S. W. WARDWELL.

WINDING MACHINE.

APPLICATION FILED MAR. 3, 1908.

946,831.

Patented Jan. 18, 1910.

4 SHEETS—SHEET 1.

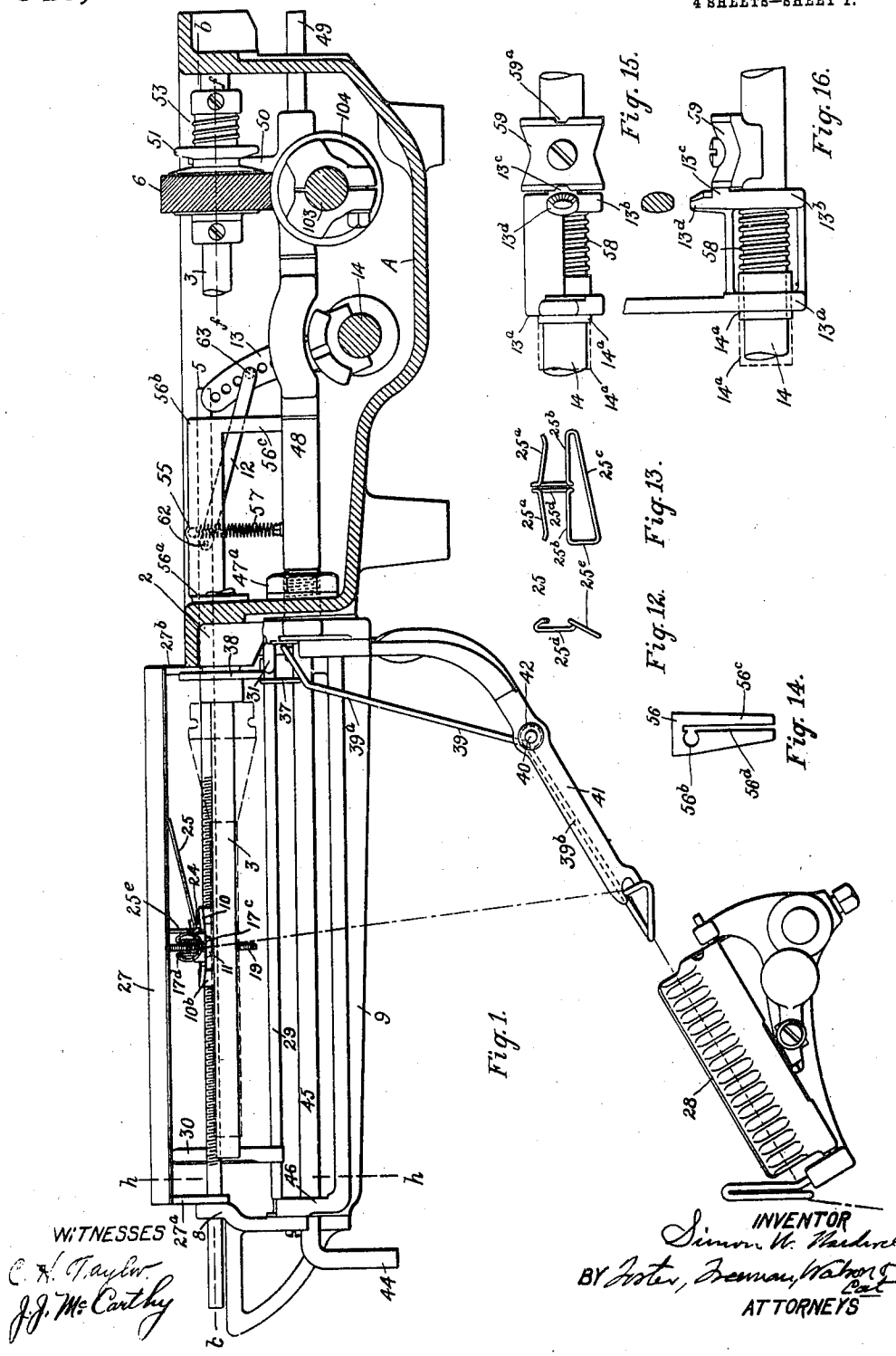

Fig. 1.

Fig. 15.

Fig. 16.

Fig. 13.

Fig. 12.

Fig. 14.

WITNESSES

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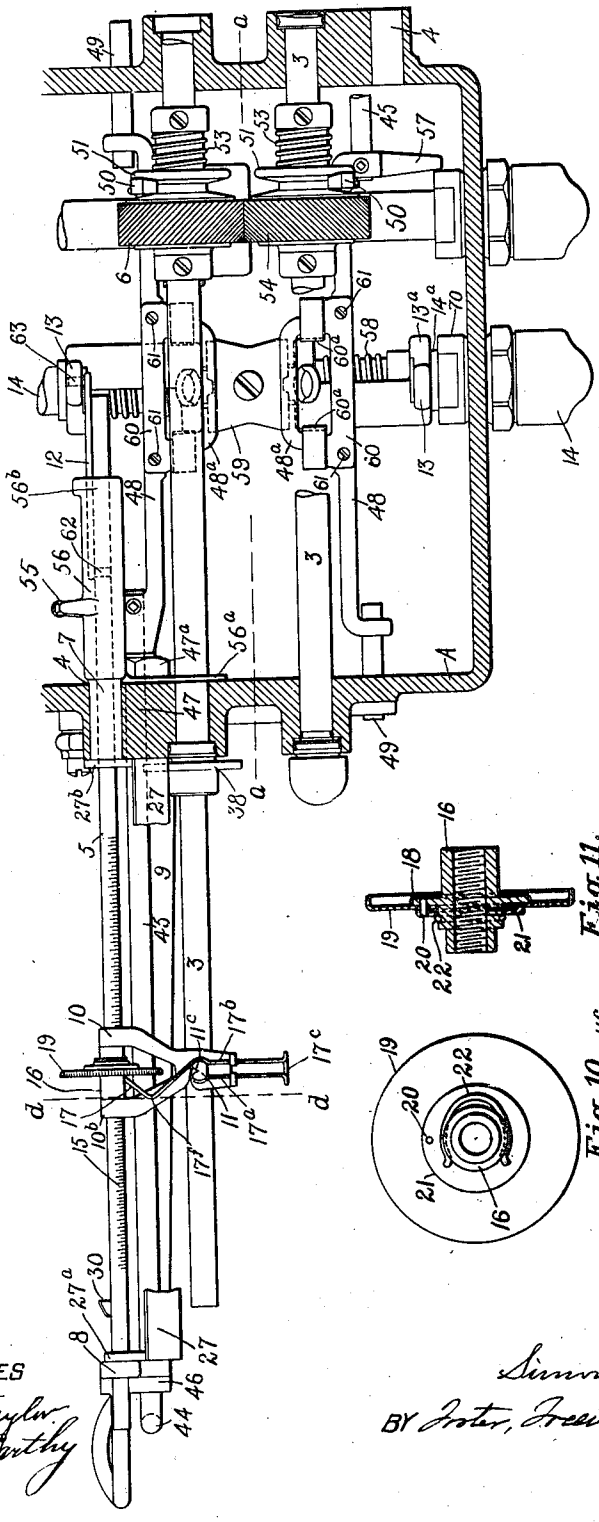

Fig. 2.

