Sept. 28, 1926. 1,601,568

C. W. HUBBARD

TWISTING AND WINDING APPARATUS

Original Filed July 3, 1922 3 Sheets-Sheet 1

Fig. 1.

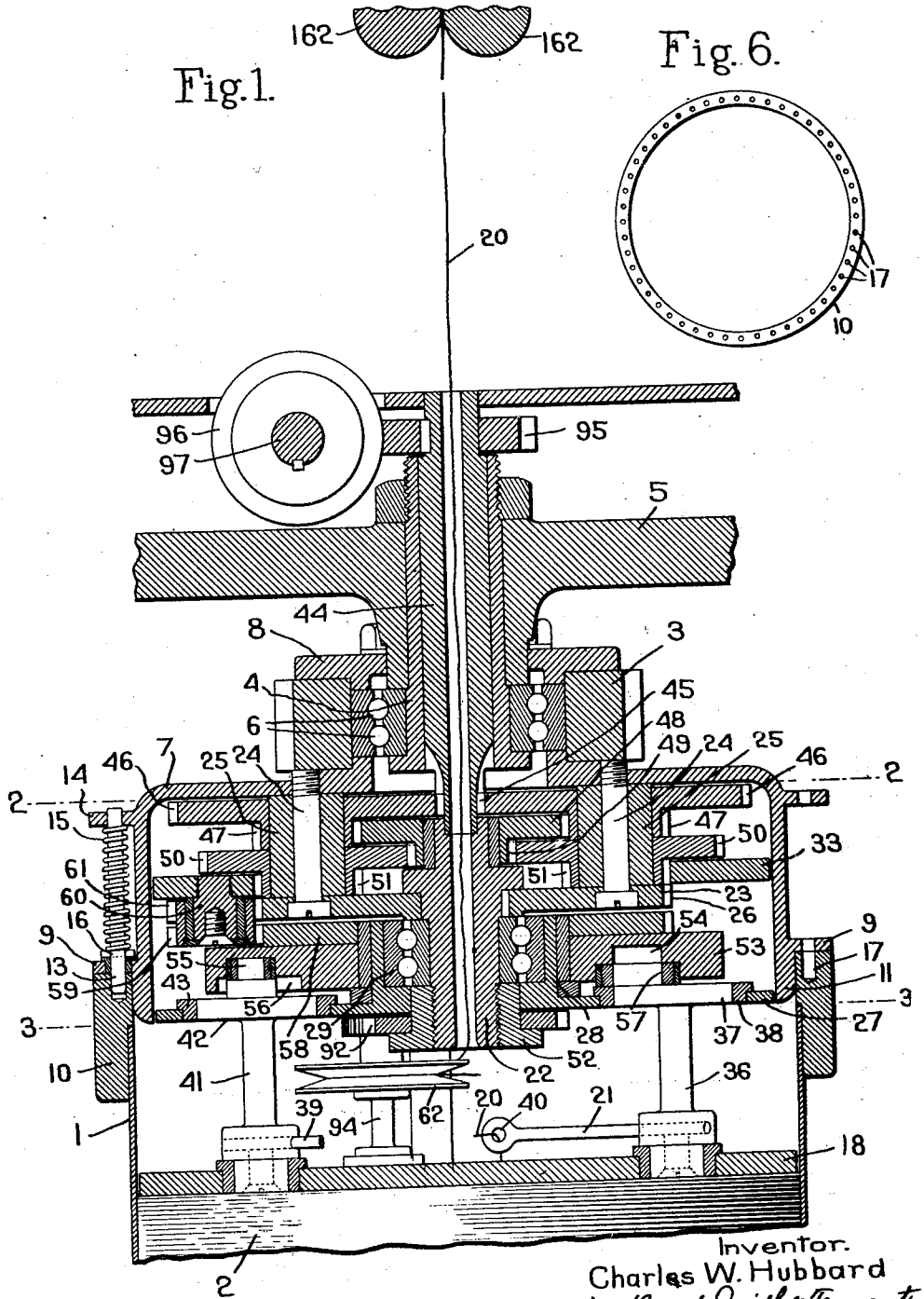

Fig. 6.

