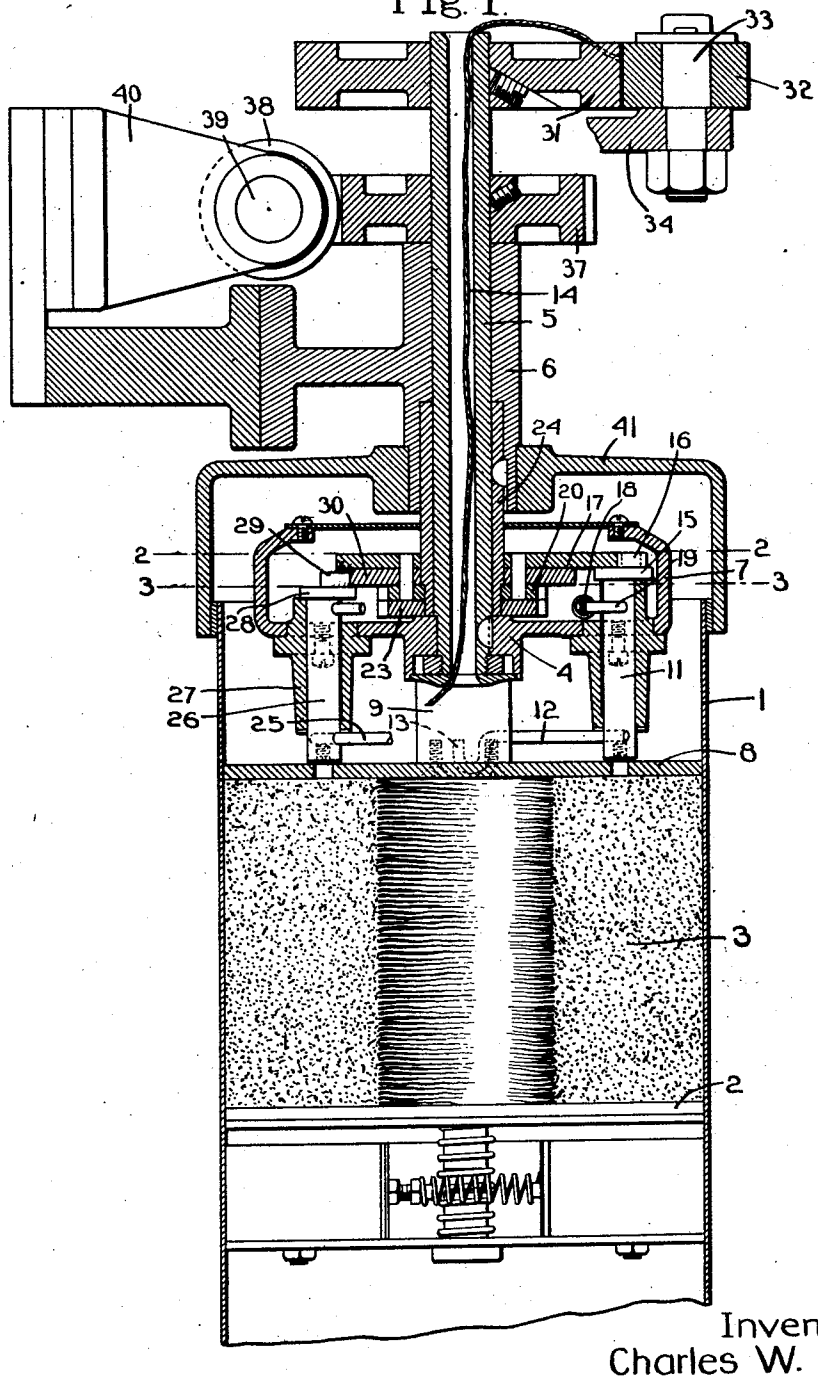
Sept. 28, 1926. 1,601,567

C. W. HUBBARD

WINDING APPARATUS

Original Filed Oct. 4, 1919 3 Sheets-Sheet 1

Fig. 1.



Inventor.
Charles W. Hubbard
by Heard Smith & Tennant.
Attys

Sept. 28, 1926. 1,601,567

C. W. HUBBARD

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Original Filed Oct. 4, 1919 3 Sheets-Sheet 2

Fig. 2.

