

Dec. 30, 1924.

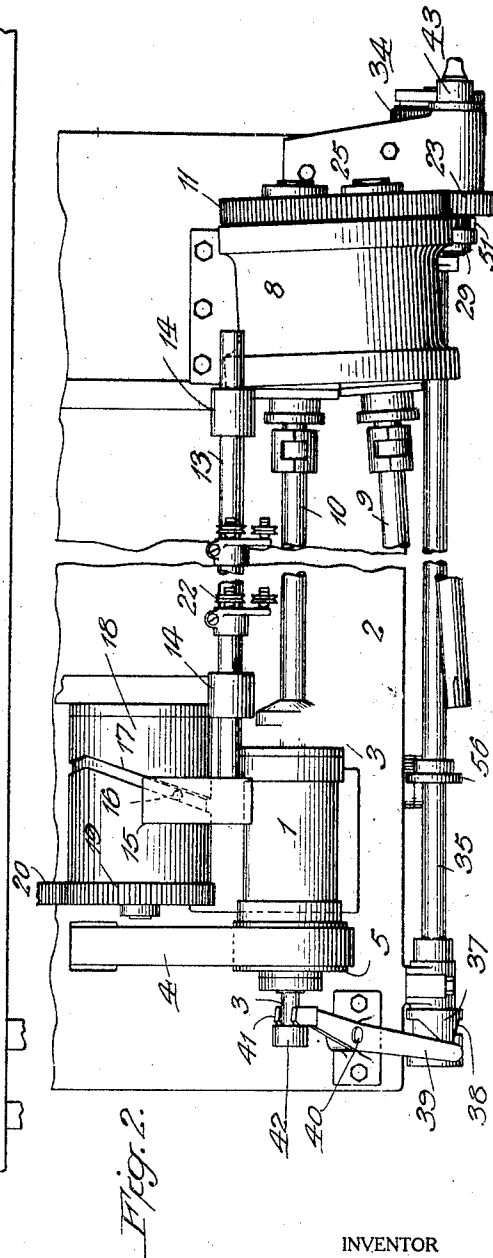
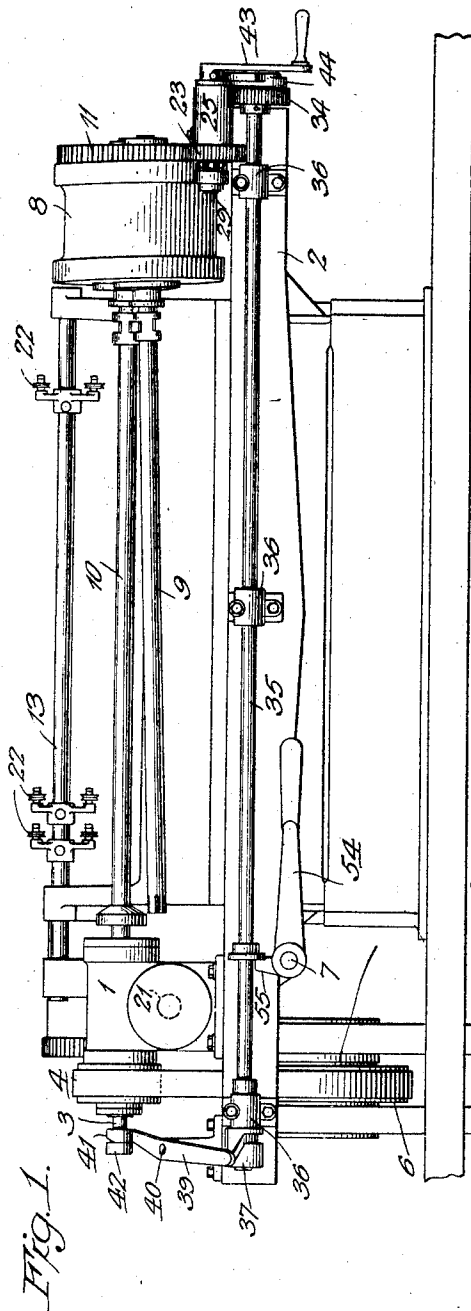
A. D. SCOTT

