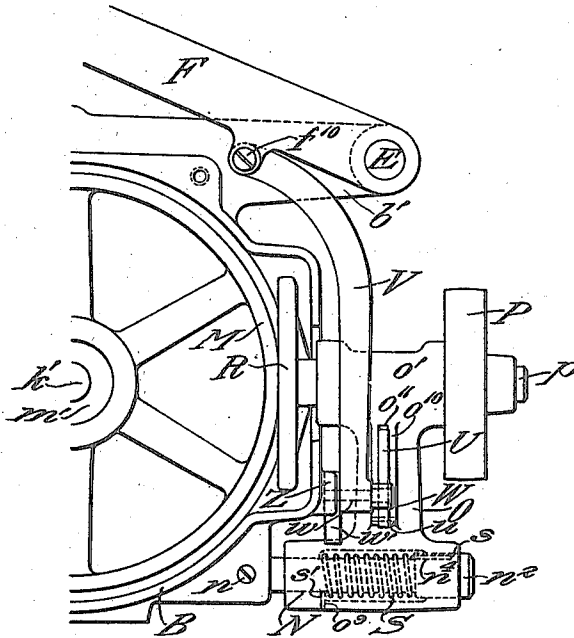


Fig. 5.

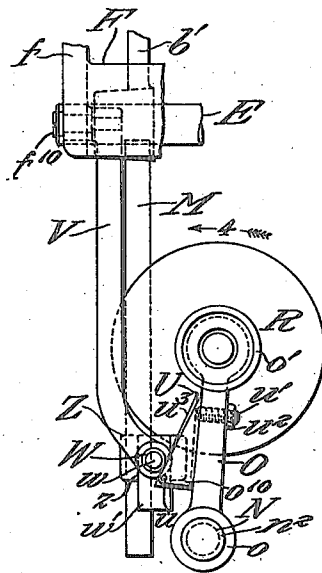


Fig. 6.

INVENTOR
Edward F. Parks
By
Peter S. Homan & Co.
ATTORNEYS

UNITED STATES PATENT OFFICE.

EDWARD F. PARKS, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO UNIVERSAL WINDING COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

WINDING-MACHINE.

1,248,898.

Specification of Letters Patent.

Patented Dec. 4, 1917.

Application filed June 23, 1916. Serial No. 105,425.

To all whom it may concern:

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

My invention relates to winding machines and particularly to that type of machines known as "friction-drive" or "drum-winders", in which the cop or package is rotated through contact of its surface with a drive-roll or driving-drum. My improvement is directed to the means for reciprocating the thread-guide which traverses the yarn or thread longitudinally of the cop during the winding, to deposit it thereon in cross-coils or helical turns, and comprises a novel arrangement of mechanism for regulating the speed of traverse of the guide in relation to the axial speed of rotation of the cop. The object of my improvement is to provide means for automatically adjusting the speed-ratio between the guide and cop in accordance with the increase in diameter of the latter to maintain a more constant relation of the number of turns in the winding to each traverse of the yarn across the cop, whereby a more uniform system of laying the coils in place is effected and thereby a better package produced.

The manner and means for carrying out my improvement are fully described in the following specification, illustrated by the accompanying drawings, in which like reference characters designate like parts. In the drawings:—

Figure 1 is a side elevation of a winding machine showing my improved traverse-mechanism applied thereto;

Fig. 2, a plan view of the same;

Fig. 3, a detail view of the traverse-cam and driving-means therefor, shown partly in section on the line 3—3 of Fig. 1, looking

in the direction indicated by the arrow 2; Fig. 4, a detail view showing the connections between the cop-supporting frame and the traverse-speed-changing devices; and Figs. 5 and 6, detail views of a modified form of the connections for the speed-changing means.

Referring to Figs. 1 and 2, B designates the box-like frame or casing of the machine, within which the traverse-mechanism for

the thread-guide G is contained, and on the top of which the drive-roll D is mounted. The roll or drum D is secured fast on a horizontal shaft *d* journaled in bearings *b*, *b* on the frame B and driven from the main source of power through any suitable connections, not herein shown or described. Usually the machine comprises a plurality of frames or heads B arranged in gang form on a suitable framework or bed and the shaft *d* extends the whole length of the gang, supported by its bearings in the several heads. As illustrated in Fig. 2, a belt-pulley I is mounted at one end of the shaft *d* through which the latter is connected to a countershaft, not here shown, generally arranged below the bed of the machine.