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Fig.2.

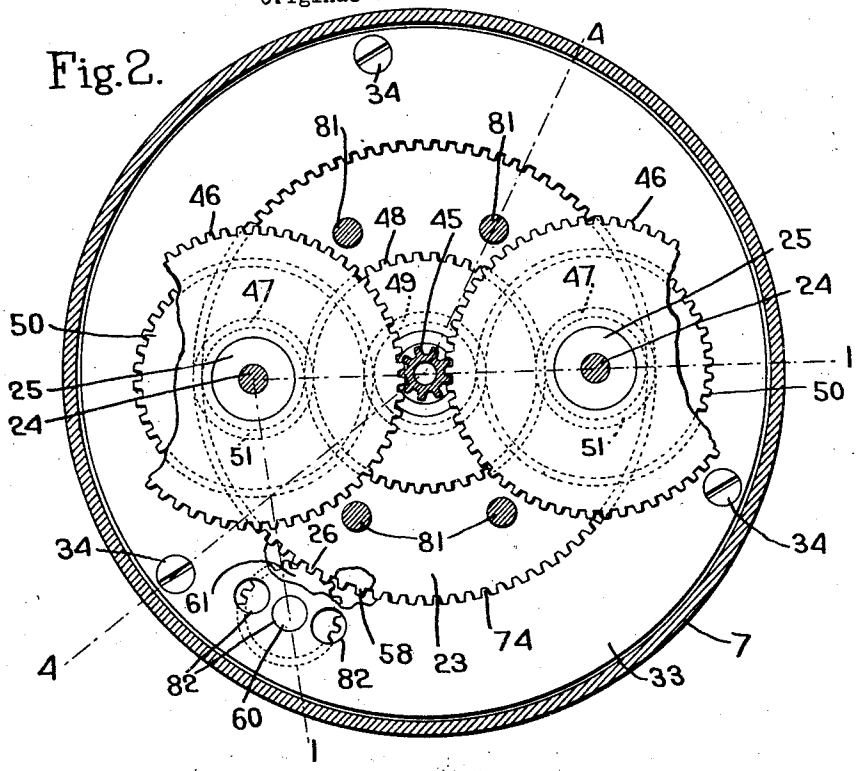

Fig.3.

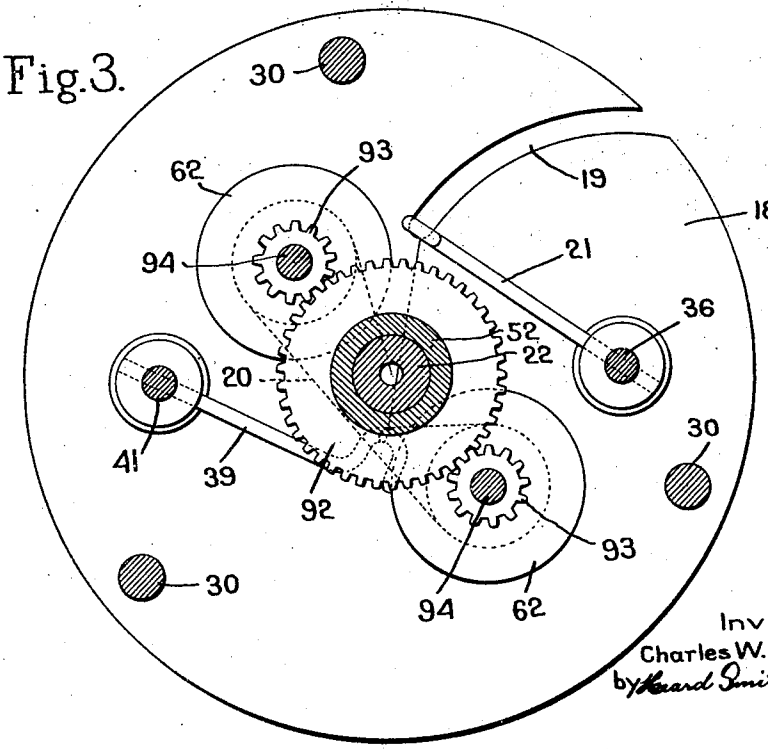

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Fig. 4.