1,521,396

WINDING MACHINE

Filed July 14, 1923

2 Sheets-Sheet 1



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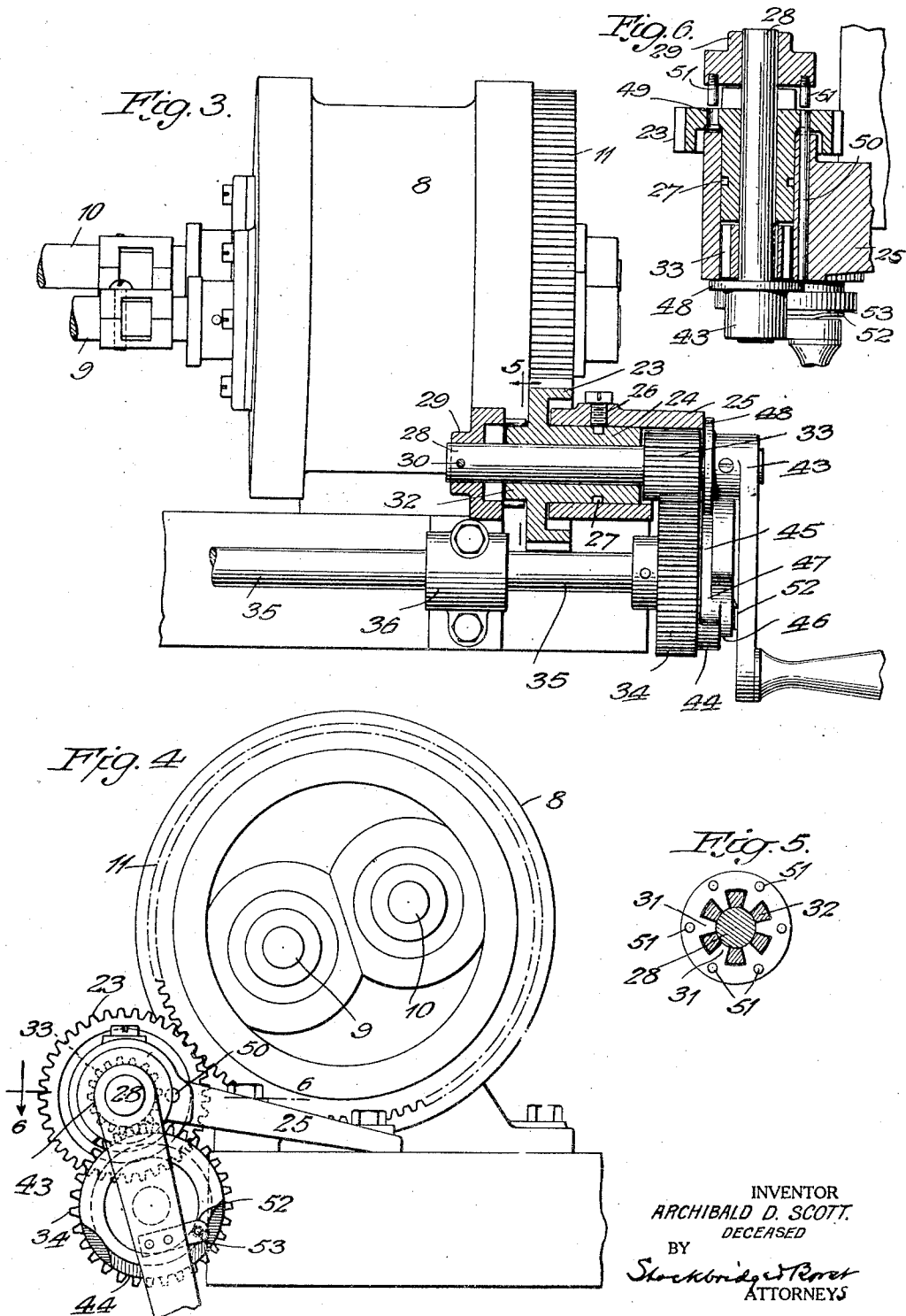
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE.

