C. W. HUBBARD.

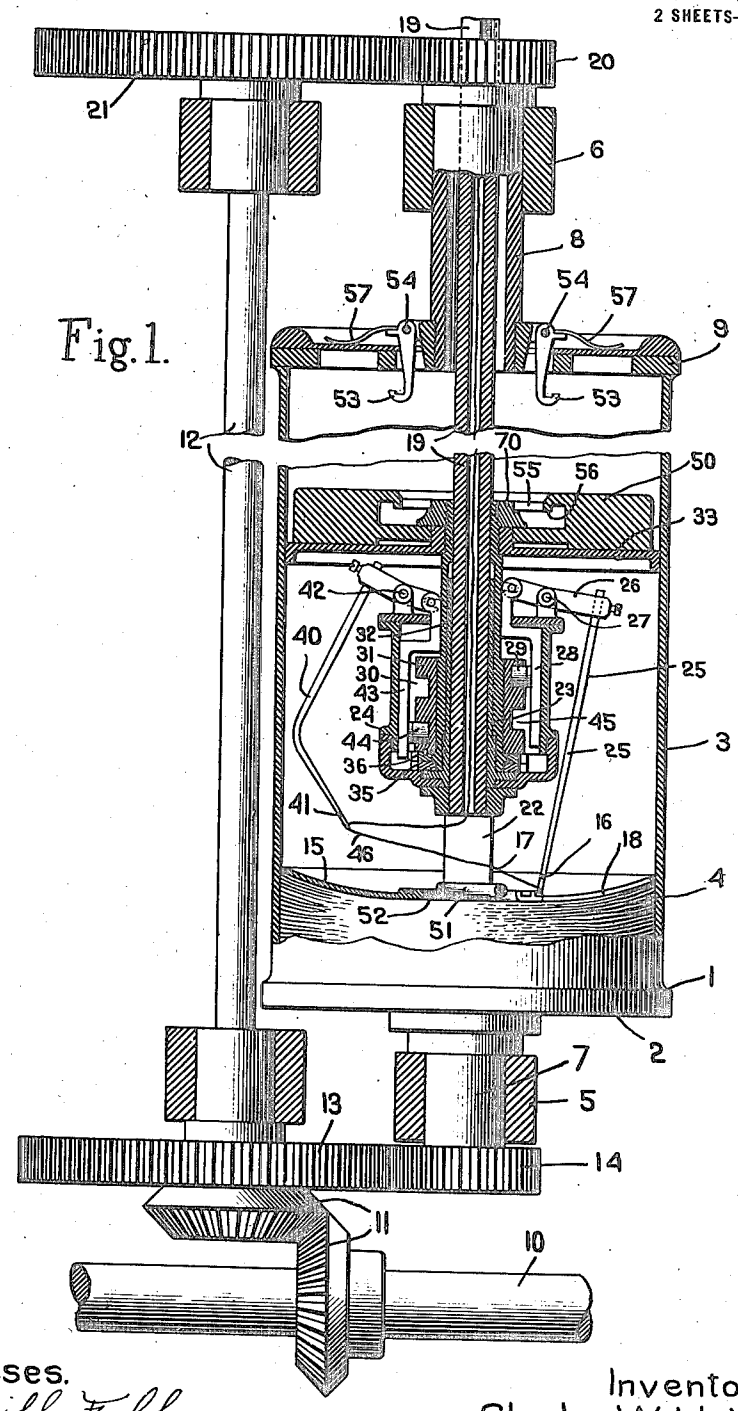
SPINNING AND TWISTING APPARATUS.

APPLICATION FILED DEC. 12, 1914. RENEWED DEC. 5, 1916.

1,232,685. Patented July 10, 1917.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses.

J. Morrill Fuller

William E. Gagen

Inventor.

Charles W. Hubbard,

by Heard Smith & Kennard.

Atty's.

C. W. HUBBARD.

SPINNING AND TWISTING APPARATUS.

APPLICATION FILED DEC. 12, 1914. RENEWED DEC. 5, 1916.

1,232,685. Patented July 10, 1917.

2 SHEETS—SHEET 2.

Fig.2.