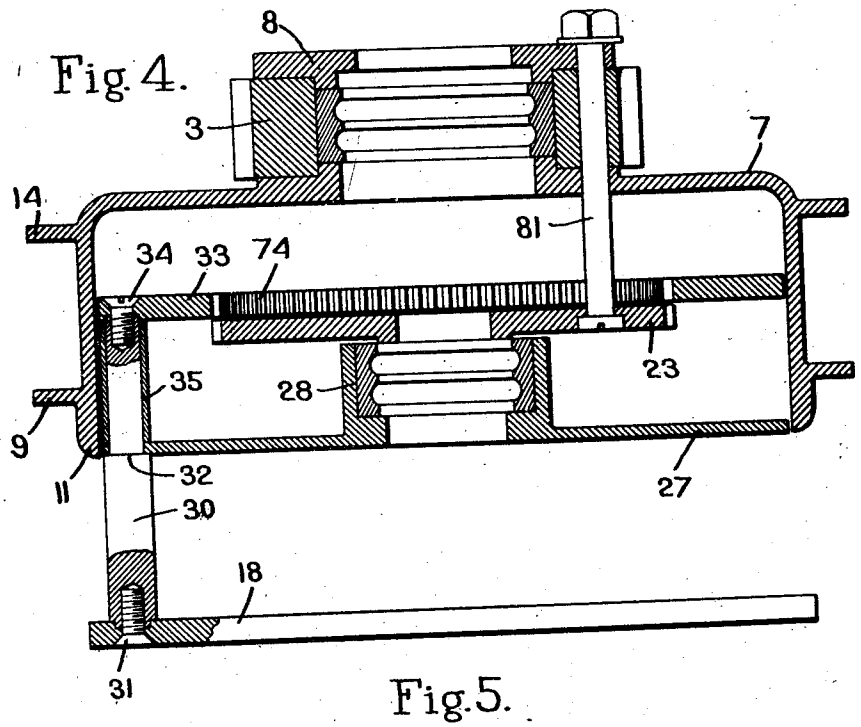
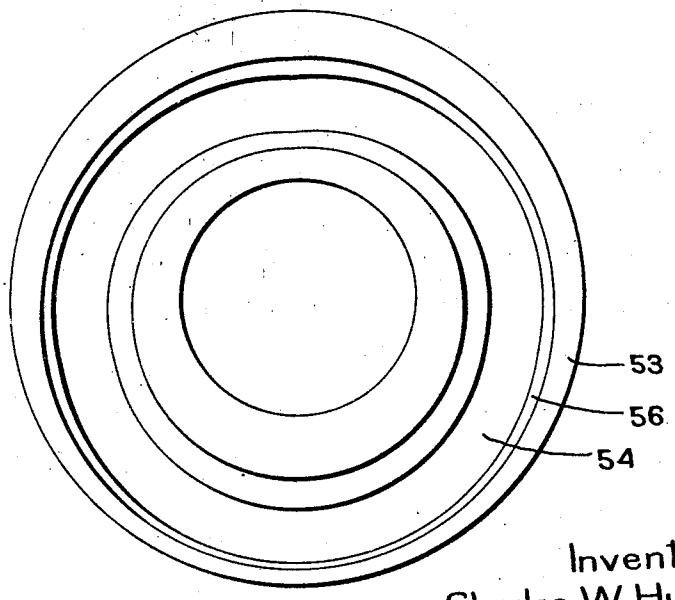


Fig. 5.



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UNITED STATES PATENT OFFICE.

