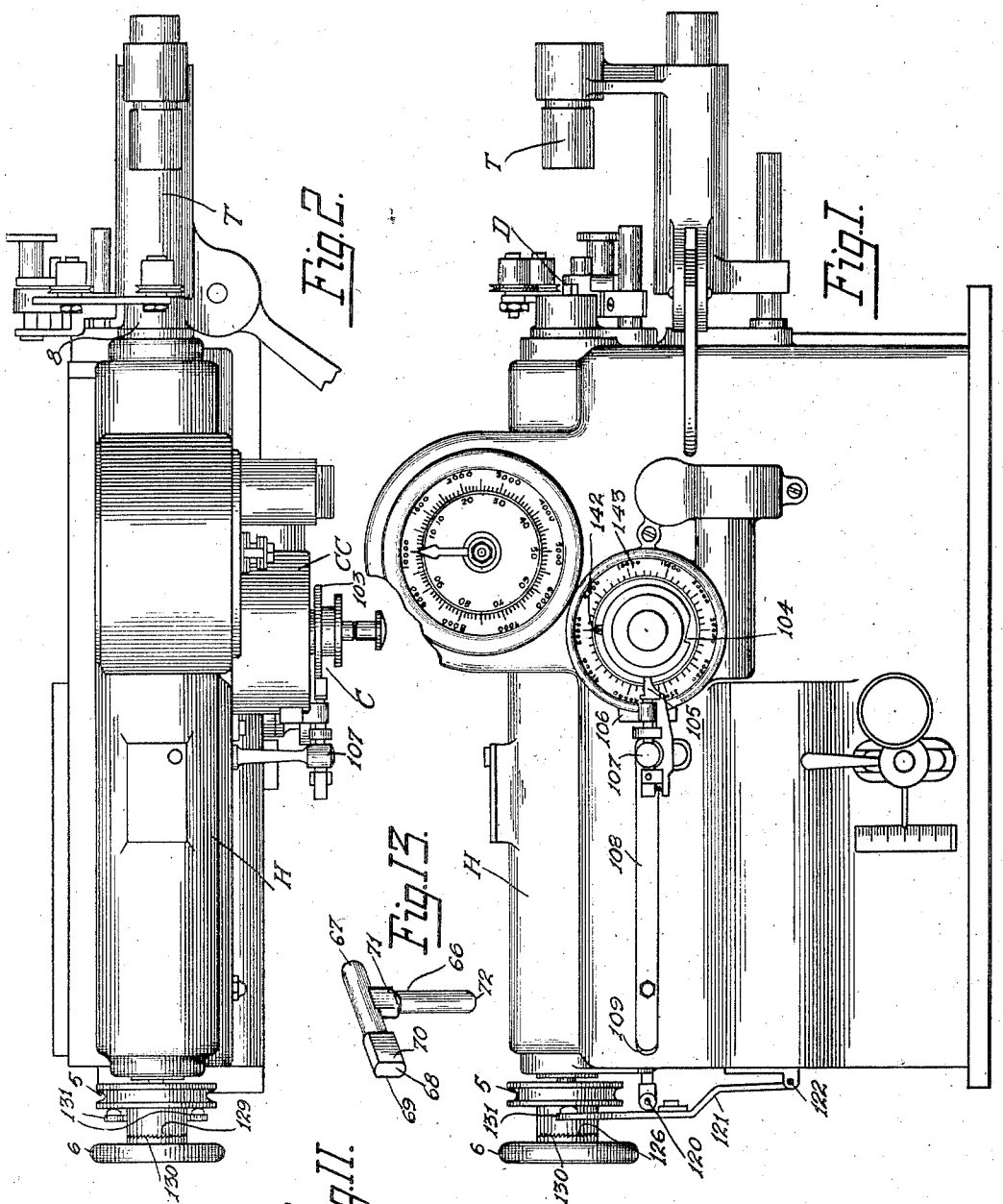
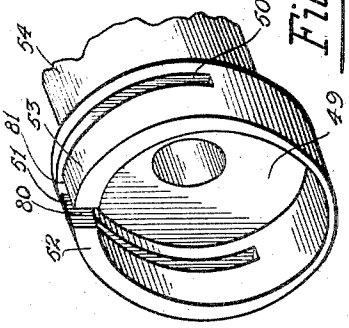
Jan. 22, 1929. **1,699,841**