ARCHIBALD D. SCOTT, DECEASED, LATE OF JERSEY CITY, NEW JERSEY; BY MARY V. SCOTT, EXECUTRIX, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO VARLEY DUPLEX MAGNET COMPANY, A CORPORATION OF NEW JERSEY.

WINDING MACHINE.

Application filed July 14, 1923. Serial No. 651,493.

To all whom it may concern:

Be it known that ARCHIBALD D. SCOTT, deceased, late a citizen of the United States, residing at Jersey City, in the county of Hudson and State of New Jersey, invented certain new and useful Improvements in Winding Machines, of which the following is a full, clear, and exact description.

This invention relates to machines for winding strands of material such as wire, thread, or ribbon into coils, helices or bobbins, and has particular reference to a machine for winding copper wire into electric coils or helices for use in various types of electrical apparatus. The particular invention herein described is in the nature of an improvement upon the machines described in United States Patents #654,583 issued July 31st, 1900, #798,864 issued September 5th, 1905, and #1,344,432 issued June 22nd, 1920. The invention is directed to an improvement upon the turret control and operation disclosed in the last mentioned U. S. patent. In the patented machines a plurality of coils are wound simultaneously in separate zones upon a single spindle or mandril, the convolutions of wire being wound in layers superimposed one upon the other. When the required number of layers are completed the machine stops and all of the coils on the spindle are removed in a body or stick and afterwards separated into individual coils. After the removal of the stick, the spindle is prepared for another winding operation by placing thereon a paper or other suitable tube, fastening thereto at the proper points the various strands of wire, and then starting up the machine. The operation of preparing the spindle and manipulating the finished coils consumes considerable time during which the machine in accordance with the earlier inventions was idle, which resulted in a limitation of the output of the machine. In the U. S. Patent #1,344,432, the intervals of idleness were reduced in duration by the provision of a plurality of spindles carried by a turret and adapted to be rotated successively into winding positions, and suitable driving connections were made to each spindle when in the winding position.

An object of the invention is to improve and simplify the turret controlling and operating mechanism in order that the neces-

sary steps between the winding operations may be more easily and rapidly carried out and by relatively unskilled labor. Other objects and advantages will be apparent from the following description of an embodiment of the invention, and the novel features will be particularly pointed out hereinafter in claims.

In the accompanying drawing:

Fig. 1 is a front elevation of a machine constructed in accordance with the invention;

Fig. 2 is a plan of the same;

Fig. 3 is a front elevation of the turret and its operating mechanism;

Fig. 4 is an end elevation of the same;

Fig. 5 is a section through the same taken substantially along the line 5—5 of Fig. 3; and

Fig. 6 is a section through the same taken substantially along the line 6—6 of Fig. 4.

In the illustrated embodiment of the invention, a bearing housing 1, which is supported upon a machine frame 2, rotatably supports a driving spindle 3. The spindle 3 is rotatably driven in a suitable manner such as by a belt 4 passing over a pulley 5 thereon, the belt 4 being driven from a pulley 6 which may have a driving connection from a suitable source of power (not shown) and the application of which to the pulley 6 is controlled by a shaft 7.

A turret 8 mounts a plurality of spindles 9 and 10 for rotation about their axes and for bodily rotation about the axis of the turret. The spindles are mounted in the turret so as to be slightly divergent from one another and from the axis of the turret and are bodily rotated about the axis of the turret by a gear 11. The axis of the turret 8 is slightly oblique to the axis of the spindle 3 so that when the gear 11 is rotated to bodily rotate the winding spindles 9 and 10, the latter will be carried successively into aligned positions relatively to the driving spindle 3, which aligned positions will be hereinafter referred to as the winding positions because in these positions the spindles will be rotated about their own axes for the winding thereon of the wire.

The driving spindle 3 is provided, at the end adjoining the winding spindles, with a chuck 12, and the spindle 3, which is slidable as well as rotatable in the housing 1, may

be shifted endwise to carry the chuck 12 into or out of chucking engagement with the free end of the aligned winding spindles. When the chuck engages with the winding spindle a driving connection is effected between the driving spindle 3 and the winding spindle, and this connection is broken by shifting the driving spindle 3 endwise in a direction to carry the chuck 12 out of engagement with the spindle.