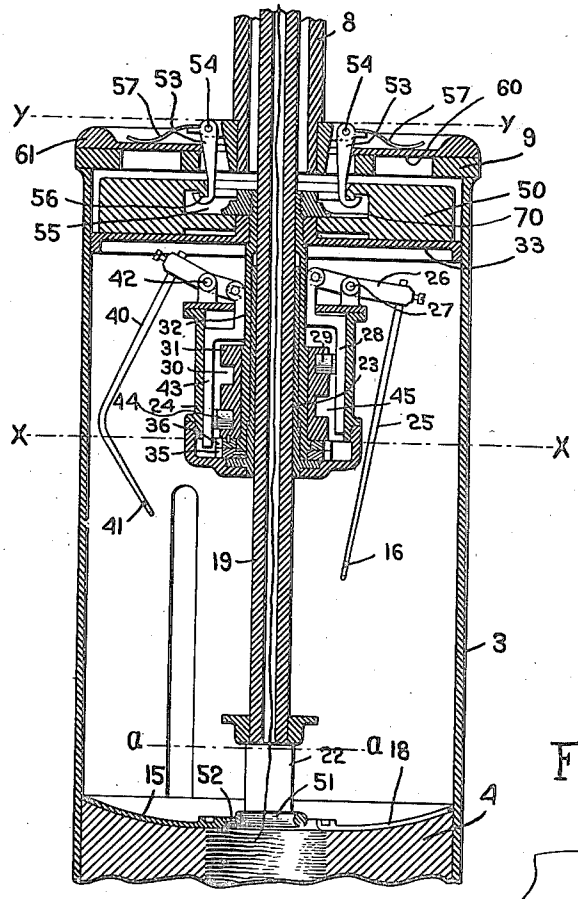


Fig.5.

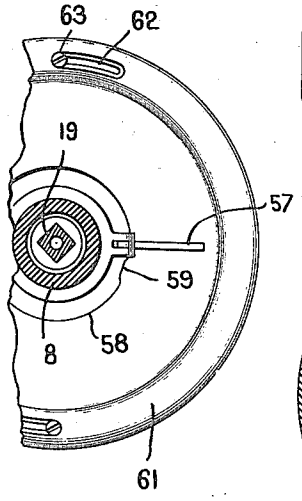


Fig.3.

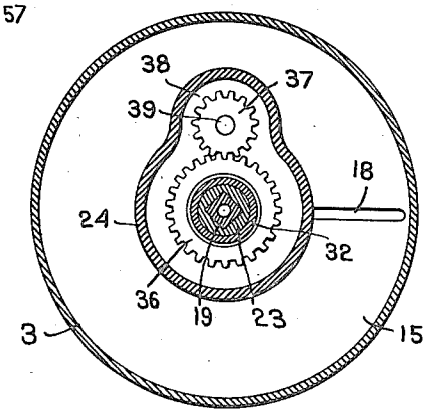
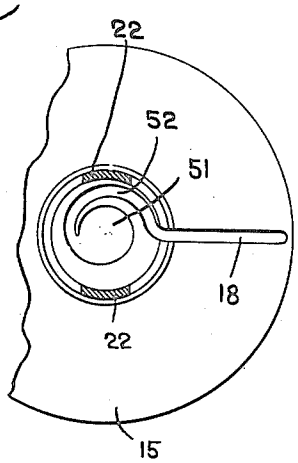


Fig.4.



Witnesses.
J. Morrill Fuller
William E. Gagen

Inventor.
Charles W. Hubbard
by Heard Smith & Tennant.
Atty's.

UNITED STATES PATENT OFFICE.

CHARLES W. HUBBARD, OF BOSTON, MASSACHUSETTS.

SPINNING AND TWISTING APPARATUS.

1,232,685. Specification of Letters Patent. Patented July 10, 1917.

Application filed December 12, 1914, Serial No. 876,758. Renewed December 5, 1916. Serial No. 135,272.

To all whom it may concern:

Be it known that I, CHARLES W. HUBBARD, a citizen of the United States, residing at Boston, county of Suffolk, State of Massachusetts, and whose post-office address is No. 111 Devonshire street, Boston, Massachusetts, have invented an Improvement in Spinning and Twisting Apparatus, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to spinning and twisting apparatus of that type which is constructed to build up the yarn mass on a yarn receiver in layers extending transversely to the axis of rotation. Devices of this type include a rotating yarn support on which the yarn is wound, a twisting or winding head comprising a winding plate which rests on the yarn mass and which has a rotative movement relative thereto, and a traversing member or yarn guide movable radially of the winding plate and operating to lay the yarn in a definite position on the yarn mass.