Extending rearwardly from the top of the frame B are two arms *b'*, *b'* at the ends of which is fixedly supported a horizontal cross-rod or shaft E. Pivotaly mounted on the cross-rod E is a substantially rectangular frame F comprising opposite side-arms *f*, *f'* at the ends of which are bearings for the rotatable cop-tube or support C. As shown in Fig. 2, one end of the cop-tube C fits over the end of a spindle *f*² rotatably mounted in the end of the arm *f* and having a flange *f*³ with a spline *f*⁴ adapted to engage a cross-slot *c* in the end of the tube. The opposite end of the tube C is supported on a spindle *f*⁵ journaled in the end of an arm *f*⁶ hinged at *f*⁷ on the arm *f*⁷ of the frame F. A coiled spring *f*⁸ bears against the rearward end of the arm *f*⁶ to maintain its spindle *f*⁵ in engagement with the end of the tube C while allowing the arm to be swung back for insertion and removal of the tube.

Referring particularly to Fig. 1, the yarn or thread-guide G is mounted on a slide or carriage *g* which is supported on two parallel, horizontal rods *g'*, *g'* secured in opposite bearings *b*², *b*² at the sides of the frame B and extending across the machine adjacent the periphery of the traverse-cam K. A roll or stud *g*² on the under side of the carriage *g* engages with the helical groove *k* in the face of the cam K, see also Fig. 3, whereby the rotation of the cam imparts a reciprocatory motion to the carriage *g* to slide it along the rods *g'*, *g'*. The guide G is usually constructed of sheet-metal, to render it light in weight, and, as shown in Fig. 1, is bent in arcuate form to

adapt it to reach up around the drive-roll D. Its upper end is curled back and slotted at g^3 , as shown in Fig. 2, to adapt it to receive the yarns or threads y to deliver them to the cop at a point adjacent the point of contact of the winding on the drive-roll D.

As illustrated in the drawings, the present machine is adapted for winding in multiple, that is with a plurality of yarns y delivering through the guide G. As shown in Fig. 2 three tension-devices L, L, L are supported on the front of the frame B and these are of conventional arrangement comprising the hinged grids l, l , see also Fig. 1, adapted to press on the yarns drawing across their bars. The yarns deliver from supply cops or bobbins arranged below the machine, but not here illustrated, draw through the tension-devices L, up across a guide-rod J, and thence lead to the guide G.

The traverse-cam K which reciprocates the thread-guide G is of usual construction, as illustrated in Fig. 3, and is mounted fast on a horizontal shaft k' rotatably supported in ball-bearings b^3, b^4 at the sides of the frame or casing B. Also secured fast on the shaft k' adjacent one end of the hub k^2 of the cam K is a friction-disk or wheel M through which the shaft k' and cam K are driven from means later described. It will be noted from Fig. 3 that the right-hand side B' of the frame B is constructed as a cover for the main part of the casing so that it may be removed to afford access to the parts inclosed therein. To provide for variations in the fit of the parts of the casing the cam-shaft k' is assembled therein with self-adjusting bearings arranged as next described: At its inner end the shaft k' is mounted in the ball-bearing b^3 which comprises an outer ball-race b^5 seated in a bushing b^6 , and an inner race b^7 mounted on the shaft abutting the end of the hub k^2 of the cam K. Between the inner ball-race b^7 and outer race or cage b^5 are the balls b^8 on which the shaft k' turns. At the opposite end of the shaft k' the outer ball-race b^9 is seated in a counterbore in the hub b^{10} of the cover B' and the inner race b^{11} is free to slide on the shaft k' . A coiled spring m , pocketed in a counterbore at the end of the hub m' of the driving-wheel or disk M, bears against the ball-race b^{11} to hold it against the balls b^{12} , while also maintaining the shaft k' in position in its inner ball-bearing b^3 . In this manner the shaft k' is arranged to "float" in its bearings with the spring m maintaining the parts in proper relation while also providing for self-adjustment to take care of any inaccuracy in the fit of the cover B' . Referring to Fig. 1, the cover B' is secured in place on the side of the frame B by means of screws inserted in the holes b^{13} , or through any other similar arrangement.