A rod 13 is disposed parallel with the driving spindle 3, and is mounted for endwise sliding movement in bearings 14 which are mounted upon the machine frame 2. The rod 13 is provided with a follower block 15 carrying a follower pin 16 that runs in a cam groove 17. The cam groove 17 extends peripherally of a cylinder 18 which is rotatably mounted upon the machine frame 2 and driven by a gear 19 and gear train 20 from any suitable source of power, preferably from a shaft 21 (Figure 1) which has a worm driven connection with the spindle 3. Thus during the rotation of the driving spindle 3 the drum 18 will be rotated, and the cam groove 17 will act through the follower pin 16 to reciprocate the rod 13. The rod 13 is provided with suitable wire or thread guides 22 which are adapted to guide the wire or thread to be wound from suitable spools or bobbins (not shown) to the winding spindle upon which the coils are being wound. Any number of guides 22 may be mounted upon the rod 13 and it will be understood that these guides will be spaced to correspond with the spacing of the coils.

A pinion 23 meshing with the gear 11 of the turret is provided with a tubular hub 24 which extends within and is rotatably supported in a bearing 25 of the machine frame 2. A screw pin 26 extending through the bearing 25 and from the inner bearing surface thereof runs in an annular groove 27 of the hub 24 of the pinion 23. An operating shaft 28 is slidably and rotatably mounted in the pinion 23 and its hub. A clutch element 29 is secured by a pin 30 upon one end of the shaft 28, and upon the face abutting the pinion 23 is provided with clutch teeth 31 which may be shifted into and out of clutching engagement with complementary clutch teeth 32 that are provided upon the abutting face of the pinion 23. The movement of the clutch 29 into and out of clutching engagement with the pinion 23 is accomplished by shifting the shaft 28 endwise of itself.

The shaft 28 is also provided with a pinion 33 which meshes with a gear 34 fixed upon a control shaft 35. The shaft 35 is rotatably mounted in suitable bearings 36 of the machine frame 2, and extends across the front of the machine. The control shaft 35, at its end adjacent the driving spindle 3,

carries a cylindrical cam 37 having in its peripheral surface a cam groove 38. A lever 39 is pivotally mounted at 40 upon a suitable bearing of the machine frame 2 and at one end has a follower pin running in the cam groove 38, whereby the lever will be oscillated in accordance with the character of the cam groove. The lever also has a forked end 41 which embraces the driving spindle 3, and by engagement against a collar 42 on the spindle 3 may operate the spindle in an endwise direction when the shaft 35 is rotated. It will be understood that a suitable spring (not shown) is provided within the housing 1 for normally stressing the driving spindle 3 in a direction opposite to that to which it is shifted by the lever 39.

A suitable operating handle 43 is secured upon the shaft 28, and assuming that the shaft 28 is in such a position that it is unclutched from the pinion 23, the rotation of the shaft 28 by the handle 43 will effect a driving of the shaft 35 and an endwise movement of the driving spindle 3. When the handle 43 is operated to shift the shaft 28 into clutching engagement with the pinion 23, a rotation of the shaft 28 by the handle will not only rotate the shaft 35 but also the turret gear 11 and through it effect a bodily rotary movement of the winding spindles 9 and 10.

A disc 44 is secured upon the end of the shaft 35, adjacent the operating handle 43, and has in its periphery two track ways 45 and 46. The trackway 45 extends about 220° around the disc and at its ends communicates through gateways 47 with the ends of the trackway 46. The handle 43 is provided with a collar 48 which is adapted to extend into one or the other of the trackways 45 or 46, and by engagement with the ends of the trackways limit the rotation of the shaft 35 which in turn limits the rotation of the operating handle 43. When the collar 48 is at either end of the trackway 45 it may be shifted endwise of one of the gateways 47 into the trackway 46, or vice versa. The shaft 28 can therefore only be shifted endwise when the collar 48 can be shifted through one of the gateways 47. At all other times the collar 48 will be locked against endwise movement, and through it the shaft 28 will be locked against endwise movement.