The objects of the present invention are to provide an improved device of this nature in which the mechanism of the twisting head is greatly simplified and arranged to occupy a compact space, in which the differential gearing by which the thread or yarn guide is given its traversing movement is confined within an oil chamber and can, therefore, be operated in oil, thus enabling the device to be run at an extremely high speed, in which novel means are provided for maintaining a constant tension on the yarn at all times, thus enabling a homogeneous yarn mass to be built up; which is so designed that when the desired amount of yarn has been built up on the yarn mass said yarn can be withdrawn from the yarn mass to be wound on a spool or other device without removing the twisting head from the device, and in which the winding plate which rests on the yarn mass as the latter is built up can also be used as a presser-plate to hold the yarn mass in position as the yarn is being withdrawn therefrom during the doffing process, and otherwise to improve twisting and spinning apparatus of this nature, all as will be more fully hereinafter described and then pointed out in the appended claims.

In order to give an understanding of my invention I have illustrated in the drawings a selected embodiment thereof which will now be described.

Figure 1 is a vertical sectional view through a device embodying my invention showing the parts in the position for winding yarn onto a yarn mass;

Fig. 2 is a similar view showing the parts in position for withdrawing the yarn from the yarn mass;

Fig. 3 is a section on the line x—x, Fig. 2;

Fig. 4 is a section on the line a—a, Fig. 2 showing the winding plate in place;

Fig. 5 is a section on the line y—y, Fig. 2 with a part broken out.

The yarn support on which the yarn is received is herein shown at 1, it comprising a base 2 on which the yarn mass is built and side walls 3 which may or may not have openings therein, and which form with the base a chamber or receptacle to receive the yarn mass 4. This particular form of yarn receiver, however, is not essential to the invention. The yarn receiver is shown as journaled in bearings 5 and 6, it having for this purpose a journal or step 7 at its lower end which is operating in the bearings 5, and being provided with a bearing sleeve 8 extending from its upper end which is journaled in the bearing 6. The sleeve or stem 8 is herein shown as secured to the cover portion 9 of the yarn receptacle. The yarn support is shown as driven from a driving shaft 10 by means of suitable gearing, that herein shown comprising bevel gears 11 by which a vertically arranged shaft 12 is operated from the shaft 10, and a gear 13 on the shaft 12 which meshes with a gear 14 on the step 7, said gears thus operating to give a positive drive to the yarn support. As stated above, the yarn 17 is laid on the yarn support in layers which extend transversely to the axis of rotation, this being done by a winding or twisting head provided with a winding plate 15 that rests on the yarn mass and is rotated relative thereto at a definite speed and a yarn guide 16 movable axially of the winding plate 15 adjacent a slot 18 in said plate, said yarn guide operating to guide the yarn 17 back and forth in the slot as the winding plate revolves.

The winding head derives its rotary movement from a spindle 19 which is shown as square in cross-section and which projects up through the top 9 of the receptacle, through the hollow sleeve 8 and through a gear 20 which is held from longitudinal movement while permitting the spindle to slide therethrough, and which meshes with and is driven by a gear 21 carried by the shaft 12, said gears 20 and 21 having such relation to the gears 13 and 14 that the winding head will rotate either faster or slower than the yarn mass thereby to cause the laying of the yarn on the yarn mass. The spindle 19 is made hollow so that the yarn 17 is led therethrough to the thread guide 16 and the desired twist is given to the yarn by reason of the rotary motion of the winding head, as will be obvious.

As the thread mass builds up the twisting head will rise in the receptacle 3 and the spindle 19 will be carried up through the spindle 8 and gear 20, but as said spindle 19 terminates at the winding head, there will be no spindle extending through the yarn mass 4. In my present invention I have endeavored to simplify the construction of the winding head so as to enable the parts thereof to occupy a compact space and so as to provide that the gearing and cam mechanism shall operate in oil.

The spindle 19 is secured at its lower end to a yoke 22 that in turn is rigidly secured to the winding plate 15 and thus there is a positive rigid connection between the spindle 19 and the winding plate so that the latter will be driven positively by the gear 20.