Fig. 17.

Fig. 11.

Fig. 10.

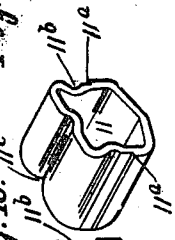

Fig. 4.

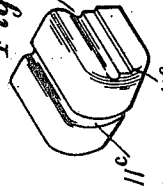

Fig. 3.

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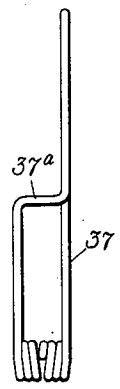

Fig. 9.

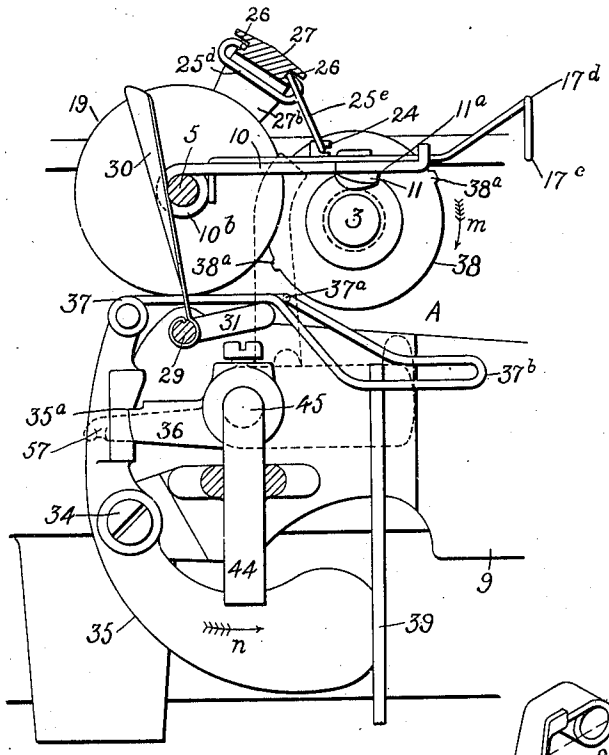

Fig. 5.

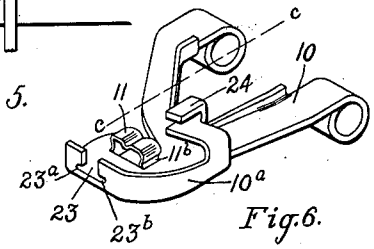

Fig. 6.

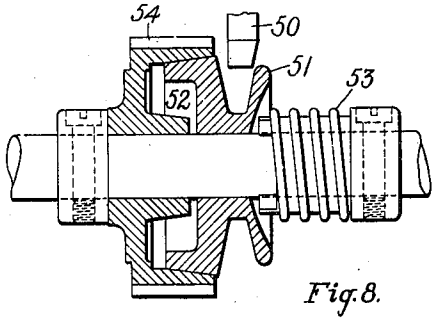

Fig. 8.

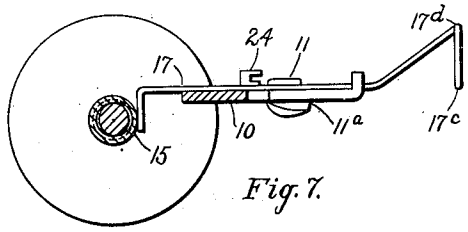

Fig. 7.

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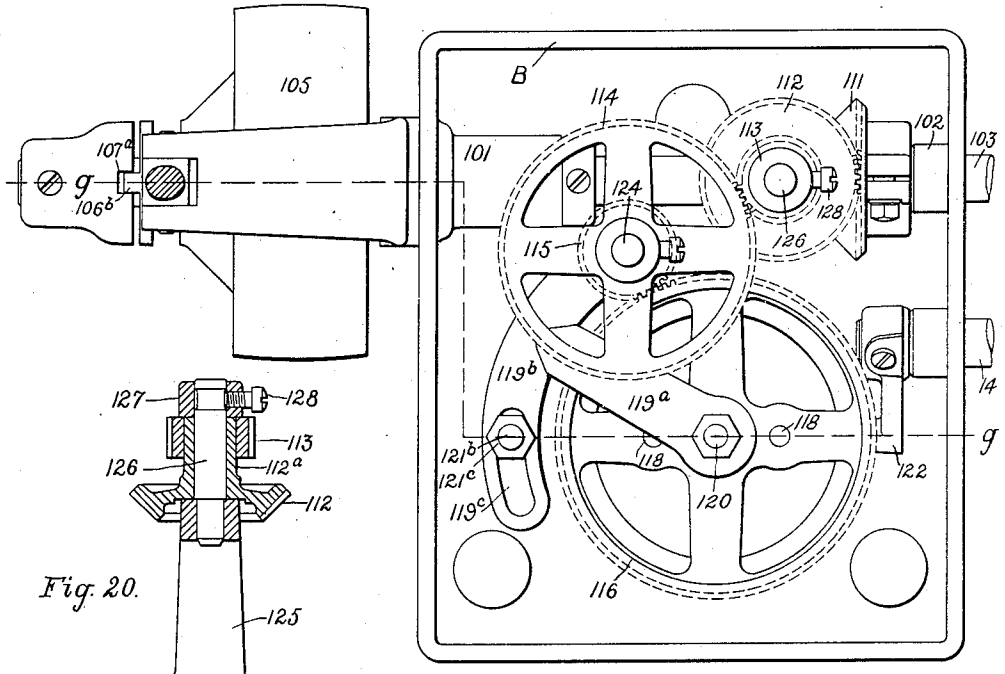

Fig. 18.