The pinion 23 is provided with a plurality of apertures 49 extending from face to face and arranged in a circular row concentric with the axis of rotation of the shaft 28. A locking pin 50 is disposed parallel with the shaft 28 and mounted for endwise sliding movement in the bearing 25. The locking pin 50 is disposed at such a distance from the axis of the shaft 28 that when shifted endwise it may enter any of the apertures 47 which are brought into align-

ment therewith through the rotation of the pinion 23. The collar 48 overlies one end of the locking pin 50 and is adapted to engage it and shift it endwise into one of the apertures 47 of the pinion 23 to lock the latter against rotation when the shaft 28 is shifted endwise in a direction to unclutch it from the pinion 23. A plurality of ejector pins 51 extend from the clutch element 29 toward the abutting face of the pinion 23, and these ejector pins are arranged in a circular row concentric with the axis of the shaft 28, so that when the clutch member 29 is carried into clutching engagement with the pinion 23, the ejector pins will enter the apertures 49 of the pinion and eject the locking pin 50 therefrom.

A spring finger 52, provided upon the handle 43 is adapted to click over a pin 53 provided upon the end face of the disc 44 and by the sound and drag created indicate when the collar 48 is approximately midway between the ends of the trackway 45.

The shaft 7, which controls the activity of the driving spindle 3, is provided with an operating handle 54 having a tongue 55 extending beneath the shaft 35 and adapted to enter a notch (not shown) in the periphery of a collar 56 which is fixed upon the shaft 35. The position of the slot in the collar 56 is such that the tongue 55 can only enter it when one of the winding spindles is in alignment with the driving spindle 3 and clutched thereto. It will, therefore, be impossible to start the machine unless a winding spindle is properly positioned and clutched to the driving spindle. Also it will be impossible to operate the turret or to declutch the winding spindle and driving spindle while the machine is in operation.

In the operation of this device, the paper tubes or other forms upon which the coils are to be wound are slid over the free end of the disengaged winding spindle and secured thereon in any suitable manner. The threads or wires to be wound are conducted over the guides 22 and secured to the forms in any suitable manner. The turret is operated to place the spindle with the form in alignment with the driving spindle and clutch the latter thereto. When this is accomplished the shaft 35 will be in such a position that the starting and stopping handle 54 can be manipulated to start the machine. The coils will then be wound automatically, and when they are completed the machine will be stopped either manually or by the automatic mechanism disclosed in the prior patents hereinbefore referred to. During the winding operation, the operator will place a new form upon the unused spindle.

The operator, at the completion of the winding movement, operates the handle 43 by rotating it until the collar 48 is reached by one end of the trackway 45. During this rotation of the handle, the shaft 35 will be rotated, but the pinion 23 will not be rotated since it is unclutched from the shaft 28. This increment of rotation of the shaft 35 will cause the cam 37 thereon to operate the lever 39 and draw the driving spindle 3 and its chuck 12 out of engagement with the winding spindle which is then in alignment therewith. The handle 43 is then operated to pull the shaft 28 endwise and carry the clutch member 29 into clutching engagement with the pinion 23, the movement of the collar 48 through the gateway 47 permitting this endwise movement of the shaft 28. During this endwise movement the ejector pins 51 will enter the apertures in the pinion 23 and eject therefrom the locking pin 50.

At the completion of this endwise movement of the shaft 28, the collar 48 will lie in the trackway 46, and then further rotation of the handle 43 in the same direction can be effected. During continued rotation of the handle, the pinion 23 will be driven and will in turn drive the turret gear 11 and rotate the winding spindles bodily about the axis of the turret to carry a new winding spindle into alignment with the driving spindle 3. This increment of movement will be limited by the engagement of the opposite end of the track 46 with the collar 48.

During this last mentioned increment of rotation, the shaft 35 will rotate, but the cam groove 38 will have such a direction that during this portion of its revolution it will not affect the position of the lever 39. The handle 43 may then be operated to shift the shaft 28 endwise and carry the collar 48 to the other gateway 47 into the trackway 45. During this endwise movement of the shaft 28, the clutch member 29 will be disengaged from the pinion 23, and the collar 48 will engage and operate the locking pin 50 in a direction to cause it to enter one of the apertures 49 of the pinion 23, the ejector pins being withdrawn during the same movement. The locking pin then prevents rotation of the pinion 23 and through it rotation of the turret.