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TWISTING AND WINDING APPARATUS.

Application filed July 3, 1922, Serial No. 572,441. Renewed Februray 27, 1926.

This invention relates to twisting and winding apparatus of that general type shown in Patent No. 1,258,412, March 5, 1918, and which comprises a yarn receiver, and a winding head which are rotatable relative to each other and are arranged so that the winding head lays the yarn in the yarn receiver in loops forming layers extending transversely of the axis of rotation, and which also comprises a driving member from which the yarn receiver and winding head derive their relative rotary movement.

The features peculiar to the present invention are:

1. The manner in which the driving member and winding head are supported, the driving member being rotatably supported on the main frame, and the winding head being supported on the driving member.

2. The manner in which the driving member is locked to the yarn receiver.

3. The use of small differential twist-controlling spur gearing in each driving member for controlling and determining the amount of twist which is given to the yarn.

With this feature the amount of twist put into the yarn is determined by the gearing in each winding head rather than by gearing on the main frame exterior to the winding head.

In addition to the above features the invention also has for its object to improve generally a winding and twisting apparatus all as will be more fully hereinafter set forth and then pointed out in the appended claims.

In the drawings wherein I have illustrated a selected embodiment of the invention, Fig. 1 is a vertical sectional view through a winding head and its support embodying my invention taken on substantially the broken line 1—1, Fig. 2.

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

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

Fig. 4 is a section on the line 4—4, Fig. 2 with some of the parts omitted.

Fig. 5 is a plan view of the cam for controlling the yarn-laying arm and compensating arm.

Figure 6 is a plan of the yarn container showing the openings for co-operation with the locking means.

In the drawings 1 indicates a portion of the yarn receiver in which the yarn mass 2 is wound, said mass being built up in the yarn receiver in layers extending transversely to the axis of rotation all as usual in machines of this sort.

The yarn receiver is rotated about a vertical axis from a driving member 3 which is rotatably mounted on a fixed hollow stud 4 that is carried in a suitable frame, a portion of which is indicated at 5. I have illustrated a ball bearing 6 between the driving member and the stud for the purpose of reducing friction. This driving member 3 may assume various forms without departing from the invention, that is, it may be a belt pulley driven from a belt, or a sprocket wheel driven from a sprocket chain or a gear driven from suitable gearing. I have herein illustrated it as in the form of a gear which will be connected to and driven by suitable driving gears. The yarn receiver and driving member are connected together through the medium of a housing 7, which housing also functions to enclose the winding head presently to be described. This housing has the gear 3 secured thereto in any suitable way and said housing is shown as provided with the annular flange 9 adapted to be connected to the rim 10 of the yarn receiver, the lower edge 11 of the housing setting into said rim. The yarn receiver is supported on a suitable step bearing (not shown) and it is locked to the housing so as to rotate therewith by means of one or more locking pins 13 which are guided in apertures in the flange 9 and another similar flange 14 and which are acted upon by springs 15 tending to hold them in their operative position. The spring 15 for each pin engages the flange 14 at its upper end and at its lower end rests upon a cross pin 16 carried by the locking pin 13.

The locking pin 13 extends below the flange 9 and is adapted to enter one of a plurality of recesses 17 formed in the upper edge of the rim 10. I propose to provide said rim with a considerable number of recesses 17 so spaced with reference to the spacing of the pins 13 that a very slight relative turning movement between the yarn receiver and the housing will bring one of the pins into alignment with a recess and when this occurs the pin will automatically enter the recess thus locking the two parts together for rotary movement.

The step bearing on which the yarn receiver is sustained is a vertically movable

one as shown in my above-mentioned patent and in placing the yarn receiver in position the latter is set onto the step bearing and then said bearing is raised until the lower edge 11 of the housing enters the yarn receiver, after which a slight turning movement either of the yarn receiver or of the housing will bring one of the locking pins into alignment with one of the recesses 17 thus locking the two parts together.