Fig. 20.

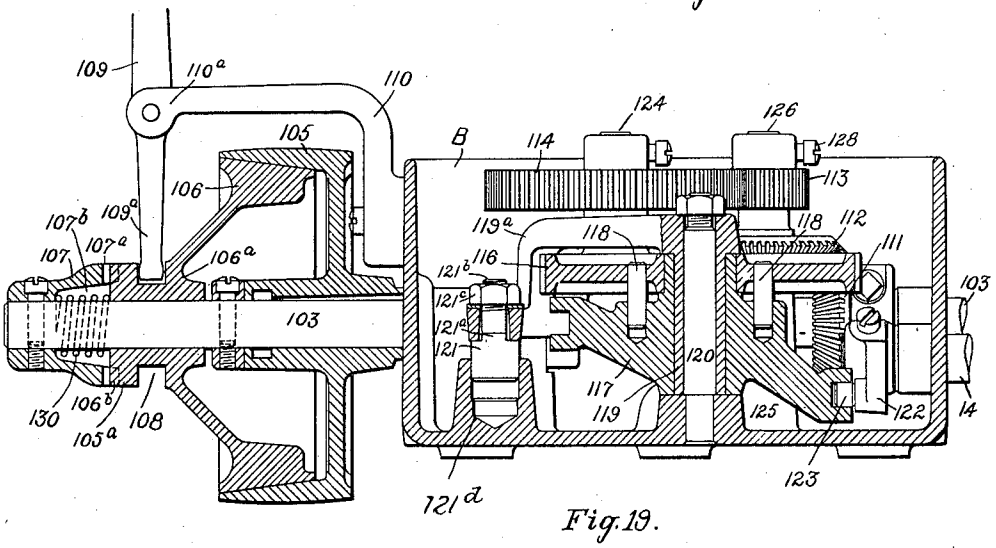

Fig. 19.

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UNITED STATES PATENT OFFICE.

SIMON W. WARDWELL, OF PROVIDENCE, RHODE ISLAND.

WINDING-MACHINE.

946,831. Specification of Letters Patent. Patented Jan. 18, 1910.

Application filed March 3, 1908. Serial No. 418,998.

To all whom it may concern:

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

My invention is a winding machine for producing bodies of textile or other attenuated material, of a form suitable for use in fabric forming processes, and especially for producing filling bobbins for use in fly shuttles.

The purpose of my invention is to produce a bobbin which shall be compact, so constituted as to contain a maximum amount of material by virtue of its extreme density, and which, by its peculiar yarn disposition shall permit the yarn mass to completely fill the yarn space in the shuttle, laterally touching its sides, and yet deliver all its substance without restriction or break until said substance is entirely exhausted, without residue.

The mechanism whereby the foregoing is accomplished is fully disclosed in the following specification and accompanying drawings, which latter show respectively:

Figure 1, a front elevation of the winding head partly in section on the line *a—a* of Fig. 2. Fig. 2, a plan view of the winding head in part section on the line *b—b* of Fig. 1. Figs. 3 and 4, details of preferred form of guide. Fig. 5, a detail of the winding and stop devices, sectional on line *h—h*, Fig. 1. Fig. 6, a perspective view of the traverse guide arm. Fig. 7, a side view of the guide arm in part section on line *c—c* of Fig. 6 and of line *d—d* of Fig. 2. Fig. 8, a sectional view of the spindle clutch on line *f—f* of Fig. 1. Fig. 9, a detail of the stop lever 37. Figs. 10 and 11, details of the traveling mechanism for progressively varying the winding position of the guide on the winding spindle. Figs. 12 and 13, details of the guide controlling bail 25. Fig. 14, a detail of the member 56. Figs. 15, 16 and 17, details of the traverse clutch mechanism. Fig. 18, a plan view of the driving head. Fig. 19, a sectional view of the driving head on line *g—g* of Fig. 18. Fig. 20, a detail of the driving head.

The machine consists of a plurality of winding heads, each comprising preferably, one or more pairs of opposed winding spindles, with their attendant winding mechanisms, and one driving head which contains the elements that actuate the mechanisms of the connected plurality of winding heads.

In Fig. 1 and Fig. 2, A is the case of the winding head in which are bearings 2—2 for the winding spindle 3, and a socket 4 for the bearing of the traverse bar 5. The winding spindle 3 is driven with the spiral gear 6 by means that will be described later.

The traverse bar 5 is capable of longitudinal reciprocation in the quill or sleeve bearing 7 that is held in the socket 4, and in an outboard bearing 8 which is secured to or forms a part of the projecting bracket 9. The traverse bar carries a thread guide arm 10 in which is a thread guide 11. The traverse bar with its thread guide arm and guide, is connected by a link 12 with the traverse arm 13 on the rock-shaft 14 whose mode of operation will be later described in connection with the driving head.

The portion of the traverse bar 5 opposed to the winding spindle 3, is formed with an eccentric screw thread, of such degree of eccentricity that there is a full thread on the side or surface toward the winding spindle, but no thread whatever on the surface which is away from the winding spindle, as indicated in Fig. 2 and more clearly shown in Fig. 7, where 15 indicates the screw threaded surface of the traverse bar 5. Engaging this eccentric screw is a nut 16 which is pressed toward the traverse rod 5 by the spring 17.

Obviously, when the thread guide arm 10 is in a position such as shown in Fig. 7, the spring 17 presses the nut 16 into engagement with the screw thread 15, and any rotation of the nut will cause the thread guide arm 10 to travel on the traverse bar. Such progressive travel is effected by the thread guide traveling mechanism, detailed in Fig. 10 and Fig. 11, and further indicated with other coadjuncts in Figs. 1, 2 and 7.

The nut 16 is of internal diameter and thread corresponding with the eccentrically threaded portion of the traverse bar 5, and consequently of larger diameter internally than is the traverse bar 5 externally. It has a flange 18, preferably about midway of its ends, which supports a contact wheel or flanged disk 19. This disk 19 is dogged or rotatively connected with the nut by the pin 20 and is further secured against the flange

aforesaid, and in engagement with the pin 20 by the cupped washer 21, held in place by the clip 22 which is snapped into a groove in the nut 16. The latter is held on the traverse bar between the two legs or branches of the bifurcated thread guide arm 10 and, as previously explained, is held against the traverse bar by the spring 17. This is secured in the thread guide arm 10, by the thread guide 11, the two interlocking, each securing the other.