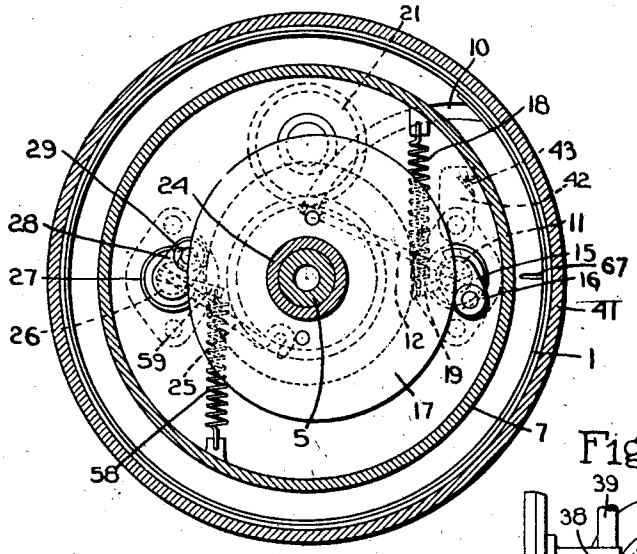


Fig. 5.

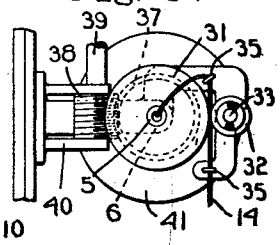


Fig. 3.

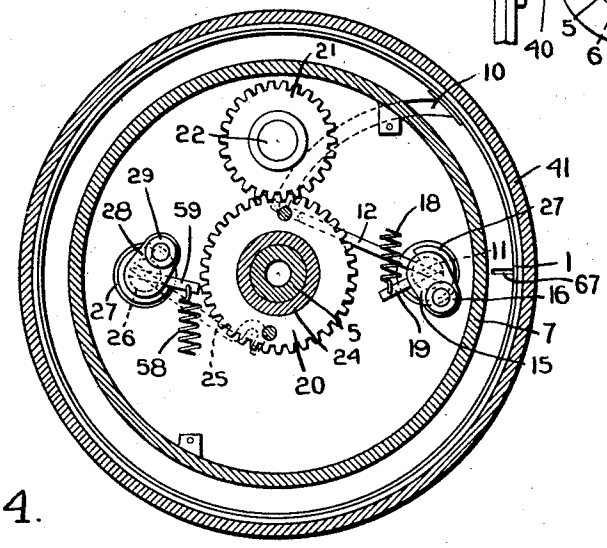
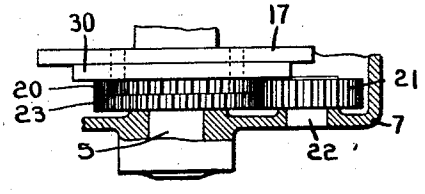


Fig. 4.



Inventor.
Charles W. Hubbard
by Heard Smith & Tennant
Attys.

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C. W. HUBBARD

WINDING APPARATUS

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Fig.6.

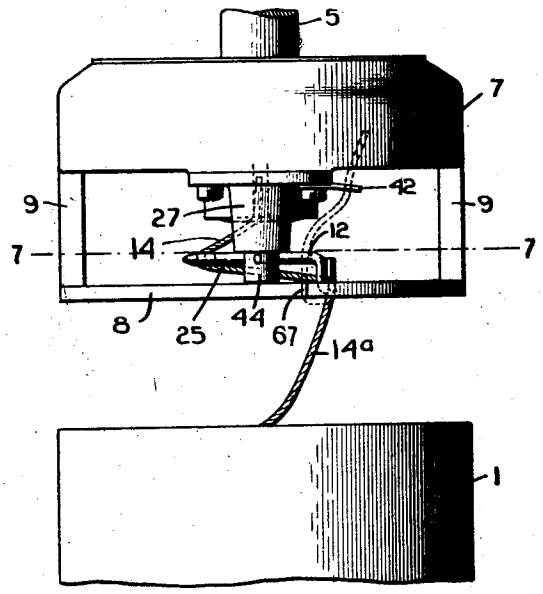
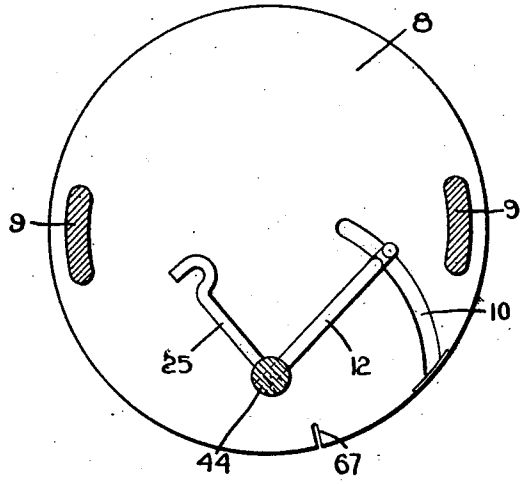


Fig.7.