The yarn guide 16 is given its vibratory movement by differential gearing which is driven partly from the spindle 19 and partly from the yarn support. Said spindle 19 extends through a sleeve 23 which is noncircular in cross section and which, therefore, fits the spindle, but is slidably mounted thereon, and said sleeve has secured to its lower end a casing 24 in which the differential gear and cam mechanism for operating the yarn guide 16 are inclosed. The yarn guide 16 is carried by the end of an arm 25 which is detachably secured to a member 26 pivoted at 27 to the casing 24, the inner end of said member 26 having connection with a sliding actuator 28 that extends into the casing and is provided with a roll 29 operating in a cam groove 30 of a cam member 31, so that rotation of the cam 31 will cause the vertical movement of the actuator 28 thereby oscillating the yarn guide 16. The cam member 31 is rotatably mounted upon a sleeve 32 which incloses the sleeve 23 and which is arranged to be rotated with the yarn support. To accomplish this the sleeve 32 is shown as secured at its upper end to a head 33 which is received within the receptacle 3 for vertical movement, but rotates therewith. Thus when the machine is in operation the casing 24 will rotate with the spindle 19, while the sleeve 32 will rotate with the yarn support. The rotary movement of the cam 31 is derived partly from the rotation of the spindle 19 and partly from the rotation of the sleeve 32 and the means herein shown for giving the cam its rotation comprises a gear 35 rigid with the sleeve 32 and rotating therewith, a second gear 36 rigid with the cam 31 and situated co-axially with the gear 35, but having a different number of teeth, and an intermediate gear 37 carried by the casing 24 and meshing with both gears 35 and 36. The gear 37 is shown as occupying a recess 38 formed in the casing 24 and as rotatably mounted upon a stud 39 sustained in the casing. The gear 35 is thus rotating at the same speed as the yarn support, while the casing 24 with the gear 37 is rotated at a different speed by the spindle 19. Thus the gear 37 will be carried around the rotating gear 35, and as the gear 36 has a different number of teeth from the gear 35, the result will be that the gear 36 will be given a rotary movement relative to the gear 35, thus turning the cam member 31. The casing 24 is made oil tight and is designed to contain oil for lubricating the gears and the cam, and thus these parts may be run in oil. The shape of the casing is such that there is no danger of oil being thrown out therefrom during the operation of the machine. Further, the cam and gear construction of the winding head is compact and occupies but a small space.

In laying yarn by a twisting head of this type wherein the yarn guide moves radially of the yarn mass, the yarn will be laid more rapidly when the thread guide is at the periphery of the yarn mass than when the thread guide is near the center thereof, and thus the movement of the thread guide toward and from the center would tend to produce an uneven tension on the yarn, the tension being greatest when the yarn is being laid on the periphery and least when being laid near the center. In order to obviate the disadvantages inherent in a structure where the yarn is thus subjected to varying tension, I have provided a novel compensating device which acts on the yarn between its delivery from the spindle 19 and the yarn guide and which serves to vary the tension on the yarn as required to compensate for the uneven tension produced by the vibrating movement of the yarn guide. This compensating device is shown in the form of a compensating arm 40 having an eye 41 through which the yarn passes and which is pivoted at 42 on the casing, the inner end of said arm

being pivotally connected to a sliding actuator 43 movable vertically within the casing and which is provided with a roll 44 operating in a cam groove 45 formed in the cam member 31. The cam groove 45 will be so designed as to give the compensating arm 40 the requisite movement to compensate for the varying tension which would be produced in the yarn by the movement of the yarn guide 16. When the yarn guide 16 is moving toward the center of the mass the compensating arm 40 will be moving outwardly, thus drawing on the yarn and forming a loop 46 therein, while when the yarn guide 16 is moving in the opposite direction or toward the periphery the compensating arm will move inwardly, thus giving up the yarn of the loop 46. By this means the yarn will be drawn through the spindle 19 at a uniform rate of speed and the tension thereon will be constant.

The present invention is so designed as to permit the withdrawing of the yarn from the yarn mass and without removing the twisting head from the receptacle, so that with this device it is possible to spin yarn and lay the spun yarn in a thread mass in the receptacle 3, and when the desired amount of yarn has thus been accumulated, the yarn may be removed from the eyes 41 and 16 (they being made in the form of open eyes for this purpose), and the end of yarn led out through the hollow spindle to a spool or other receiving device and thus withdrawn from the receptacle 3. During this operation the receptacle 3 may be rotated so that additional twist may be put into the yarn while it is being withdrawn therefrom. The advantage of this is that a part only of the desired twisting need be put into the yarn when it is led into the receptacle 3, as the remaining amount of desired twist can be put into the yarn as it is being withdrawn from the receptacle 3.