The thread guide arm is formed (Fig. 6) with a flange 10^a which extends across the extremity of the arm and along one side. At the extremity of this arm is a recess 23 of substantially T form. Directly behind the recessed extremity is a seat for the thread guide 11. The latter is formed with shoulders 11^a to abut the bottom of the thread guide arm and grooves 11^b just above the top of same, and it is obvious that any element engaging these grooves will act as a lock or latch to draw the shoulder 11^a against the thread guide arm 10 and lock the guide therein.

The spring 17, (Fig. 2) which is one and the same with the auxiliary guide which leads the yarn to the thread guide 11, is a spring wire of substantially hair pin shape, but with one prong longer than the other to act on the nut 16. The two prongs, 17^a and 17^b, pass to either side of the thread guide 11, through laterals 23^a and 23^b of the T recess 23, (Fig. 2) projecting the loop 17^c of the "hair pin" beyond the extremity of the thread guide arm 10. Immediately beyond the extremity of the thread guide arm, the prongs 17^a and 17^b, rise at an angle to the point 17^d, (Fig. 5 and Fig. 7) where the loop 17^c drops abruptly, spreading, preferably in circular form, (Fig. 1) to form the auxiliary guide referred to.

The two prongs 17^a and 17^b engage the grooves 11^b of the thread guide 11, thus securing the latter as indicated, and the guide 11, being interposed between the two prongs 17^a and 17^b, prevents them from springing together and disengaging from the laterals 23^a and 23^b. The portion of 17 which engages the nut 16 is bent in knee or toggle form at 17^f, and in such direction that the elastic action of holding the nut 16 in place draws the spring 17 tightly against the guide 11 securing the latter more firmly.

The guide 11, may be of any suitable construction, formed as indicated in Figs. 5 and 7 of solid material and as indicated in Fig. 2, with a round body to which the prongs 17^a and 17^b conform. I prefer however to make the guide 11 of shell construction as detailed in Figs. 3, 4, and 6. Thus made, it can be drawn up of thin steel, with the crease or threadway 11^c to control the yarn, and prevent it from rolling, thus insuring positive and accurate disposition. At the same time the lateral grooves 11^b for the wire 17 are formed. This forming is accomplished in smoothly burnished dies, so that the resultant guide is of smooth surface, devoid of the roughness and chatter marks incident to machine cuts. The shoulders 11^a are preferably machine cut, to secure accuracy of relation between them and the grooves 11^b and insure interlocking with the wire 17. Being made of thin steel, the guide can be thoroughly hardened and to a degree that is attained with great certainty and little liability to cracking, and finally the cost is slight, due to performing by press in one operation, what would require a multiplicity of machine cuts.

At one side of the thread guide arm is a guide lug 24 which extends from the flange 10^a (Fig. 6) and is formed to engage the inclined guide bail 25 which corresponds in inclination with the taper of the nose of the bobbin wound. The bail is preferably of wire having guide portions 25^a and 25^b, (Figs. 12 and 13) which fit and run in grooves 26 in the bearing bar 27, (Fig. 5) and the depending, inclined guide portion 25^c which engages the guide lug aforesaid. The portions 25^d are looped back to avoid and clear the body of the bearing bar 27, (Fig. 5).

The bearing bar 27, is a bar which reacts against the thread guide arm, through the bail 25, to counteract the vibration and chatter due to rapid reciprocation. Its function is to control the inertia the irregularities of action naturally superinduced by rapid reciprocation and in this case augmented by the combination of reciprocation along the winding spindle with oscillation toward and from the spindle. To this end, the bearing bar 27, is made of sufficient mass for the purpose intended. By two arms 27^a and 27^b the bearing bar is hung on the traverse bar 5.

The action of the winding mechanism is therefore as follows. Winding is done on a bobbin having a tapered base, substantially as indicated in Fig. 1 by the broken lines. At the commencement of winding, the thread guide 11, is directly opposed to the bobbin's tapered base, the yarn being drawn from a supply of usual form, through tensions 28 and the loop or auxiliary guide 17^c. The diameter of the contact wheel 19 is such that when the base diameter of the taper of the winding attains its prescribed diameter it engages the said contact wheel, causing a slight rotation and corresponding advance of the guide along the winding spindle and reducing the winding diameter. When the yarn mass again attains its prescribed diameter which is the diameter of the bobbin, the guide is again similarly advanced, and as it advances it carries the bail 25, by engagement of the lug 24, with the portion 25^c. During the winding, the draft of the yarn

from the supply, through the tensions holds the guide 11 in contact with the winding surface, so that the yarn being wound is completely confined between the surface of the bobbin and the walls or sides of the threadway or crease 11^c, thus controlling the disposition of the yarn accurately. When the bobbin has been wound to the desired length and the winding has stopped, the guide 11 with its guide arm 10 is disconnected from the traverse bar by turning it back from the winding spindle 3, until the spring 17, forces the nut 16 out of engagement with the screw threads of the traverse bar 5. It is then slid on the traverse bar back to its starting point. The winding is discontinued by the controlling mechanism which comprises the following instrumentalities. Carried on the rod 29 is an arm 30 twisted like a propeller blade to present an inclined surface to the hub 10^b of the thread guide arm 10, Fig. 2. Pressure of the hub 10^b on the arm 30 rocks the latter and with it the rod 29 and an arm 31 on said rod, preferably a formation thereof. (Figs. 1 and 5.)

Fulcrumed at 34 (Fig. 5) preferably to the bracket 9 is a detent lever 35, having a detent shoulder 35^a, which engages a detent 36 to restrain the latter from movement. This detent, as will be later explained, controls the clutch of the stop device.