Inventor.
Charles W. Hubbard
by Heard Smith & Tennant.
Attys.

Patented Sept. 28, 1926. 1,601,567

UNITED STATES PATENT OFFICE.

CHARLES W. HUBBARD, OF WESTON, MASSACHUSETTS.

WINDING APPARATUS.

Application filed October 4, 1919, Serial No. 328,383. Renewed May 8, 1926.

This invention relates to winding apparatus of that general type shown in my prior Patents No. 1,232,686, July 10, 1917, and No. 1,258,411, March 5, 1918, and which comprise a yarn receiver and a winding head which are rotatable relative to each other and which are arranged so that the winding head lays the yarn in layers extending transversely to the axis of rotation, each layer comprising a plurality of loops.

The object of the present invention is to provide a novel winding mechanism of this type having improved means for actuating and controlling the laying arm and compensating arm, an improved means for feeding the yarn to the winding head and other features of improvement, all as will be more fully hereinafter set forth.

In order to give an understanding of my invention, I have illustrated in the drawings some selected embodiments thereof which will now be described, after which the novel features will be pointed out in the appended claims.

In the drawings, Fig. 1 is a vertical sectional view of a winding apparatus embodying my invention;

Fig. 2 is a section on the line 2—2, Fig. 1;

Fig. 3 is a section on the line 3—3, Fig. 1;

Fig. 4 is a detail of the differential gear controlling the cams;

Fig. 5 is a plan view of the device;

Fig. 6 is a side elevation of the device showing the winding head separated from the yarn receiver and indicating the manner in which the yarn is cut;

Fig. 7 is a section taken on the line 7—7, Fig. 6.

In the drawings, 1 indicates the yarn receiver which is preferably in the form of a cylindrical receptacle, 2 indicates a yarn support situated within the yarn receiver 1 and on which the yarn mass 3 is supported, and 4 indicates generally the winding head by which the yarn mass 3 is built up in the yarn receiver in layers extending transversely to the axis of rotation.

The yarn support 2 may have any suitable construction, that herein shown being similiar to the yarn support which is illustrated and described in my Patent No. 1,394,732, dated October 25th, 1921.

The winding head 4 is fast on a shaft 5 journaled in suitable bearings 6, said shaft being rotated by some suitable means. For this purpose, I have shown a gear 37 fast on the shaft 5 which meshes with and is driven by a driving gear 38 mounted on a shaft 39 journaled in the frame 40. Said winding head comprises a supporting member or housing 7 in which is received the differential gearing and cams to be hereinafter referred to and which supports a winding plate 8 that rests on the yarn mass 3. This winding plate 8 is sustained from the housing or member 7 by means of two oppositely-disposed arms 9 and it is provided with a yarn-guiding slot 10 through which the yarn is delivered to the yarn mass, all as usual in devices of this character.

One feature of my present invention relates to means for guiding and controlling the yarn as it is delivered through the guiding slot 10. Supported in the member 7 is a vertical rock shaft 11 which carries at its lower end a yarn-laying arm 12 and means are provided for oscillating the rock shaft 11 to cause the end 13 of said arm 12 to vibrate longitudinally of the slot 10. The yarn 14 is delivered to the yarn-laying arm 12 through the shaft 5 which is hollow for this purpose, and the vibration of the arm 12 will traverse the yarn back and forth in the slot 10, thus causing the yarn to be laid in loops as in the above-mentioned patents. For thus vibrating the rock shaft 11 I employ herein a novel cam mechanism which is actuated by differential gearing situated within the housing 7. The upper end of the rock shaft 11 is provided with a crank arm 15 carrying a roll 16 which rests against the periphery of a cam 17, said roll being held in contact with the cam by means of a spring 18, one end of which is secured to an arm 19 extending from the rock shaft, and the other end of which is secured to the housing 7.