The handle 43 may now be rotated further in the same direction, and during this rotation the turret will not be operated but the shaft 35 will be rotated. This increment of rotation of the shaft 35 will operate the lever 39 to release the driving spindle 3 and permit the spring within the housing (not shown) to carry the driving spindle into chucking engagement with the winding spindle which has just been brought into alignment therewith. This last position is

reached when the collar 48 is approximately midway between the ends of the trackway 45 and will be indicated by the clicking engagement of the spring 52 with the pin 53.

5 The locking pin 50 prevents movement of the turret to displace the spindles while the driving spindle is being engaged with the spindle or disengaged therefrom. The threads or wires are next disconnected from
10 the coils which have been wound and connected to the new form upon the spindle now in driving position, whereupon the lever 54 may be operated to start the machine.

While a new set of coils is being wound
15 the operator will remove the previously wound coils and place a new form upon the free spindle. When the machine again stops at the completion of a new set of coils the operator will rotate the handle 43 in the
20 same direction until the end of the trackway 45 engages the collar 48. This operates the shaft 35 to carry the chuck 12 out of engagement with the active winding spindle. The shaft 28 may then be shifted endwise
25 to clutch the member 29 with the pinion 23, during which clutching movement the ejector pins 51 will enter the apertures 49 and push the locking pin 50 out of locking engagement with the pinion. The handle 43 is
30 then operated to carry a new spindle into winding position as before explained.

It will be obvious that various changes in the details and arrangements of parts herein described and illustrated for the purpose
35 of explaining the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

I claim:

40 1. In a winding machine, a turret, a driving clutch, a plurality of winding spindles carried thereby for movement, when the turret is rotated, successively into positions for driving engagement with said
45 clutch, means including a control shaft for effecting or breaking driving engagement between the clutch and spindles, a bearing, an auxiliary shaft rotatably mounted in said bearing and connected to said control
50 shaft for operation concomitantly therewith, a gear rotatably mounted on said auxiliary shaft and having driving engagement with said turret, said gear having a plurality of apertures from face to face arranged
55 in a row concentrically of the axis, a clutch collar on the auxiliary shaft adapted when the latter is moved to carry the collar toward the gear to have clutching engagement therewith, said collar having pins adapted
60 to enter the apertures when the collar and gear are clutched and to leave the apertures when the collar and gear are clutched, a second collar on said auxiliary shaft, a locking pin slidable endwise in said bearing and
65 disposed parallel with said auxiliary shaft

between the gear and second collar, said pin being disposed at a distance from the axis of the auxiliary shaft corresponding to that of said row of apertures in the gear, whereby when the auxiliary shaft is shifted in a
70 direction to unclutch it from the gear the second collar will push the locking pin into one of the apertures in the gear and lock the gear and turret against rotation, and when shifted in a direction to clutch it to
75 the gear, the pins on the first collar will enter the apertures and eject the locking pin to release the gear and turret for rotation.

2. In a winding machine, a bearing, a gear having a hub extending into and rotatable in said bearing, means for preventing
80 endwise displacement of said gear, an operating shaft passing through and slidable and rotatable in said gear and bearing, a
85 clutch collar fixed to the shaft so as to be moved toward and from a face of said gear when the shaft is shifted endwise, said gear having an aperture from face to face, a locking pin slidable in said bearing into and out
90 of the aperture of the gear, a collar on said shaft for engaging with the locking pin and pushing it into the aperture of the gear to lock the latter against rotation when the shaft is shifted endwise in one direction, a
95 pin carried by the clutch collar for movement into said aperture of the gear to eject the locking pin therefrom and release the gear for rotation, when the shaft is shifted
100 endwise in the opposite direction, the engagement of the ejecting pin and gear aperture serving to couple the shaft and gear for concomitant rotation, a turret geared to said gear and carrying a plurality of winding
105 spindles which are movable successively into winding position during the rotation of the turret, and means operated concomitantly with said shaft for making and breaking driving connections to said spindles successively.