Attached to the detent lever 35 is a pawl 37, which rests on the arm 31 and has a transverse portion 37^a (Fig. 9) adapted to engage projections 38^a on the stop collar 38 which is fast on and rotates with the winding spindle 3, in the direction indicated by the arrow *m*. Elevation of the pawl 37, moves its portion 37^a into the path of the moving projections 38^a, and such elevation is effected by rocking the rod 29, thereby raising the arm 31 on which the pawl 37 rests under its own weight. The outwardly projecting loop portion 37^b augments the downward tendency of the pawl 38, both by its intrinsic mass, and by the leverage due to the projection of that mass beyond the bearing point on the arm 31 and also provides for the other automatic actuation as follows. The rod 29 will also be automatically rocked to disengage the detent lever and detent by instrumentality of the end stop 39 which is fulcrumed at 40 in the tension bracket 41. The end stop 39 is preferably formed of wire, having a hub formed of a plurality of coils from which one portion or arm of the wire 39^a extends up to a point adjacent the pawl 37 whence it is diverted in direction to incline it to the pawl in a wedgelike relation, and to an extent that insures against disengagement therefrom. The other arm 39^b of the wire is directed downwardly toward and to a point adjacent the tensions 28 where it is formed to be engaged and upheld by the yarn as it draws from the tensions as is described in my pending application Serial No. 419,000, filed March 3, 1908.

Rocking of the rod 29 for the purpose of effecting disengagement of the detent lever and detent has been ascribed to engagement of the thread guide arm hub 10^b with the arm 30 and other automatic actions. Obviously the same effect will result from a manual rocking of the arm 30, and this is an intended provision, so the operator may stop the machine at will.

The winding is started by rocking the starting handle 44 in the direction of the arrow *n*, Fig. 5, thereby moving the detent 36 with which it is connected by the rod 45, into engagement with the detent lever 35. Preferably, the starting handle 44 is integral with the rod 45, being formed thereon. The rod 45 has a bearing 46 in the bracket 9, and a bearing 47 in a stem portion of the bracket 9 which extends through the case A, through which bearing it projects into the interior of the case. Within the case it is joined to a bridge member 48 which spans the rock shaft 14 and has for a rotative bearing, a trunnion or pin 49 secured in the case A. The bearing 47 is in a stem of the bracket 9 by which the latter is secured to the case A. The stem projects through a hole or socket suitably formed in said case. The portion which projects into the case is threaded to receive the nut 47^a whereby the bracket 9 is drawn tightly against said case and secured. The bracket 9 is further secured from turning by the trunnion pin 49 which extends through both the case A and the bracket, acting thus as a dowel.

Extending upward from the bridge 48 is a clutch arm 50 having a beveled side to engage with wedging action the beveled flange 51 of the clutch 52. This clutch is of usual form, preferably of the friction type, and is impelled by the clutch spring 53 to engage the skew gear 6 through which the winding spindle 3 is driven. Engagement of the clutch arm 50 with the clutch flange 51 results in disengagement of the clutch 52 and skew gear, and consequent stopping of the winding spindle. The clutch arm 50 is impelled to engage the clutch flange by a spring 57^a that extends from an overhang 55 of the member 56 of which the quill bearing 7 is a part, to an arm 57 of the bridge member 48, (Figs. 1, 2 and 5). Therefore, with the parts immediately described, under the effect of the clutch arm spring 57^a there is no operation of the winding spindle. By rocking the starting handle 44 as described, the clutch 52 is permitted to engage its skew gear 6 and to be operatively driven thereby. In like manner, the same elements control the operation of the traverse mechanism, by the following means.

As previously indicated, the traverse bar

is driven by the traverse arm 13 through the traverse bar link 12, the arm being mounted on the rock shaft 14. The arm has two bearings 13^a and 13^b with an intervening space to accommodate the compression spring 58. This spring lies between the bearing 13^b and the sleeve 14^a on the rock shaft 14 to which sleeve the bearing 13^a is adapted. The sleeve 14^a is prevented from sliding under influence or action of the spring 58 by a suitable abutment. This abutment may be a similar adjoining sleeve of an adjacent traverse mechanism as indicated by the dotted lines of Fig. 15, or as indicated in Fig. 2, it may be the bearing .70 of the rock shaft. On the face of the bearing 13^b is a projection 13^c having beveled sides and adjacent the latter is an upward projection 13^d with a beveled face whose function will be later described. Adjacent to the bearing 13^b a block 59 is secured to the rock shaft 14, having in its face a recess 59^a having inclined or beveled sides, corresponding to those of the projection 13^c which is normally maintained in engagement with the recess 59^a by the spring 58. The tension of this engagement is amply sufficient to drive the traverse mechanism, but affords a yielding condition which safeguards against breakage. In case of any obstruction to the traverse movement, the block 59 and the traverse arm 13 disengage automatically, arresting the traverse action, even though the rock shaft 14 should continue to oscillate.

Attention has been directed to the upward projection 13^d. This lies directly below the U formed portion 48^a of the bridge member 48 and, during the operation of the traverse mechanism, oscillates between the sides of the U. When the rod 29 is rocked to stop the machine, it depresses the U portion 48^a of the bridge member 48, see Figs. 1 and 2 engaging it with the beveled upturned projection 13^d, acts as does the clutch arm 50 in the clutch 52, withdrawing the traverse arm 13 from engagement with the oscillating block 59, and thereby arrests the traverse action. To hold the traverse arm 13 within the range of oscillation of the rock shaft 14 and the block 59, a retainer or limit is provided, in the plate 60 which has two ears 60^a, 60^a (Fig. 17) which extend up from the ends of the plate 60, inward toward its center and down across the path of oscillation of the extremity of the projection 13^d. This form imparts a desirable elasticity to yield to blows or unusual stress. This plate is secured to the bridge member by any suitable means as the screws 61, 61.

The mode of connecting the traverse bar with the traverse arm is unique and peculiarly advantageous, in that it provides for ease of quick adjustment and is unusually simple, though of substantial construction. The traverse bar bearing 7 is in the form of a quill or sleeve forced into a socket 4 in the case A, being one portion of a member 56 which comprises a lateral projection 56^a that embraces the winding spindle 3, the latter acting as a dowel to keep the piece from turning, as shown in Figs. 1 and 2.

The inward projecting extremity of the member 56 Figs. 1 and 14, has a bearing 56^b for the traverse rod, and a dependent leg 56^c in which is a guide slot 56^d for the traverse link 12 which is attached to the traverse bar by a connecting pin 62. The other end of the link also has a connecting pin 63, preferably made by forming the link at right angles. This pin 63 engages any desired one of a plurality of holes in the traverse arm 13, depending on the extent of traverse desired. As the link is guided in the slot 56^d and withheld from lateral movement, it is obviously impracticable to interchange the position of the pin 63 on the arm 13, by manipulation of the link. To effect such an interchange, the traverse arm 13 is simply shifted along the rock shaft 14 until disengaged from the pin 63, when the latter is shifted to whatever hole is desired in the traverse arm 13.