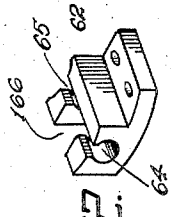
M. B. GROUT

WINDING MACHINE

Filed Nov. 6, 1926 3 Sheets-Sheet 1







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M. B. GROUT

WINDING MACHINE

Filed Nov. 6, 1926 3 Sheets-Sheet 2

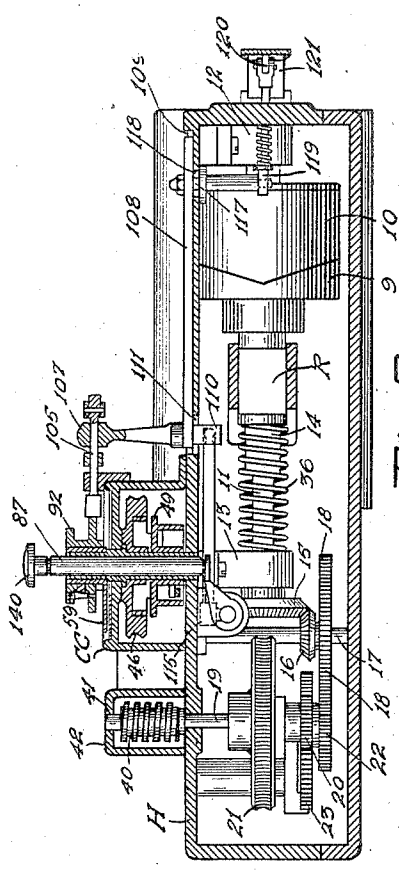


Fig. 5.

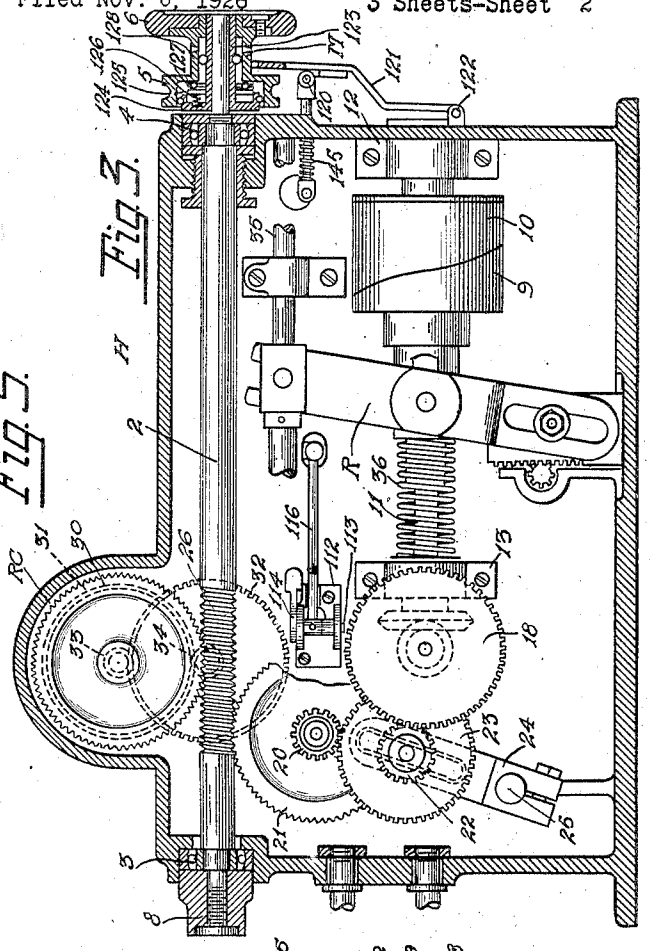


Fig. 3.

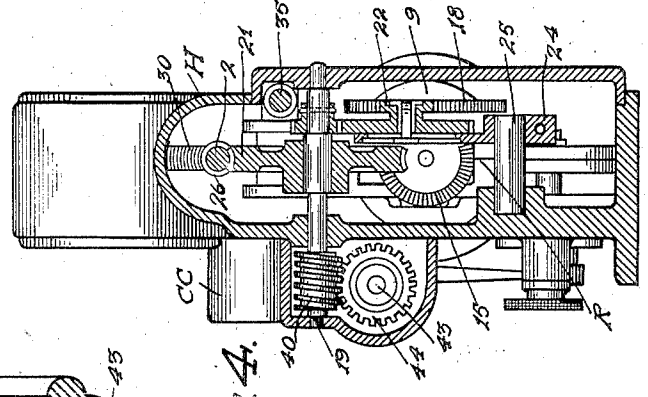


Fig. 4.

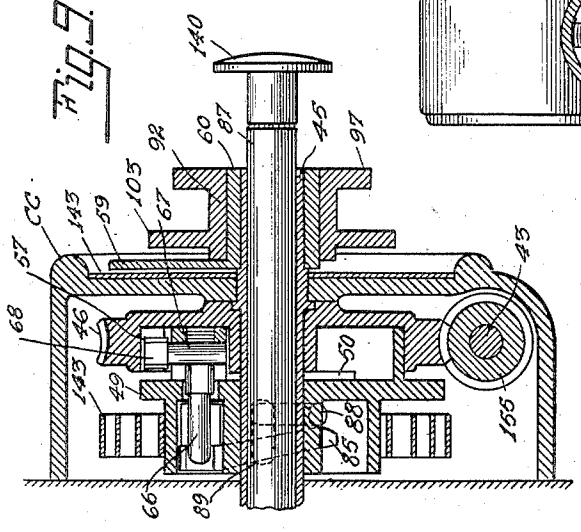


Fig. 9.