The winding head comprises a presser plate or winding plate 18 adapted to rest on the thread mass 2 and provided with a yarn-guiding slot 19 through which the yarn 20 is delivered by a traversing arm 21, and a suitable gearing for operating the arm 21 and also for providing a relative turning movement between the yarn receiver 1 and the winding plate 18. This winding head is rotatably mounted on a hollow stud 22 which is secured to and is rigid with the housing 7 and driving member 3 but which is situated in axial alignment with the hollow stud 4.

The yarn 20 to be wound is delivered from the drawing rolls 162 and passes through the two hollow studs 4 and 22 on its way to the yarn-laying arm 21.

In the construction herein shown the hollow stud 22 is secured to and supported from a plate 23 which in turn is secured to the housing 7 by means of bolts 24, said bolts having spacing sleeves 25 thereon. This plate 23 has gear teeth 26 in its periphery and thus functions as one of the cam differential gears as will be presently described.

The winding head comprises not only the winding plate 18 but also a plate 27 situated above the winding plate 18 and formed with a hub 28 which is journalled on the stud 22, a ball bearing 29 being employed between the hub and stud to reduce friction.

The plates 27 and 18 are rigidly secured together by means of tie rods 30, said rods having their lower ends secured to the plate 18 by means of suitable screws 31 and their upper end extending through and above the plate 27. The tie rods 30 are shouldered at 32 and the plate 27 rests on said shoulders. The upper end of the tie rods 32 have another plate 33 secured thereto by means of screws 34, said plate 33 being in the form of a ring having internal gear teeth 74 cut thereon and functioning as an internal gear. 35 indicates spacing sleeves between the gear 33 and the plate 27.

In the present embodiment the yarn-laying arm 21 oscillates about a vertical axis, said arm being secured to and carried by a vertical rock shaft 36 which is journalled at its lower end in the winding plate 18 and at its upper end in the plate 27. The upper end of the rock shaft 36 is formed with a head 37 which is concentric with the axis of the shaft and which is mounted to oscillate in a bearing 38 carried by the plate 27.

Associated with the yarn-laying arm 21 is a compensating arm 39 also mounted to oscillate about a vertical axis and with which the yarn engages before it is led to the eye 40 of the yarn-laying arm. The purpose of this compensating arm is to maintain an even tension on the yarn during the vibration of the yarn-laying arm all as described in my above-mentioned patent. This compensating arm is carried by a rock shaft 41 which is also journalled in the two plates 18 and 27, said rock shaft having at its upper end a head 42 which is mounted to oscillate in a bearing 43 carried by the plate 27.

Means are provided which are operated from the driving member 3 to give the winding member a rotary movement relative to the yarn receiver and also operating to oscillate the rock shafts 36 and 41 thereby to give the yarn-laying arm and the compensating arm their vibratory motion.

The means employed for rotating the winding head relative to the yarn receiver comprise a spur gear 45, which may be either stationary or may be rotated in one direction or the other and which meshes with two large gears 46 that are journalled on the spacing sleeves 25. Each gear 46 connects by suitable gearing with a gear 51 which meshes with the internal gear 33. If it be assumed that the spur gear 45 is stationary then it will be evident that as the housing 7 rotates the gears 46 will be rotated about their own axes as they are carried about the axis of the spur gear 45 and this rotation of the gears 46 will be communicated to the internal gear 33, which it will be remembered forms part of the winding head and is rigid with the winding plate 18.

The relation between the rotation of the housing 7 and that of the winding head or winding plate 18 depends upon the character of the gearing interposed between the gears 46 and 51. It will be understood that the twist is put into the yarn by the rotation of the driving member and the yarn receiver and the speed at which the yarn is wound is determined by the relative movement between the yarn receiver and the winding head. If this relative movement is a slow one then a greater amount of twist per inch will be put into the yarn than if such relative movement is a more rapid one. The relation between the rotary movement of the yarn receiver and that of the winding head is, as stated above, determined partially by the character of the gearing between the gears 46 and 51.