During the rotation of the housing 7 the rock shaft is carried about the cam 17 and the latter acts through the crank arm 15 to vibrate said rock shaft and thus give the yarn-laying arm 12 its traversing movement. In apparatus of this type it is customary to so control the operation of the yarn-laying arm that each loop will be laid either immediately in advance of or immediately behind the previous loop, thus causing the loops to be laid in transverse layers. In the present construction this end is secured by a differential mechanism which gradually shifts the position of the cam 17. Said cam 17 is made fast to a gear 20 which meshes

with an intermediate pinion 21 that is journaled on a stud 22 carried by the housing 7. This intermediate gear 21 also meshes with a stationary gear 23, said gear being held stationary by being fast on a sleeve 24 which in turn is made fast to the bearing 6.

The gear 20 has either one more or one less tooth than the gear 23 and since both gears are meshing with the pinion 21 and the latter is being rotated about the stationary gear 23 by the rotation of the housing 7, it will result that at each rotation of said housing 7, the gear 20 will be either advanced or retarded one tooth. The action of the cam 17 will thus be either advanced or retarded slightly at each rotation with the result that the loops will be laid side by side as usual in devices of this character.

The apparatus herein shown is of that type which has a compensating arm cooperating with the yarn-laying arm 12 for maintaining an even tension on the yarn during the vibration of the yarn-laying arm. This compensating arm is indicated at 25 and it is carried by a vertical rock shaft 26 similar to the rock shaft 11, said rock shaft being journaled in a bearing 27 carried by the housing 7. The rock shaft 26 has at its upper end a crank arm 28 provided with a roll 29 which rests against the periphery of a compensating cam 30 which is rigid with the traversing cam 17. This compensating cam is designed to give the proper vibrating movement to the compensating arm 25 so that the latter will take up slack in the yarn when the yarn-laying arm is moving toward the axis of rotation and give up yarn when the yarn-laying arm is moving in the opposite direction.

It will be noted that the mechanism for operating the yarn-traversing arm and compensating arm is very simple and comprises merely the two cams with the simple differential gearing. It is also entirely enclosed within the housing 7 so that there are no exposed moving parts to be caught by the yarn.

My present invention also includes a novel yarn-feeding device for positively feeding yarn to the winding head at a predetermined rate of speed. This feeding device is in the form of a friction feed wheel 31 which is fast on the shaft 5 at its upper end and which frictionally engages an idler or presser wheel 32 that is journaled on a stud 33 carried by an arm 34 extending from the frame. The yarn 14 passes between the presser roll 32 and feed roll 31 and then passes down through the hollow shaft 5 to the compensating arm 25 and yarn-laying arm 12. I have illustrated the yarn guides 35 which serve to hold the yarn as it is fed by the feed roll 31. Since this feed roll is fast on the shaft 5 it will positively draw yarn from the source of supply at a speed corresponding to that at which the yarn is wound and thus the compensating arm and yarn-laying arms are relieved entirely from any strain due to drawing yarn from the source of supply. The yarn will, therefore, be laid under a constant tension at all times, thus producing a uniformly compact yarn mass 3. The yarn container 1 is shown as secured to a cap or head 41 which is carried by the member 6, and said yarn container is so supported that when it is filled it can be disconnected from the housing 41 and lowered so as to withdraw it from the winding head, as shown in Fig. 6. When the yarn container has thus been filled and is lowered to withdraw it from the winding head it is necessary to cut the yarn leading from the yarn mass to the winding plate before the container can be entirely removed from the machine. When an empty yarn container is replaced in the machine it is necessary that the end of the yarn should be threaded through the slot 10 and held beneath the winding plate so that when the machine is started said end will be retained on the yarn support thereby to ensure the proper winding action. I have provided herein an improved knife for thus severing the thread which is so constructed that the severing of the thread can be done without de-threading the winding plate. One of the bearings 27 has secured thereto a knife member 42 provided with a cutting edge 43, and the winding plate 8 has a notch 67 in its periphery. When the yarn container has been lowered and withdrawn from the winding head, as shown in Fig. 6, the portion 14^a of the yarn which extends from the winding plate to the yarn mass is pulled out and carried under the winding plate 8 and into the notch 67 and then against the cutting edge 43 of the knife, as shown in dotted lines Fig. 6. This operation of severing the yarn does not remove it from the slot 10 and the notch 67 holds the severed end beneath the plate so that when an empty yarn receiver is placed in the machine the severed end will be retained beneath the winding plate and will be held between said plate and the yarn support until the winding will be properly started.