3. In a winding machine, a turret, a plurality of winding spindles carried by the turret for movement successively into winding positions as the turret rotates, a gear
110 driving said turret, a rotatable and endwise slidable shaft adapted to be clutched to and unclutched from said gear by its slidable movement, means operated by said shaft in its endwise movements for locking the gear against rotation when the shaft is unclutched therefrom and unlocking it for rotation when clutched thereto, and means operated by the shaft when rotated for making and breaking driving connections to said
115 spindles successively.

4. In a winding machine, a turret, a plurality of winding spindles carried by the turret for movement successively into winding positions as the turret rotates, a gear
120 driving said turret, a rotatable and endwise
125
130

slidable shaft adapted to be clutched to and unclutched from said gear by its slidable movement, means operated by said shaft in its endwise movements for locking the gear against rotation when the shaft is unclutched therefrom and unlocking it for rotation when clutched thereto, a second shaft geared to the first shaft, means operated by the second shaft when rotated for making and breaking driving connections to said spindles successively, and automatic means for preventing endwise movement of the first shaft when none of the winding spindles are in winding position.

5. In a winding machine, a turret, a plurality of winding spindles carried by the turret for movement successively into winding positions as the turret rotates, a gear driving said turret, a rotatable and endwise slidable shaft adapted to be clutched to and unclutched from said gear by its slidable movement, means operated by said shaft in its endwise movements for directly locking the gear against rotation when the shaft is unclutched therefrom and unlocking it for rotation when clutched thereto, a second shaft geared to the first shaft, and means operated by the second shaft when rotated for making and breaking driving connections to said spindles successively.

6. In a winding machine, a turret, a plurality of winding spindles carried by the turret for movement successively into winding positions as the turret rotates, a gear driving said turret, a rotatable and endwise slidable shaft adapted to be clutched to and unclutched from said gear by its slidable movement, a locking pin operated by said shaft in its endwise movements for engaging with and locking the gears against rotation when the shaft and gear are unclutched and for releasing the gear when the shaft and gear are clutched together, and means operated by the shaft when rotated for making and breaking driving connections to said spindles successively.

7. In a winding machine, a turret, a plurality of winding spindles carried by the turret for movement successively into winding positions as the turret rotates, a gear driving said turret, a rotatable shaft endwise slidable co-axially with said gear and having fixed thereon a clutch for move-

ment endwise therewith into and out of clutching engagement with said gear, whereby the shaft during its rotation may drive the turret through said gear after being clutched to the latter by endwise movement, and a locking device for directly holding the gear against rotation and operated into ineffective position to release the gear, by the shaft during its endwise movement into clutching relation with said gear.

8. In a winding machine, a turret, a plurality of winding spindles carried by the turret for movement successively into winding positions as the turret rotates, a gear driving said turret, a rotatable shaft endwise slidable co-axially with said gear and having fixed thereon a clutch for movement endwise therewith into and out of clutching engagement with said gear, whereby the shaft during its rotation may drive the turret through said gear after being clutched to the latter by endwise movement, and a relatively stationary locking pin slidable directly into and out of locking engagement with said gear to lock the gear against rotation or release it depending upon the position of the pin, said pin being operated endwise by the said shaft during the latter's endwise movement into and out of clutching relation with said gear.

9. In a winding machine, a turret, a plurality of winding spindles carried by the turret for movement successively into winding positions as the turret rotates, a gear driving said turret, a rotatable shaft endwise slidable co-axially with said gear and having fixed thereon a clutch for movement endwise therewith into and out of clutching engagement with said gear, whereby the shaft during its rotation may drive the turret through said gear after being clutched to the latter by endwise movement, means for preventing operation of said gear and turret and operable into and out of effective movement-preventing condition by the endwise movement of said shaft, whereby the turret will be held against rotation when the shaft is unclutched therefrom.

In witness whereof, I hereunto subscribe my signature.

MARY V. SCOTT,
Executrix of Archibald D. Scott, deceased.