The driving head is illustrated in Figs. 18 and 19. The case B has bearings 101 and 102 in which runs the shaft 103, that extends from the driving head through all the winding heads. Within each winding head (Fig. 2) this shaft carries skew gears 10 that mesh with the skew gears 6 on the winding spindles 3 and whereby the latter are driven.

Outside the case B the shaft 103 carries a clutch pulley 105 which rotates freely on the shaft adjacent the clutch 106 which rotatably, is secured to the shaft but free to slide thereon longitudinally. The means whereby the clutch is thus mounted are as follows:—The clutch hub 106^a has projections 106^b which engage corresponding recesses 107^a in the collar 107 which is fixedly secured to the shaft 103. The extent of this engagement is such that the clutch cannot be disengaged from its collar by any movement within its normal range. Within the collar 107 is a recess 107^b, and in this recess, between the collar and the end of the driving pulley hub, is a spring 130 which normally holds the clutch and pulley in engagement. Disengagement of the clutch 106 and the pulley 105 is effected by the handle 109.

In the hub of the clutch is a peripheral groove 108 which is engaged by the projection 109^a of the handle 109. The handle 109 rocks in a bearing 110^a of the overhanging bracket 110, which in turn is secured to the case B.

Within the case B, the shaft 103 carries a bevel gear 111 which meshes with the bevel

gear 112, which, through the train of spur gears 113—114—115—116 rotates the cam 117. The bevel gear 112 is mounted on a stand 125 on the case B. Set in the top of the stand is a pin or stud 126 which is the bearing for the gear 112, the latter having a long hub 112[a] fitted thereto. The bevel gear 112 is maintained on the stud by the collar 127 with its set screw 128. On the hub of the bevel gear 112 is secured the gear 113.

The cam 117 is a cylindrical cam, and is connected with the gear 116 by driving pins 118. The gear 116 is mounted on the hub of the cam 117 and the latter has a running bearing on a quill or sleeve 119 which is held in the case B by the stud 120 and forms the hub of a change gear arm. From the top of the quill there extends laterally an arm 119[a] with an arcal transverse portion 119[b], one end of which has a slot 119[c] and the other end a stud or bearing 124 for the gear 114, which is a change gear whereby the ratio of speed of revolution of the winding spindles to reciprocating speed of the traverse mechanism is regulated. The slot in the other end of the arcal portion is for the purpose of securing the gear 114 in mesh with the gear 113 and for permitting an interchange of gears as indicated. This is effected by the shouldered stud 121 whose body fits freely the hole or socket 121[d] in the bottom of the case B. To prevent the stud from turning, a substantially rectangular portion 121[a] is formed to enter the slot 119[c], from which extends the screw threaded stem 121[b] to which is fitted the nut 121[c]. This construction permits the arm 119[a] to be securely locked without disturbance of its form or position, which would distort the cam bearing and increase the frictional resistance at that point.

The rock shaft 14 which extends through all the winding heads and on which all the traverse arms 13 are mounted, extends into the driving head near the cam 117, and carries on its end a rocker arm 122, which carries, preferably at its extremity, suitable means for engaging the cam groove such as the roll 123.

Obviously, rotation of the clutch pulley causes, through the train of mechanism just described, concurrent rotation of the shaft 103 and oscillation of the rock shaft 14, through which the winding is effected by concurrent and coöperative action of the winding and traverse mechanism as previously described.

The winding action has been described in detail and the various mechanisms have been so clearly defined and identified with the winding action and with each other, that further discussion is needless. It is pointed out however, that the ultimate product of the machine is distinctly novel because of its compactness and its action in delivery. Whereas, the types of bobbin usually employed are subject to repeated breakages and variations of tension, the bobbins wound by this machine are characterized by continuity of delivery and uniformity of tension. This is due to the exact disposition of the yarn in winding, attributable to precise control of the yarn, confined in the thread groove of its guide by close contact with the surface of the bobbin, and accurate control of the guide through the traverse and traveling mechanisms.

Without limiting myself to the precise construction and arrangement of the parts, I claim:

1. In a winding head, the combination with a constantly rotating shaft and a constantly oscillating shaft of a rotative winding spindle with means to operatively connect it with and disconnect it from the constantly rotating shaft, a traverse guide, means to traverse the guide, and means to operatively connect the guide traversing means with and disconnect it from the constantly oscillating shaft.

2. In a traverse mechanism for a winding head, the combination with a reciprocating member and traverse guide mounted thereon, of a constantly oscillating shaft, an arm thereon connected with the reciprocating member and means that normally oscillate the arm positively, but permit the arm to automatically disconnect itself from the shaft when an unusual resistance is encountered.

3. In a traverse mechanism for a winding head the combination with a reciprocating bar, traverse guide mounted thereon, a link connected with the bar and a member having a guide slot therefor, an oscillating arm having holes to receive the end of the link, an oscillating shaft carrying the arm, and a yielding connection between the shaft and the arm permitting disengagement of the arm and link to engage the link with any of the holes in said arm.

4. In a traverse mechanism for a winding head the combination with a reciprocating bar and a traverse guide thereon of an oscillating arm, a link to connect the reciprocating bar and oscillating arm, an oscillating shaft, a block on the shaft, and a spring to hold the oscillating arm in engagement with the block.

5. In a traverse mechanism for a winding head, the combination with a reciprocating bar and a traverse guide thereon, of an oscillating shaft having a sleeve, a block secured to the shaft, an oscillating arm having a bearing on the shaft and another bearing on the sleeve, a spring interposed between said sleeve and the opposite bear-

ing of the arm, to engage the arm with the block, and a link to connect the arm with the reciprocating bar.

6. In a traverse mechanism for a winding head, the combination with reciprocating bars and traverse guides thereon, of an oscillating shaft having sleeves, a block secured to the shaft, an oscillating arm on either side of the block each arm having two bearings, one fitting the shaft and the other fitting one of the sleeves thereof, a spring for each arm between its sleeve and the opposite bearing, and a link connecting each arm with its reciprocating bar.

7. In a traverse mechanism for a winding head the combination with a reciprocating bar and traverse guide thereon, of an oscillating shaft, a block secured thereto and an arm to drive the bar mounted thereon both intermeshingly conformed to each other, a spring to normally effect intermeshing of the arm with the block and permit disengagement of the two when the arm encounters unusual resistance.