In order to permit the yarn to be withdrawn from the receptacle 3 while the latter is being rotated and yet to hold the various layers of the yarn mass in operative position, it is necessary to employ a presser-plate which rests on the yarn mass as the yarn is being withdrawn therefrom. In my present invention I use the same plate 15 as the winding plate for winding the yarn onto the yarn mass 4 and as a presser-plate for holding the top layer of yarn mass in position as the yarn is withdrawn therefrom.

In winding yarn into the receptacle 3, it is desirable to have a greater weight on the winding plate than is necessary on the presser-plate when yarn is being withdrawn from the yarn mass. In the present embodiment the weight on the winding plate 15 when yarn is being wound onto the yarn mass comprises the weight of the casing 24 with the gearing and cam therein, the weight of the plate 33 and an additional weighted member 50 loosely resting on the plate 33. The amount of the weight 50 is proportioned to suit the requirements of use. In order to enable the same plate 15 to be used as a presser-plate when the yarn is being unwound or withdrawn from the yarn mass, I have provided herein a construction by which the weight of the parts 50, 33 and the gearing and cams for operating the arm 25 can be removed from the plate 15 so that the yarn mass will be subjected only to the weight of the plate 15 and the spindle 19. I accomplish this by making the sleeve 23, casing 24 with the arms 25 and 40, sleeve 32, and head 33 with its weight 50 so that they move as a unit and can be raised or lowered on the spindle 19. The lower end of the casing 24 is not connected to the yoke 22, but merely rests thereon when the parts are in position for winding yarn onto the yarn mass, as shown in Fig. 1.

When it is desired to unwind or withdraw yarn from the yarn mass 4, the casing 24 with its associated parts is raised upon the spindle 19 so that its weight is removed from the plate 15 and the yarn end is then led from the slot 18 into a central aperture 51 formed in the plate 15, from which it is withdrawn, said yarn passing up through the spindle 19, see Fig. 2. In order to permit the ready threading of the yarn into the central aperture 51, I propose to extend the slot 18, as shown at 52, to cause it to enter the aperture 51, the portion 52 of the slot having a general spiral shape. This enables the yarn end to be readily carried from the traversing slot 18 around into the aperture 51 when the winding operation has ceased and it is desired to unwind the yarn from the thread mass. The shape of the spiral slot 52 is such as to prevent the yarn from passing back into the slot 18 during the unwinding process.

I have provided herein for supporting the casing 24 with its inclosed parts and the head 33 with its weight 50 from the top 9 of the receptacle 3 when the yarn is being withdrawn from the receptacle thereby holding said parts out of the way while allowing the plate 15 to act freely as a presser-plate. Any suitable means for accomplishing this may be employed. As herein shown the head 9 is provided with supporting hooks 53 pivoted thereto at 54 and which depend therefrom, said hooks being adapted to interlock with the weight 50 when the latter is raised, as seen in Fig. 2, thereby to hold the parts associated with the weight 50 and head 33 in their elevated inoperative position. The weight 50 is shown as provided with an annular opening 55 and

with an annular flange 56 at the periphery of the opening with which the supporting hooks 53 engage. The hooks 53 are acted upon by suitable springs 57 so that when the head 33 and the weight 50 are raised the hooks will automatically enter the opening 55 and become interlocked with the flange 56.

In order to disconnect the hooks from the flange 56 it is necessary to first raise the weight slightly and then to force the hooks inwardly, and this latter operation is accomplished by means of a cam 60 which is loosely mounted on the top 9 of the receptacle and is provided with cam projections 59 adapted to engage the shanks of the hooks 53 when the cam member is turned. This cam member is shown as having a rim portion 61 which may be grasped to turn it, and its turning movement relative to the top 9 is limited by slots 62 formed therein through which pass pins or screws 63 that enter the top 9. The disengaging of the hook from the flange 56, therefore, involves raising the twisting head slightly and then operating the cam member 60 to force the hooks inwardly.

The eyes 16 and 41 are preferably open eyes or hooks so that the yarn can be easily threaded into them or removed from them as occasion necessitates.

While I have illustrated herein a selected embodiment of my invention I do not wish to be limited to the constructional features shown.