In Figs. 1, 2 and 3 I have shown the yarn-laying arm and compensating arm as mounted on separate rock shafts. In Figs. 6 and 7 I have shown a construction where these two arms are carried by the same rock shaft which is indicated at 44. Where this construction is employed only one cam will be necessary instead of the two cams 17 and 30. The one-cam construction shown in Figs. 6 and 7 does not, however, give as perfect compensation as the two-cam construction.

I claim:

1. In a winding apparatus, the combination with a yarn receiver, of a rotatable

shaft, and a winding head mounted thereon, said winding head including a rock shaft situated non-axially of the winding head and extending parallel to the axis of rotation, a yarn-laying arm extending from said rock shaft, and a cam member about which the rock shaft is rotated by the head and which oscillates said shaft as the head rotates.

2. In a winding apparatus, the combination with a yarn receiver, of a rotatable shaft, and a winding head mounted thereon, said winding head including a rock shaft situated non-axially of the winding head and extending parallel to the axis of rotation, a yarn-laying arm extending from said rock shaft, a cam member about which the rock shaft is rotated by the head and which oscillates said shaft as the head rotates, and compensating means acting on the yarn before it is delivered to said yarn-laying arm.

3. In a winding apparatus, the combination with a yarn receiver, of a rotatable shaft, and a winding head mounted thereon, said winding head including a rock shaft situated non-axially of the winding head and extending parallel to the axis of rotation, a yarn-laying arm extending from said rock shaft, a cam member about which the rock shaft is rotated by the head and which oscillates said shaft as the head rotates, and a vibrating compensating arm acting on the yarn before it is delivered to the yarn-laying arm.

4. In a winding apparatus, the combination with a yarn receiver, of a rotatable shaft, a winding head carried thereby and comprising a winding plate resting on the yarn and provided with a yarn-laying slot, two rock shafts extending parallel to the axis of rotation of the shaft, a yarn-laying arm extending from one rock shaft, a compensating arm extending from the other rock shaft, and cam members about which said shafts are carried during the rotation of the winding head and which cause said shafts to oscillate as the winding head rotates.

5. In a winding apparatus, the combination with a yarn receiver, of a rotatable shaft, and a winding head mounted thereon, said winding head including a rock shaft situated non-axially of the winding head and extending parallel to the axis of rotation, a yarn-laying arm extending from said rock shaft, a cam member about which the rock shaft is rotated by the head and which oscillates said shaft as the head rotates, and means to give the cam a relatively slow rotation about the axis of rotation of the shaft.

6. In a winding apparatus, the combination with a yarn receiver, of a rotatable shaft, and a winding head mounted thereon, said winding head including a rock shaft situated non-axially of the winding head and extending parallel to the axis of rotation, a yarn-laying arm extending from said rock-shaft, a cam member about which the rock shaft is rotated by the head and which oscillates said shaft as the head rotates, and means actuated by the rotation of the shaft to give the cam a relatively slow rotative movement about said axis.

7. In a winding apparatus, the combination with a yarn receiver, of a rotatable shaft, a winding head mounted thereon, said winding head including a rock shaft situated non-axially of the winding head and extending parallel to the axis of rotation, a yarn-laying arm extending from said rock shaft, a cam member about which the rock shaft is rotated by the head and which oscillates said shaft as the head rotates, a gear rigid with said cam member, a second stationary gear, said gears having a different number of teeth and both being situated in axial alinement with said shaft, and an intermediate gear meshing with both of the first-mentioned gears.

8. In a winding apparatus, the combination with a yarn receiver, of a rotatable shaft, a supporting member or head fast thereto, two rock shafts journaled in said supporting member and extending parallel to the rotatable shaft, a winding plate suspended from said supporting member, a yarn-laying arm extending from one rock shaft, a compensating arm extending from the other rock shaft, each rock shaft having a crank arm, two cam members axially alined with the rotatable shaft and acting against said crank arms, and springs for maintaining said crank arms in engagement with said cams.