Where it is desired to put a small amount of twist into the yarn then this gearing will

be so arranged as to decrease the relative rotary movement between the winding head and yarn receiver, while if a large amount of twist is to be put into the yarn then gearing will be employed which will increase the relative rotary movement between these parts.

In the construction shown each gear 46 has rigid therewith a smaller gear 47 which meshes with and drives a gear 48 situated coaxially of the driving head and rotatably mounted on the upper end of the stud 22. This gear 48 has a smaller gear 49 rigid therewith which meshes with and drives two larger spur gears 50 which are loosely mounted on the spacing sleeves 25. Each gear 50 has a small gear 51 which meshes with the internal gear 33.

Assuming that the spur gear 45 is stationary, it will follow that the rotation of the housing 7 by the driving member 3 will operate through the train of gearing above mentioned to give a rotary movement to the internal gear 33 and thus to the winding plate 18, and, therefore, the winding plate will have a rotary movement relative to the yarn receiver, the character of which is determined by the train of gearing above recited.

If it is desired to increase or decrease the relative rotary movement between the yarn receiver and the winding plate 18 then the gearing between the gears 46 and 33 can be changed to produce the desired result.

Another way in which this desired change in the relative rotation of the winding head and yarn receiver may be secured is by rotating the gear 45. This gear is herein shown as carried on a sleeve 44 which extends through the hollow stud 4 and said sleeve 44 is shown as geared to a shaft 97 by any suitable gearing 95, 96. This shaft 97 may be rotated in one direction or the other or may be held stationary and by this means the gear 45 can be rotated in one direction or the other or may be held stationary.

Assuming for instance that if the spur gear 45 is stationary the gearing between said gear 45 and the internal gear 33 will give n twist per inch, than revolving the gear 45 in the direction of the driving member will give $n+$ twist per inch, while if the gear 45 is rotated in the opposite direction then $n-$ twist per inch will be given to the yarn.

The winding head is readily removable from the stud 22 and by removing it the gears of the above-mentioned train of gears can be changed so as to provide for a greater or less amount of twist in the yarn. It will be noted that the winding head is retained on the stud 22 by means of the retaining nut 52 and therefore after the yarn receiver 1 has been separated from the housing 7, the nut 52 may be removed after which the plate 28 may be withdrawn from the stud 22. This will expose the heads of the screws 24 so that the latter may be withdrawn thereby permitting the gears 46, 47, 50 and 51 to be replaced by other gears of different sizes if desired to change the relative speed between the driving member and the winding head.

The movement of the yarn-laying arm 21 and of the compensating arm 39 is controlled by a cam member 53 which is loosely mounted on the hub 28 and which is provided with one cam path 54 adapted to receive a roll or stud 55 extending from the head 42 and situated eccentrically thereof and also provided with another cam path 56 adapted to receive a roll or stud 57 rising from the head 37 but situated eccentrically thereof.

In the construction herein shown the cam path 54 is formed in the bottom of the cam path 56 and the stud 55 is, therefore, smaller than the stud 57. The rotation of the cam 53 produces an oscillatory movement in the rock shafts 36 and 41 thereby giving the required oscillatory movement to the yarn-laying arm 21 and compensating arm 39, and in order that different loops of yarn will be laid progressively the cam 53 is given a differential movement with reference to the yarn receiver. This is accomplished by providing a gear 58 which is rigid with the cam 53 and which meshes with a gear 59 journalled on a stud 60 carried by the plate or internal gear 33. This gear 59 has rigid therewith another gear 61 which meshes with the gear 23 that is rigid with the housing 7. The gears 23 and 58 have a different number of teeth, one of said gears having one or two or more teeth than the other, and the gears 59 and 61 also have a different number of teeth. As a result of this construction the relative rotary movement between the gear 23 and the plate or internal gear 33 will operate through the gears 59, 61 to rotate the gear 58 and cam 53 but said gear 58 will have a slightly faster or slightly slower speed of rotation than the gear 23 or housing 7 due to the different number of teeth in the gears 23, 58, 59, 61.