I claim:

1. In a machine of the class described, the combination with a rotary yarn receiver, of a winding head comprising a winding plate resting on the yarn mass, a thread guide movable radially of said plate, means to rotate said yarn receiver and winding plate at different speeds, and means to actuate said thread guide, said thread guide and its operating mechanism being separable from the winding plate.

2. In a machine of the class described, the combination with a rotary yarn receiver, of a winding head comprising a winding plate resting on the yarn mass, a yarn guide movable radially of said plate, means to rotate said yarn receiver and winding plate at different speeds, and means to actuate said yarn guide thereby to lay the yarn in layers extending transversely to the axis of rotation of the yarn receiver, said yarn guide and its operating mechanism being movable as a unit axially of the yarn receiver independently of the winding plate.

3. In a device of the class described, the combination with a yarn receiver, of means to rotate it, a winding head for delivering yarn to the yarn receiver and laying it in layers extending transversely to the axis of rotation, said winding head including a winding plate resting on the yarn mass, a vibrating yarn guide, means to vibrate the latter, and means to rotate the winding plate at a different speed from that of the yarn receiver, said parts being organized to lay the yarn in layers extending transversely of the axis of rotation of the yarn receiver, said yarn guide and its operating mechanism being movable as a unit relative to the winding plate axially of the yarn receiver.

4. In a machine of the class described, the combination with a rotary yarn receiver, of means to rotate it, a winding plate resting on the yarn mass, a spindle connected thereto and extending upwardly therefrom, means to rotate said spindle and thereby the winding plate at a speed different from that of the yarn receiver, a yarn guide movable radially of the winding plate, and means actuated partly by the spindle and partly by the yarn receiver to give vibratory movement to said yarn guide, said parts being organized to lay the yarn in layers extending transversely of the axis of rotation of the yarn receiver.

5. In a machine of the class described, the combination with a rotary yarn receiver, of means to rotate it, a winding plate resting on the yarn mass, a spindle connected thereto and extending upwardly therefrom, means to rotate said spindle and thereby the winding plate at a speed different from that of the yarn receiver, a yarn guide movable radially of the winding plate, and means actuated partly by the spindle and partly by the yarn receiver to give vibratory movement to said yarn guide, said yarn guide and its operating mechanism being movable longitudinally of the spindle.

6. In a device of the class described, the combination with a yarn receiver, of means to rotate it, a winding plate resting on the yarn mass carried by the yarn receiver, a spindle rigidly secured to the winding plate and situated entirely thereabove, means to rotate the spindle at a speed different from that of the yarn receiver, a vibratory yarn guide, and means within the yarn receiver and encircling said spindle to actuate said guide.

7. In a device of the class described, the combinaion with a yarn receiver, of means to rotate it, a winding plate resting on the yarn mass carried by the yarn receiver, a spindle rigidly secured to the winding plate and situated entirely thereabove, means to rotate the spindle at a speed different from that of the yarn receiver, a vibratory yarn guide, and means within the yarn receiver and encircling said spindle to actuate said guide, said yarn guide and its operating mechanism being movable longitudinally of the spindle.

8. In a device of the class described, the

combination with a yarn receiver, of means to rotate it, a winding plate resting on the yarn mass delivered to said receiver, a spindle secured to and extending upwardly from the winding plate, means to rotate the spindle, a casing surrounding the spindle, a yarn guide pivotally mounted on the casing, and means within the casing for vibrating the yarn guide.

9. In a device of the class described, the combination with a yarn receiver and means to rotate it, of a winding plate resting on the yarn mass delivered to said receiver, a spindle connected to and extending upwardly from the winding plate, means to rotate the spindle, an oil-tight casing mounted on the spindle and rotative therewith, a yarn guide carried by the casing and cooperating with the winding plate to lay the yarn in transverse layers, and means within the casing to vibrate the yarn guide.

10. In a device of the class described, the combination with a yarn receiver and means to rotate it, of a winding plate resting on the yarn mass delivered to said receiver, a spindle connected to and extending upwardly from the winding plate, means to rotate the spindle, an oil-tight casing mounted on the spindle and rotative therewith, a yarn guide carried by the casing and coöperating with the winding plate to lay the yarn in transverse layers, a cam within the casing to actuate the yarn guide, and means for operating the cam.