9. In a winding apparatus, the combination with a yarn receiver, of a rotatable shaft, a supporting member or head fast thereto, two rock shafts journaled in said supporting member and extending parallel to the rotatable shaft, a winding plate suspended from said supporting member, a yarn-laying arm extending from one rock shaft, a compensating arm extending from the other rock shaft, each rock shaft having a crank arm, two cam members axially alined with the rotatable shaft and acting against said crank arms, springs for maintaining said crank arms in engagement with said cams, and means for rotating said cams slowly.

10. In a winding apparatus, the combination with a yarn receiver, of a rotatable shaft, a supporting member or head fast thereto, two rock shafts journaled in said supporting member and extending parallel to the rotatable shaft, a winding plate suspended from said supporting member, a yarn-laying arm extending from one rock shaft, a compensating arm extending from the other rock shaft, each rock shaft having a crank arm, two cam members axially alined with the rotatable shaft and acting

against said crank arms, springs for maintaining said crank arms in engagement with said cams, a gear rigid with said cams, a second stationary gear, a pinion carried by said supporting member and meshing with both gears, said gears having a different number of teeth whereby the cams are gradually advanced by the rotary motion of the supporting member.

11. In a winding apparatus, the combination with a yarn receiver, of a winding head for laying the yarn in said yarn receiver in layers extending transversely to the axis of rotation, a hollow shaft on which said winding head is supported and through which the yarn is delivered to the winding head, means for rotating said shaft, and a pair of feed rolls for delivering yarn to the hollow shaft, said feed rolls being situated at the end of the shaft and one of them being rigid with the shaft.

12. In a winding apparatus, the combination with a yarn receiver, of a winding head for laying the yarn in said yarn receiver in layers extending transversely to the axis of rotation, a hollow shaft on which said winding head is supported and through which the yarn is delivered to said head, means to rotate said shaft, a feed roll carried by said shaft at its upper end, a presser roll with which the feed roll has frictional contact, and means for guiding the yarn as it is led to the feed roll and from the feed roll to the end of the hollow shaft.

13. In a winding apparatus, the combination with a yarn receiver, of a winding head comprising a supporting member, a winding plate connected to said member and provided with a yarn-laying slot, means for traversing the yarn in said slot, and a knife member carried by the winding head and situated above the winding plate.

14. In a winding apparatus, the combination with a rotatable yarn receiver adapted to contain a yarn mass, of a winding head resting on the yarn mass in the yarn receiver and operating to build up said mass in layers extending transversely to the axis of rotation, a hollow shaft on which said winding head is supported, and means carried by said shaft for feeding yarn uniformly to the winding head.

15. In a winding apparatus, the combination with a yarn receiver, of a rotary winding head for laying the yarn in said yarn receiver in layers extending transversely of the axis of rotation, a hollow shaft on which said winding head is supported and through which the yarn is delivered to the winding head, means for rotating said shaft, a pair of feed rolls for delivering the yarn to the entering end of said shaft, one of said feed rolls being fixed on the shaft and the other supported independently thereof.

16. In an apparatus of the class described, the combination with a yarn receiver, of a winding head, means to give the winding head and yarn receiver a relative rotary movement, said winding head including a rock shaft situated non-axially thereof and extending parallel to the axis of the relative rotary movement, a yarn-laying arm extending from said rock shaft, and means to oscillate said arm in a plane extending at right angles to said axis.

17. In an apparatus of the class described, the combination with a yarn receiver, of a winding head, means to give the yarn receiver and winding head a relative rotary movement, said winding head including two rock shafts situated non-axially of the winding head but extending parallel to the axial line of the relative rotary movement, a yarn-laying arm carried by one of the shafts, a compensating arm carried by the other shaft, and means for oscillating each arm in a plane perpendicular to said axis.

18. In an apparatus of the class described, the combination with a yarn receiver, of a winding head, means to give the winding head and yarn receiver a relative rotary movement, said winding head including a rock shaft situated non-axially thereof and extending parallel to the axis of the relative rotary movement, a yarn-laying arm extending from said rock shaft, and a cam situated axially of the winding head for oscillating said rock shaft.

19. In an apparatus of the class described, the combination with a yarn receiver, of a winding head, means to give the winding head and yarn receiver a relative rotary movement, said winding head having two rock shafts both situated non-axially of the winding head but extending parallel to the axial line of the relative movement, a yarn-laying arm carried by one rock shaft, a compensating arm carried by the other rock shaft, and a cam device situated coaxially with said winding head and operating to oscillate both rock shafts.

In testimony whereof, I have signed my name to this specification.

CHARLES W. HUBBARD.