8. In a traverse mechanism for winding heads, the combination with a reciprocating bar and traverse guide thereon, of a link connected with the bar, an oscillating shaft, an arm engaged with the shaft having a plurality of holes, and an elastically yielding means to hold the arm in engagement with the link and to permit withdrawal therefrom to secure engagement of the link with any one of the holes in said arm as desired.

9. In a traverse mechanism for a winding machine, the combination with a reciprocating bar and traverse guide thereon, an oscillating shaft and arm thereon to drive the bar of an elastically yielding means to normally engage the arm and shaft and permit their automatic disengagement on occasion of abnormal stress and a limiting means to hold the arm, when disengaged, within the range of oscillation of the shaft.

10. In a winding head, the combination with a winding spindle, a traverse guide, an inertia guide controlling means including an element that conforms to the path of travel of the guide, and a reciprocating bar and connected link to carry the guide, of a gear to drive the spindle and a spring actuated clutch to engage the gear with the spindle, a rock-shaft to reciprocate the bar and connected link, and an oscillating arm, spring pressed to engage both link and shaft, and means to concurrently disengage the clutch from the gear and the arm from its oscillating shaft.

11. In a winding head, the combination with a case therefor, a winding spindle, traverse guide and reciprocating bar therefor, means to rotate the spindle and means to reciprocate the bar, of a bearing for the reciprocating bar comprising a quill which enters a hole in the winding head case, and a lateral arm which engages the winding spindle to prevent the quill from turning.

12. As an article of manufacture, a guide for a winding machine formed of a hollow cup-shaped shell of sheet metal with a guide way to control the yarn, and locking grooves 11^b to secure the guide.

13. As an article of manufacture, a thread-guide for winding machines formed in the shape of a hollow cup with a rounded surface adapted to bear on the surface of the winding, and having a thread groove indented in said surface.

14. In a winding machine the combination with a reciprocatable traverse-bar, of an arm hinged on said bar, a thread-guide formed in the shape of a hollow cup with a convex surface adapted to bear on the surface of the winding and a thread-groove extending around the exterior of the guide, and means to secure the guide to the arm.

15. In a guide device for a winding machine, the combination with a guide-arm 10 and a yarn depositing guide 11 therein, of an auxiliary guide 17^c to lead the yarn, said auxiliary guide formed with two arms 17^a and 17^b interlocking with the guide 11 so that each secures the other from displacement.

16. In a traverse mechanism for a winding head, the combination with reciprocating bars 5 and traverse guides 11 thereon, of a rock shaft 14 having abutments 14^a thereon, a block 59 secured to the shaft between the abutments, an arm 13 on either side of the block formed to engage the same, each having one bearing on the shaft and one bearing on an abutment, a spring 58 between each abutment and the shaft bearing of an arm, and a link 12 connecting each arm with its reciprocating bar.

17. As an article of manufacture, a thread-guide for a winding machine drawn up from sheet metal in the form of a hollow cup having a thread way extending along one side and around the bottom of the guide and two locking grooves extending longitudinally on opposite sides of the guide.

18. In an article of manufacture, a thread guide for winding machines formed with a threadway 11^c and with a shoulder 11^a and coördinated with lock grooves 11^b substantially as described.

19. In an article of manufacture, a thread guide for winding machines drawn up from sheet metal with a threadway 11^c and locking grooves 11^b and formed with a shoulder 11^a that is coördinate with said grooves.

20. In a winding machine, the combination with a winding spindle, reciprocating guide, means for causing their coördinate action, and means for causing the guide to travel progressively along the spindle, of a bearing bar to counteract by its inertia ir-

regularities in the movement of the guide due to rapid action of the latter.

21. In a winding machine, the combination with a winding spindle, a guide having a combined movement of reciprocation along the spindle and oscillation to and from the spindle, and means for causing coördinate action of spindle and guide, of a bearing bar to counteract by its inertia the irregularities in movement of the guide due to rapid action of the latter.

22. In a winding machine, the combination with a reciprocating guide and bearing bar, of a member mounted on the bearing bar having a portion conformed to the path of travel of the guide.

23. In a winding machine, the combination with a winding spindle, reciprocating guide and means to propel the guide progressively along the spindle, of a bearing bar and a member mounted thereon and conformed to the path of reciprocation of the guide, which member travels with the guide in its progressive movement along the spindle.

24. In a winding machine, the combination with a winding spindle, reciprocating guide and means to propel the guide progressively along the spindle, of a bearing bar and a member conforming to the path of reciprocation of the guide mounted thereon and propelled thereon by the guide in its progression along the spindle.

25. In a winding machine, the combination with a winding spindle, reciprocating guide and means to propel the guide progressively along the spindle, of a bearing bar having grooves, and a member conformed thereto and to the path of reciprocation of the guide mounted on the bearing bar and propelled thereon by the guide.

26. In a winding machine, the combination with a winding spindle, a guide having a combined movement of reciprocation longitudinally of the spindle and oscillation to and from the same and means to propel the guide progressively along the spindle, of a bearing bar extending along the path of progress of the guide and a member mounted thereon conformed to the path of travel of the guide and propelled thereby.

27. In a winding machine, the combination with a winding spindle, reciprocating guide having a lug, grooved bearing bar therefor, and means to propel the guide along the spindle, of a traveling wire member, having portions conformed to the grooves in the bearing bar, an inclined portion conforming to the path of travel of the guide and engaging the lug thereon during the guide's reciprocation, and another portion by engagement of which with said lug the said member is propelled along the bearing bar by the guide.

28. In a winding machine, the combination with a case therefor, a winding spindle, and driving means therefor including a clutch, of controlling devices to operate the clutch including a clutch operating rod, and a bracket to support said controlling devices having a stem, with a bearing therein for said rod, projecting through the side of the case and means engaging said stem to secure the bracket against the case.

29. In a winding machine, the combination with a case therefor, a winding spindle and driving means therefor including a clutch, of controlling devices to operate the clutch including a clutch operating rod, and a bracket 9 to support said controlling devices having a stem, wherein is a bearing 47 for said rod, projecting through the side of the case, and a nut 47^a threaded to said stem to secure the bracket to the case.

30. In a traverse mechanism for a winding machine, the combination with a reciprocating guide, a traverse arm and means connecting the two, and a rock shaft to oscillate the arm, of means to disconnect the arm from rocking engagement with the shaft to arrest the reciprocating action.