It will be remembered that at each rotation of the cam a loop of yarn is laid on the yarn mass and these loops are laid in overlapping relation with a greater or less lead between successive loops depending upon the gearing for operating the cam.

In winding fine yarn a less lead is required than in winding a coarse yarn. I find that by providing gears 59, 61 of different sizes it is possible to secure a wide range in this lead or advance. To permit this to be done I have made the plate 33 with a plurality of slots 81 situated at different radial distances from the center and into any one of which the stud 60 may be

screwed, thus providing for using the duplex gears 59, 61 of different sizes. When the stud 60 is in the aperture 81, which is furthest from the center, the larger duplex gear 59, 61 can be used than when it is in the slots nearer the center and the larger gear may be made with a greater variation in the number of teeth between the two gears 59, 61. By this means the mechanism can be adjusted so that it will lay the yarn with any desired number of loops in each transverse layer.

If desired drawing rolls or capstans can be added for the purpose of assisting in drawing the yarn through the winding head and delivering it to the yarn-laying arm. These capstans are indicated at 62 and are located between the hollow stud 22 and the winding plate. There are two such capstans and each is mounted on a shaft 94 which is journalled in the plates 18 and 27. Each shaft has a gear 93 thereon which meshes with a gear 92 fast on the stud 22 so that the difference of rotation between the driving member and the winding head will operate to rotate the capstans thus feeding the yarn positively to the compensating and yarn-laying arms.

I claim—

1. In a winding and twisting apparatus, the combination with a hollow supporting stud, of a driving member supported thereby and rotatable thereabout, a housing rigid with the driving member, a supporting plate within the housing and rigidly secured thereto, a winding plate adapted to rest on the yarn mass and having a yarn-guiding slot, gearing situated above the first-named plate and co-operating with the hollow supporting stud for giving rotary movement to the winding plate, and means for traversing the yarn in the yarn-laying slot.

2. In a winding and twisting apparatus, the combination with a hollow supporting stud, of a driving member supported thereby and rotatable thereabout, a yarn-receiving member secured to the housing, a plate within the housing rigidly secured thereto, a second hollow stud supported by said plate, and a winding head supported by said latter stud.

3. In a winding and twisting apparatus, the combination with a hollow supporting stud, of a driving member supported thereby and rotatable thereabout, a yarn-receiving member secured to the housing, a plate within the housing rigidly secured thereto, a second hollow stud supported by said plate, a winding head supported by said latter stud and comprising a winding plate adapted to rest on the yarn mass and having a yarn-guiding slot, and gearing situated within the housing above the plate for giving rotative movement to the winding plate.

4. In a winding and twisting apparatus, the combination with a hollow supporting stud, of a driving member supported thereby and rotatable thereabout, a housing rigid with the driving member, a yarn receiver secured to said housing, a plate within the housing and rigid therewith, a second hollow stud carried by the plate, a winding head rotatably mounted on said second hollow stud, said winding head including a winding plate having a yarn-guiding slot and a yarn-laying arm for traversing the yarn in said slot, gearing situated within the housing above the plate and co-operating with the first-named hollow stud for rotating the winding head, and other gearing co-operating with said plate to give the yarn-laying arm its operative movement.

5. In an apparatus of the class described, the combination with a hollow fixed stud, of a driving member supported thereby and rotatable thereabout, a yarn-receiver secured to the driving member, a second stud in axial alignment with the first-named stud and carried by the driving member, a winding head sustained by and rotatable on said second stud, and spur gearing for operating the winding head carried partly by the fixed stud.

6. In an apparatus of the class described, the combination with a hollow fixed stud, of a driving member sustained thereby and rotatable thereabout, a second hollow stud sustained by the driving member and situated in axial alignment with said first-named stud, a winding head mounted on and rotatable about said second stud, said winding head including a winding plate adapted to rest on the yarn mass and provided with a yarn-guiding slot, a yarn-laying arm for traversing the yarn in said slot, said yarn being led to the arm through the hollow studs, and yarn-feeding means situated between the studs and the yarn-laying arm.