Referring to Fig. 1, a stud or shaft N is mounted in a bore b^{14} near the base of the frame B and extends rearwardly therefrom, being held fixedly in place by the set-screw n . Pivotaly mounted on the stud N is a hub o having an upwardly extending arm O at the top of which is a bearing o' . Mounted in the ends of the bearing o' are ball-bearings o^2, o^2 in which is journaled a horizontal shaft p . On the forward end of the shaft p is fixedly mounted a friction-driving disk R arranged to engage with the periphery of the drive-wheel M on the cam-shaft k' . Preferably, the driving surface of the disk R is covered with a facing r of fiber or similar material to provide for a frictional contact on the rim of the wheel M and to also resist the wear between these two parts. Fixedly secured to the rearward end of the shaft p is a belt-pulley P which is connected to be driven from the countershaft, previously mentioned but not here shown, which drives the drive-roll D from any suitable prime-mover as desired.

Referring still to Fig. 1, it will be noted that the hub o of the arm or bracket O is chambered out between its ends to form a pocket o^4 in which is a coiled spring S. The outer end of the shaft N is enlarged to form a head n^2 against which one end of the spring S bears while its opposite end presses against the end of the pocket o^4 in the hub o . Through this arrangement the spring S acts to slide the bracket O longitudinally of its supporting shaft N to maintain the driving-disk R in frictional contact with the drive-wheel M. At the same time the bracket O is free to turn about the axis of the shaft N to allow the disk R to be displaced across the face of the drive-wheel M. Through this means the point of contact of the drive-wheel M on the disk R may be adjusted in relation to the axis of rotation of the disk to vary the speed-ratio between the driving and driven elements in the usual manner.

The means for displacing the driving-disk R relatively to the rim of the wheel M is controlled by the growth of the winding which influences the frame F to swing it upward on its pivot-rod E. As shown in Figs. 1 and 4 the frame F is formed with a rearwardly projecting lug f^9 into which is hooked the end of a wire link T. At its lower end the link T is hooked through the end of an arm o^5 projecting from the side of the hub o of the bracket O. As illustrated in Fig. 4 the arm o^5 is provided with a series of holes o^6, o^7, o^8 with which the hooked end of the link T can be engaged so that the leverage on the bracket O may be varied to alter the effect of the movement of the frame F therein. This adjustment provides for a greater or less extent of displacement of the driving-disk R in relation to the drive-wheel M in accordance

with varying requirements of the winding, as more fully explained hereinafter.

In Figs. 5 and 6, I have illustrated a modification in the mechanism for connecting the driving-disk bracket O to be moved from the cop-supporting frame F and also in the means for adjusting its range of movement. As shown in Fig. 5, the pocketed spring S which acts to slide the hub o on the shaft N also serves as a means for turning the arm O on its pivot. One end s of the spring S is held in a bore n² in the head n² of the shaft N while its opposite end s' is inserted in a hole o⁹ in the hub o. Thus, when the spring S is assembled in position under tension it will have a tendency to rock the arm O in the direction indicated by the arrow 4, Fig. 6. On one side of the arm O is a triangularly-shaped projection or lug o¹⁰ which is slotted vertically through its center as shown at o¹¹, Fig. 5. Inserted in the slot o¹¹ is a triangular cam-plate U pivoted on a cross-pin u at its lower end, see Fig. 6. A set-screw u' reaches through the arm O with one end bearing against the inner edge of the cam-plate U and a check-nut u² on its opposite end is set up against the side of the arm to hold the screw from accidental turning. By loosening the check-nut u² and adjusting the set-screw u' the cam-plate U may be rocked on its pivot to alter the inclination of its face u³. Pivoted to the side of the arm f of the frame F at f¹⁰ is a curved arm V which reaches down into position alongside the cam-plate U. At its lower end the arm V carries a pin or stud w on the end of which is rotatably mounted a roll W adapted to bear on the inclined face u³ of the cam-plate U. The rearward end of the pin w carries a block w' fitted to slide in a vertical slot z formed in a lug Z projecting from the frame B. Through this arrangement the roll W is adapted to be guided in a vertical direction as the arm V is drawn upward by the swinging movement of the frame F during the growth in the winding. As the roll W rises on the cam-plate U it allows the arm O to rock in the direction indicated by the arrow 4, Fig. 6, under action of its spring S. The range of movement of the arm or bracket O is regulated by adjusting the inclination of the cam-plate U as before described, and in this manner the amount of displacement of the driving-disk R on the drive-wheel M is controlled as required. The method of operation of the complete machine with either of the traverse-speed-controlling-means above described is as follows:

Referring to Fig. 1, the yarns y are drawn up from the source of supply, led through the tension-devices L, and thence across the guide-rod J and through the slot o⁸ in the thread-guide G. At the start of the winding the cop-tube C, see Fig. 2, bears on the

periphery of the drive-roll D and as the latter is driven constantly the tube will be rotated to wind on the yarn or thread delivered through the guide G. In Fig. 1 the cop or package Y is represented as having been built up to a diameter substantially equal to that of the drive-roll D, and as the winding continues to increase in diameter the frame F swings upwardly on its pivot to accommodate the growth in the yarn-mass. Meanwhile, the rotation of the cam K acts to reciprocate the carriage g back and forth on the rods g', g' to traverse the guide G along the cop to deposit the yarn in helical coils thereon. As before stated, the cam K is driven independently of the drive-roll D through the shaft p and friction-disk R which engages the drive-wheel M. At the start of winding of each cop or package the driving-disk R is in the position illustrated in Figs. 3 and 4, making contact with the drive-wheel M at a point adjacent the outer rim of the disk. With the disk R and wheel M having this relation, the shaft k' and cam K will be rotated at their maximum speed and consequently the thread-guide G will be reciprocated at its maximum rate in relation to the speed of the cop Y. It is obvious that since the speed of rotation of the drive-roll is maintained constant throughout the whole operation of the machine, the axial speed of the cop will be retarded as its diameter increases. According to the usual practice in producing drum-wound cops, the ratio of speed between the rotation of the cop and the reciprocation of the thread-guide is such as to give approximately eight turns of the cop to each traverse of the yarn. With this system of winding the cop is started with eight turns or coils about the tube C in each traverse of the yarn from one end to the other, or in technical terms the cop has eight "winds" in its first layer. As the cop increases in diameter its axial speed of rotation is gradually retarded, due to the increasing disparity between its circumference and that of the drive-roll as before explained, and if the speed of the thread-guide remains constant then the yarn will be wound with a decreasing number of turns during the continuous growth of the cop. In other words, the cop will be wound with a gradually diminishing number of winds from start to finish, or stated briefly, it will have a less number of winds in the outer layers than in the inner ones.

It has been found in practice that this great disparity in the number of winds at the beginning and ending of the cop is open to serious disadvantages and results in defects in the winding and irregularities in delivery of the yarn when the cop is unwound. The reasons for this are as follows: When the yarn is wound from one end of

the cop to the other with a relatively large number of turns, it will hold its place better than when wound with only a few turns. In other words, the coils are less liable to slip or become displaced when wound with a relatively slight pitch or lead; while, on the other hand, if the pitch or angle of the coils is made too great there will be a tendency for the yarn to pull in from the ends of the cop and this causes irregularities on its surface with the coils making ridges and hollows, the result being a malformed package. Furthermore, where the coils have a quick traverse across the cop at each revolution, the laying of the yarn at the ends of traverse cannot be controlled so precisely and it is liable to roll over the edges and draw across the ends in what is technically termed "cobwebs." It is well known that these defects of "cobwebs" and other malformations in the usual drum-wound cops are highly objectionable, since they prevent free delivery of the yarn in unwinding and otherwise lessen the commercial value of the package.

Another disadvantage in this method of winding is that in delivering from the full package the yarn has a tendency to roll across the face of the cop and this causes it to twist or untwist, as the case may be. In other words, when the yarn has only a half turn or comparatively few turns around the cop in its traverse from end to end, in drawing off it will pull in from the ends toward the center and in doing this will roll and twist on itself. In the case of ply yarns this action disturbs the original twist of the yarn at frequent intervals and destroys its uniformity so that its quality is impaired. The disadvantages of this feature are even more pronounced where the yarn is wound in multiple to be delivered to twisters, for a uniform twist cannot be obtained if the strands are rolled together and twisted, first one way and then the other, as they come off of the supply package. For this reason in some cases it has been found impracticable to twist from drum-wound supplies and produce an even, level yarn.