31. In a traverse mechanism for a winding machine, the combination with a reciprocating guide, a traverse arm and means connecting the two, and a rock shaft to oscillate the arm, of means to shift the arm on the shaft to disconnect its oscillatory engagement therewith.

32. In a winding machine, the combination with a winding spindle having a stop collar, of a detent lever to maintain the action of the machine, a pawl mounted on the detent lever, and an arm to raise the pawl into engagement with the stop collar to cause movement of the detent lever and arrest the action of the machine.

33. In a winding machine, the combination with a winding spindle, reciprocating guide, and arm therefor, means to operate the spindle, and means to reciprocate the guide, of stop devices, a rod to control the stop devices, and an arm thereon rocked by engagement with the guide arm to stop the machine.

34. In a winding machine, the combination with a winding spindle, reciprocating guide, means to rotate the spindle, means to reciprocate the guide and devices to cause progressive travel of the guide along the spindle, of stop devices, a rod to control the stop devices, and an arm thereon adapted to be engaged by the guide when the latter's extent of progressive travel has been completed to rock the rod to stop the machine.

35. In a winding machine, the combination with winding mechanism including a winding spindle and a guide, a continuously rotated shaft to actuate the spindle, and a rock shaft and connections to reciprocate the guide, of clutches to operatively connect each

shaft with its coöperating devices, a rockable bridge member spanning the two shafts and formed to engage the clutches, and means whereby the bridge member is rocked automatically by action of the guide, operatively disconnecting the clutches and stopping the machine.

36. In a winding machine, the combination with a winding spindle, a guide and means whereby the guide is progressively propelled along the winding spindle by action of the spindle, of a continuously rotating shaft to rotate the spindle and connections between the two including a clutch, an oscillating shaft to reciprocate the guide and connections between the two including a clutch and a traverse arm, a bridge member spanning the two shafts and formed to engage the clutches, a plate on the bridge member to limit the movement of the traverse arm, and means whereby the bridge member is rocked automatically by action of the guide to engage the clutches and stop the machine.

37. In a winding machine, the combination with a winding spindle, a guide and means to reciprocate the guide, of shafts to drive the spindle and reciprocate the guide, motive connections between each shaft and its coöperating devices, including a traverse arm to reciprocate the guide, stop devices including a rocking bridge member which spans the shafts, formed with a U shaped portion within which the traverse arm oscillates and by which said arm is withdrawn from oscillatory engagement with its shaft, and a plate secured to said bridge member to limit the movement of the traverse arm after the latter has been disengaged from its shaft.

38. In a winding machine, the combination with a winding spindle, a guide and means to reciprocate the guide, of shafts to drive the spindle and reciprocate the guide, motive connections between each shaft and its coöperating devices including a traverse arm to reciprocate the guide, stop devices including a rocking bridge member which spans the shafts formed with a U shaped portion within which the traverse arm oscillates and by which said arm is withdrawn from oscillatory engagement with its shaft, and a plate secured to said U portion of the bridge member having yielding abutments to limit the movement of the traverse arm after the latter has been disengaged from its shaft.

39. In a winding machine, the combination with a case, a winding spindle, a reciprocating guide and bar, a traverse arm and link intermediate the reciprocating bar and traverse arm, of a member 56 having a quill portion 7 extending into the case side to guide the reciprocating bar and a slotted dependent portion 56^c to guide the link.

40. In a winding machine, the combination with a case, a winding spindle having a bearing in the case, a reciprocating guide and bar therefor, a traverse arm and link intermediate the reciprocating bar and traverse arm, of a member 56 mounted on the case by a quill portion 7 which is a bearing for the reciprocating bar and having a lateral portion 56^a engaging the spindle and a dependent guiding portion 56^c to control the link.

41. In a traverse mechanism for a winding machine the combination with a reciprocating bar and a traverse guide thereon, an oscillating shaft and an arm thereon to drive the bar, of means to connect the arm with and permit its disconnection from the shaft oscillatorily and a limiting means to hold the arm when disconnected within the range of oscillation of the shaft.

42. In a traverse mechanism for a winding machine, the combination with a reciprocating bar and a traverse guide thereon, an oscillating shaft and an arm thereon to drive the bar, of means to connect the arm with and permit its disconnection from the shaft oscillatorily and a limiting means with yielding abutments to hold the arm when disconnected, within the range of oscillation of the shaft.

43. In a winding machine, the combination with winding spindles reciprocating guides and a continuously rotating shaft to drive the spindles and a rock shaft to reciprocate the guides of intermediate motive connections including a cam, a train of gears and a change gear arm having a hub on which the cam turns and to lock the arm in any desired position, a headless, socketed bolt whose body is longitudinally free in its retaining socket, and means to secure the bolt to the arm substantially as described.

44. In a winding machine, the combination with winding spindles and reciprocating guides, a continuously rotating shaft to drive the spindles, motive connections between the shaft and spindles and pulley on the shaft to drive the machine, of a rock shaft to reciprocate the guides and connections intermediate the spindle driving shaft and the rock shaft, including gears, a cam on which one of the gears is mounted, a sleeve mounted on a stud and serving as a bearing for the cam, and also having a gear supporting arm, a bolt, longitudinally free in a socket, and a nut to secure the bolt to the arm to prevent the latter from swinging.

45. In a winding machine, the combination with a winding spindle, reciprocating guide and arm therefor, a screw threaded traverse bar, and means to rotate the spindle and reciprocate the guide, of a nut engaging the screw threads of the traverse bar and abutting the guide arm, an auxiliary guide having a spring portion to contact and maintain the nut in engagement with the traverse bar, and a contact wheel removably attached to the nut in the man-

ner and for the purpose substantially as described.

46. In a propelling device for a winding machine guide to cause its travel along its reciprocating traverse bar, the combination with a nut 16 having a flange 18, of a removable contact wheel 19, a dog pin 20 to secure the contact wheel rotatively, and a washer 21 and clip 22 to attach the contact wheel to the nut.

47. In a winding machine, the combination with a winding spindle, reciprocating guide and arm therefor, a traverse-bar with eccentric screw threads formed thereon, means to rotate the spindle, and means to reciprocate the guide, of a nut abutting the guide arm, and an auxiliary guide formed of wire and arranged to fasten the guide in the guide arm and having a spring portion to contact with the nut to maintain it in engagement with the threads of the traverse-bar for the purpose specified.

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

SIMON W. WARDWELL.

Witnesses:

CHAS. A. EDDY,

ARTHUR I. HARVEY.