11. In a device of the class described, the combination with a yarn receiver and means to rotate it, of a winding plate resting on the yarn mass delivered to said receiver, a spindle connected to and extending upwardly from the winding plate, means to rotate the spindle, an oil-tight casing mounted on the spindle and rotative therewith, a yarn guide carried by the casing and coöperating with the winding plate to lay the yarn in transverse layers, a cam within the casing to actuate the yarn guide, and differential gearing within the casing for actuating the yarn guide, said differential gearing being actuated partially from the spindle and partially from the yarn receiver.

12. In a device of the class described, the combination with a yarn-receiving chamber, of means to rotate it, a winding plate within said chamber resting on the yarn mass, a spindle secured to said winding plate and extending up through the top of the yarn receiver, means to rotate the spindle, a vibrating yarn guide, and means to vibrate it.

13. In a device of the class described, the combination with a yarn-receiving chamber, of means to rotate it, a winding plate within said chamber resting on the yarn mass, a spindle secured to said winding plate and extending up through the top of the yarn receiver, means to rotate the spindle, a vibrating yarn guide, and means to actuate it, said yarn guide and its actuating mechanism being movable longitudinally of the spindle and separable from the winding plate.

14. In a device of the class described, the combination with a yarn-receiving chamber, of means to rotate it, a winding plate within said chamber resting on the yarn mass, a spindle secured to said winding plate and extending up through the top of the yarn receiver, means to rotate the spindle, a vibrating yarn guide, means to vibrate it, said yarn guide and its actuating mechanism being movable longitudinally of the spindle and separable from the winding plate, and means to sustain said yarn guide and its actuating mechanism from the top of the yarn receiver.

15. In a device of the class described, the combination with a yarn receiver, of means to rotate it, a combined winding plate and presser plate resting on the yarn mass, a yarn guide movable radially of said plate, actuating mechanism therefor, said guide and its actuating mechanism resting on the winding plate when yarn is being delivered to the yarn receiver but movable axially of the spindle to relieve said plate of the weight thereof when yarn is being withdrawn from said yarn receiver.

16. In a device of the class described, the combination with a yarn receiver, of means to rotate it, a combined winding plate and presser plate resting on the yarn mass, a yarn guide movable radially of said plate, actuating mechanism therefor, said guide and its actuating mechanism resting on the winding plate when yarn is being delivered to the yarn receiver but movable axially of the spindle to relieve said plate of the weight thereof when yarn is being withdrawn from said yarn receiver, and means to support said yarn guide and its actuating mechanism from the top of the yarn receiver.

17. In a device of the class described, the combination with a rotary yarn receiver, of means to rotate it, a winding plate resting on the yarn mass as it is delivered to said yarn receiver, means to rotate the winding plate, a yarn-guide movable radially of the winding plate, a swinging compensating arm also movable radially of the winding plate, and means to actuate said yarn guide and compensating arm in timed relation to each other whereby the yarn will be delivered with a uniform tension.

18. In a device of the class described, the combination with a yarn receiver, of means to rotate it, a winding plate resting on the yarn mass as it is delivered to the yarn receiver, a spindle secured to and extending

upwardly from said winding plate, means to rotate the spindle, a casing surrounding the spindle supported by the winding plate and through which said spindle extends, a vibrating yarn guide sustained by the casing, a swinging compensating arm also sustained by the casing, and means within the casing to operate said arm and yarn guide in timed relation to each other.

19. In a device of the class described, the combination with a yarn receiver, of means to rotate it, a winding plate resting on the yarn mass as it is delivered to the yarn receiver, a spindle secured to and extending upwardly from said winding plate, means to rotate the spindle, a casing surrounding the spindle supported by the winding plate and through which said spindle extends, a vibrating yarn guide sustained by the casing, a swinging compensating arm also sustained by the casing, a cam within the casing for vibrating said compensating arm in timed relation with the yarn guide, and gearing within the casing for operating the cam.

20. In a device of the class described, the combination with a yarn receiver, of means to rotate it, a combined winding plate and presser plate resting on the yarn mass contained by the yarn receiver and provided with a central yarn-delivery opening and a radial yarn-laying slot, said slot being connected with the opening by a spiral slot, a yarn guide movable parallel with said slot, and means to actuate the yarn guide.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

CHARLES W. HUBBARD.

Witnesses:
BERTHA F. HEUSER,
THOMAS J. DRUMMOND.