7. In an apparatus of the class described, the combination with a hollow fixed stud, of a driving member sustained thereby and rotatable thereabout, a second hollow stud sustained by the driving member and situated in axial alignment with said first-named stud, a winding head mounted on and rotatable about said second stud, said winding head including a winding plate adapted to rest on the yarn mass and provided with a yarn-guiding slot, a yarn-laying arm for traversing the yarn in said slot, said yarn being led to the arm through the hollow studs, and positively-driven yarn-feeding rolls situated betwen the studs and the yarn-laying arm.

8. In an apparatus of the class described, the combination with a hollow fixed stud, of a driving member sustained thereby and rotatable thereabout, a second hollow stud sustained by the driving member and situated in axial alignment with said first-named stud, a winding head mounted on

and rotatable about said second stud, said winding head including a winding plate adapted to rest on the yarn mass and provided with a yarn-guiding slot, a yarn-laying arm for traversing the yarn in said slot, said yarn being led to the arm through the hollow studs, yarn-feeding rolls situated between the studs and the yarn-laying arm, and means for rotating said rolls by the relative rotation of the driving member and winding head.

9. In an apparatus of the class described, the combination with a hollow fixed stud, of a driving member sustained thereby and rotatable thereabout, a second hollow stud sustained by the driving member and situated in axial alignment with said first-named stud, a winding head mounted on and rotatable about said second stud, said winding head including a winding plate adapted to rest on the yarn mass and provided with a yarn-guiding slot, a yarn-laying arm for traversing the yarn in said slot, said yarn being led to the arm through the hollow studs, and yarn-feeding rolls carried by the winding head, and means for rotating said rolls by the rotative movement of the driving member.

10. In a winding and twisting apparatus, the combination with a frame having a fixed hollow stud, of a driving member rotatable about said stud, a yarn receiver rotating with the driving member and winding head, a sleeve within the fixed stud, a spur gear thereon, a gear carried by the driving member and meshing with the spur gear, and means operated by said gear to give the winding head a rotary motion relative to the driving member.

11. In a winding and twisting apparatus, the combination with a frame, having a hollow fixed stud, of a driving member rotatable thereon, a yarn receiver rotatable with the driving member, a second hollow stud carried by the driving member, a winding head rotatable about said second stud, means operated by the driving member to give the winding head a rotary movement relative to that of the driving member, a capstan carried by the winding head, and a gear carried by the driving member and by which the capstan is operated.

12. In a winding and twisting apparatus, the combination with a frame, having a hollow fixed stud, of a driving member rotatable thereon, a yarn receiver rotatable with the driving member, a second hollow stud carried by the driving member, a winding head rotatable about said second stud, means operated by the driving member to give the winding head a rotary movement relative to that of the driving member, a capstan carried by the winding head, and a gear carried by said second stud and by which the capstan is operated.

13. In a device of the class described, the combination with a rotatable driving member having a housing rigid therewith, of a yarn-receiving member having a plurality of recesses around its periphery, a spring-pressed locking pin carried by the housing and adapted to enter any one of said recesses to lock the yarn-receiving member to the housing, and means within the housing for laying yarn in the yarn-receiving member.

14. In a device of the class described, the combination with a driving member, of a housing rigid therewith, a yarn-receiving member having an open end and a plurality of recesses in the wall thereof at said end, and a spring-pressed locking pin carried by the housing and adapted to enter any one of said recesses.

15. In a device of the class described, the combination with a driving member, of a housing rigid therewith, a yarn-receiving member having an open end and a plurality of recesses in the wall thereof at said end, and a spring-pressed locking pin extending parallel to the axial line of the yarn receiver and adapted to enter any one of said recesses.

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

CHARLES W. HUBBARD.