The object of the present invention is to eliminate the defects of drum-winding as pointed out above by preventing the rapid decrease in the number of winds from start to finish of the cop. To accomplish this purpose I provide means operating automatically to control and regulate the speed of reciprocation of the thread-guide in relation to the axial speed of rotation of the cop. In other words, the essential feature of my invention is the means for regulating the speed-ratio between the cop and the thread-guide, and this means is controlled by the cop, being dependent upon the movement of the axis of the cop away

from the drive-roll as the yarn-mass increases in diameter.

With the arrangement of mechanism as illustrated in Figs. 3 and 4 the speed-ratio between the thread-guide G and drive-roll D is adjusted to give a maximum of say five "winds" at the start of the winding. Now, as the cop builds up on its tube or support C and the frame F is swung upward in accordance with the growth in the winding, the link T acts on the arm o^5 to swing the bracket O in the direction indicated by the arrow 4, Fig. 4. As the bracket O is rocked in this manner the driving-disk R is shifted across the periphery of the drive-wheel M to change the axial relation of the disk thereto. Through this means the disk R will be caused to impart rotation to the wheel M and cam K with a gradually diminishing speed and hence the speed of traverse of the thread-guide will be proportionately retarded. In this manner the speed-ratio between the guide and cop is maintained more nearly uniform and therefore there will be less change in the number of winds from start to finish of each package. For most purposes it is not necessary to alter the speed of the thread-guide in exact proportion with the change in axial speed of the cop. The present arrangement of mechanism is designed more particularly to prevent a too rapid or excessive change in the number of winds and it has been determined that if the cop is started with approximately five winds and completed with half this number or two-and-one-half winds the result is satisfactory. A cop wound in this manner is far superior to the usual drum-wound package having eight winds at the start and only a half wind at the completion for the reasons previously given.

It is also to be noted that other changes in the speed-ratio between the cop and guide are provided for in the means for adjusting the link T along the arm o^5 to give a greater or less extent of displacement of the bracket O and driving-disk R. This feature of adjustment is illustrated in its preferred form in Figs. 5 and 6. With the arrangement here shown, as the frame F is swung upwardly with the growth of the winding the arm V is drawn up with it. The roll W is thereby caused to rise, with its axis traveling in a vertical plane as guided by the slide or block w' , and as it moves along the cam-plate U the arm O is rocked by the spring S to effect the displacement of the driving-disk R as before explained. The provision for changing the inclination of the cam-plate U, through the means of the set-screw u' , allows for a wide range of adjustment and the speed-ratio can therefore be regulated within certain limits as desired.

Having now described the nature of my improvement and the manner and means for putting it into practice, without limiting myself to the exact embodiment of the invention shown and described, what I claim is:—

1. In a winding machine, the combination with a rotating drive-roll, of a frame for supporting the cop with its axis adapted to recede from the drive-roll during the growth in the winding, a thread-guide for traversing the yarn on the cop, a cam for reciprocating the guide, a friction-wheel for driving the cam, a friction-disk engaging the periphery of the wheel, means to rotate said disk, a rockable arm on which said disk is journaled to adapt it to be shifted axially with respect to the friction-wheel, a member connected to be moved by and with the cop-supporting frame, means connecting said member to rock the arm to displace the disk, and means to adjust said connection to vary the extent of movement of the disk by the arm during the movement of the cop-supporting frame.

2. In a winding machine, the combination with a rotating drive-roll, of a frame for supporting the cop to be driven by the roll with its axis adapted to recede therefrom during the growth in the winding, a thread-guide, means for reciprocating the guide, a friction-wheel for driving the reciprocating means, a second friction-wheel for driving the first wheel, a rockable arm for supporting one wheel to adapt it to be shifted across the face of the other wheel, a cam adjustable on said arm, a link connected to be moved by and with the cop-supporting frame, means on the link acting against the cam to shift the position of the rockable arm, and means to adjust the position of the cam on the arm to vary the extent of movement of the latter during the movement of the frame.

3. In a winding machine, the combination with the main frame thereof, of a drive-roll journaled in bearings on said frame, means to rotate said drive-roll, a cop supporting frame pivoted on the main frame to rotatably support the cop in contact with the drive-roll, a traverse-cam rotatably mounted in the main frame, a thread-guide adapted to be reciprocated from said cam, a friction-wheel rotatably connected to the traverse-cam, an arm rockable on an axis at right-angles to the axis of the friction-wheel, a friction-disk journaled at the end of said arm to adapt its face to contact with the friction-wheel, a link connecting the cop-supporting frame with the rockable arm to move the latter as the axis of the cop recedes from the drive-roll, and means for adjusting said connection to vary the extent of movement of the arm during the movement of the cop-supporting frame.

4. In a winding machine, the combination with the main frame thereof, of a cam-shaft journaled in bearings in said frame, a traverse-cam on said shaft, a thread-guide adapted to be reciprocated from said cam, a friction-wheel connected to rotate the cam, a rod extending from the side of the frame at right-angles to the axis of the cam, an arm pivoted on said rod, a friction-disk journaled in bearings at the end of the arm to adapt its face to bear against the friction-wheel, a drive-roll journaled in bearings on the main frame, a cop-supporting frame pivoted on the main frame to adapt it to support the cop in contact with the drive-roll, and a link connecting said cop-supporting frame to move the pivoted arm whereby to rock the latter to displace the friction-disk with respect to the friction-wheel to alter the speed of rotation of the cam as the axis of the cop recedes from the drive-roll.

5. In a winding machine, the combination with a box-like frame, of a cam-shaft journaled in bearings in said frame, a traverse-cam on said shaft, a thread-guide reciprocated from said cam, a friction-wheel connected to drive the cam, an arm pivoted on the frame to adapt it to rock on an axis perpendicular to the axis of the friction-wheel, a friction-disk journaled in bearings at the end of said arm, a drive-roll journaled in bearings at the top of the frame, a yoke-like frame for rotatably supporting the cop to adapt it to contact with the drive-roll, and a link connecting said cop-supporting frame to rock the pivoted arm to shift the friction-disk across the periphery of the friction-wheel to alter the speed of the cam as the cop increases in diameter.

6. In a winding machine, the combination with a box-like frame, of a cam-shaft journaled in bearings in said frame, a traverse-cam mounted on said shaft, a thread-guide reciprocated from said cam, a friction-wheel connected to rotate the cam, an arm mounted to rock on an axis at right-angles to the axis of the friction-wheel, a friction-disk journaled in a bearing at the end of the arm, a spring to slide the arm to maintain the friction-disk in contact with the periphery of the friction-wheel, a drive-roll journaled in bearings at the top of the frame, a yoke-like frame pivoted on the main frame to support the cop in contact with the drive-roll, and a link connecting said frame to rock the arm to shift the friction-disk across the periphery of the friction-wheel to alter the speed of rotation of the cam as the axis of the cop recedes from the drive-roll.

7. In a winding machine, the combination with a box-like frame having a cover fitted to its side, of a ball-bearing mounted in the main section of the frame, a second ball-

bearing seated in the cover of the frame, a shaft mounted in said bearings, a traverse-cam fixedly secured on the shaft, and a spring acting on the shaft to adapt it to float in its bearings while operating to maintain the bearings in place in their seats in the frame.

8. In a winding machine, the combination with a box-like casing, of a cover fitted to one side of the casing, ball-races seated in the main part of the casing and in the cover, a shaft, opposite ball-races slidable thereon, balls between the opposite races of each pair, a hub fixedly mounted on the shaft, and a coiled spring surrounding the shaft and acting against the hub and one of the ball-races to yieldably maintain the

parts of the bearings in place with the shaft floating therein.

9. In a change-speed device for winding machines, the combination with a friction drive-wheel, of a driving-disk engaging the periphery of the drive-wheel, a rockable arm on which said disk is rotatably mounted, a cam pivoted to said arm to adapt it to be adjusted in position thereon, a roll engaging the face of said cam, and means operated by the growth in the winding to slide the roll on the cam to rock the arm and shift the driving-disk with respect to the drive-wheel.

In testimony whereof I affix my signature.

EDWARD F. PARKS.