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M. B. GROUT

WINDING MACHINE

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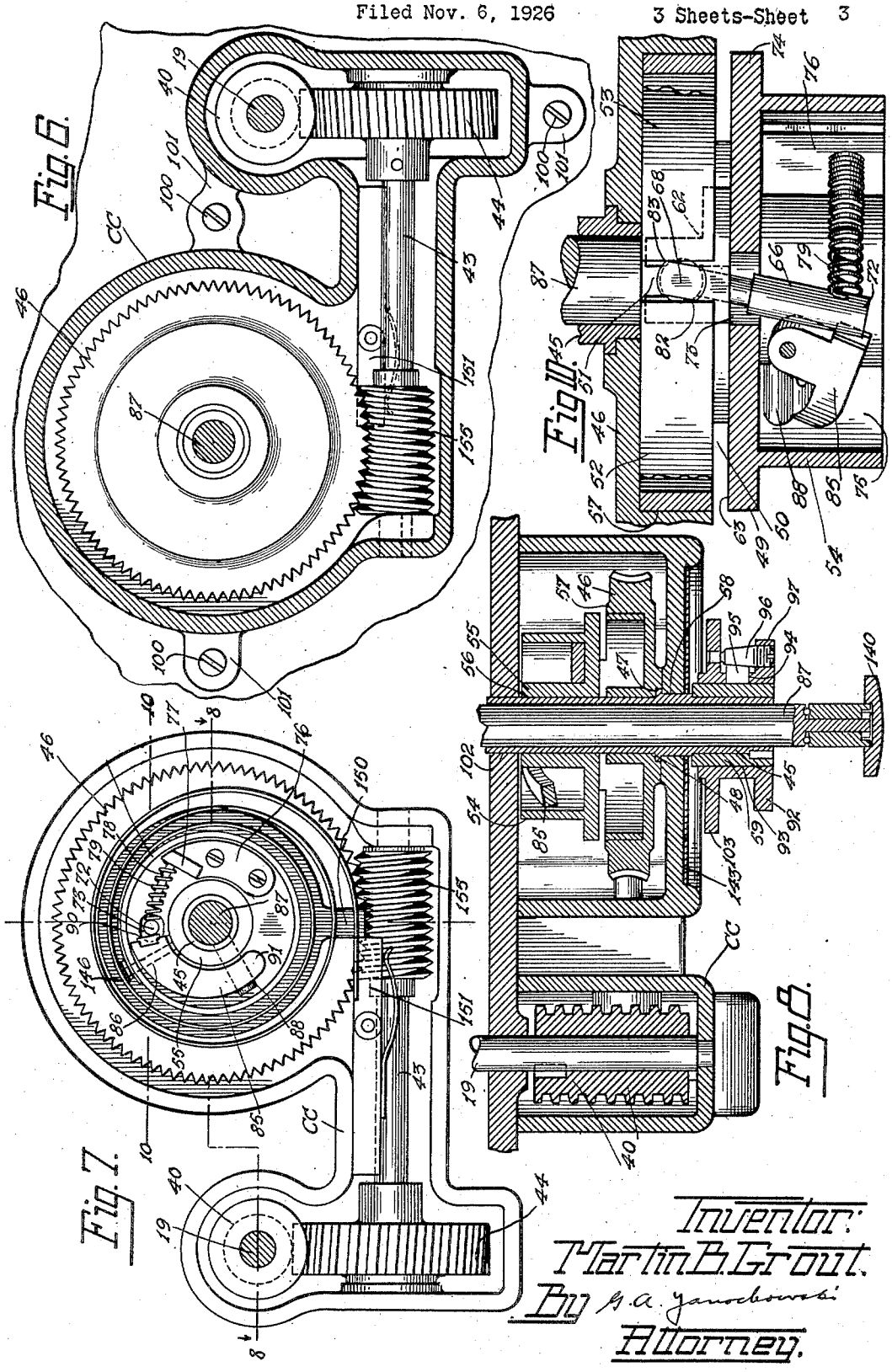


Fig. 6.

Fig. 7.

Fig. 8.

Fig. 10.

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UNITED STATES PATENT OFFICE.

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WINDING MACHINE.

Application filed November 6, 1926. Serial No. 146,684.

My invention relates to winding machines which are used for winding a material, such as a strand of wire, into electromagnet coils or the like and has to do more particularly with a coil winding machine such as is used in the winding of conducting material upon a suitable spool to serve as a winding for an electromagnet. A winding machine of the above type is provided with a distributing arm secured to a reciprocating shaft which distributes the wire from a source of supply from left to right and vice-versa and which movement is controlled by suitable mechanism and in association with suitable counting mechanism visible to the operator of the machine to indicate when the required number of convolutions have been placed upon the spool.

Electromagnets or the like are wound to a predetermined ohmic resistance and it is therefore essential that the proper number of turns or convolutions are placed upon the core or spool upon which the strand of wire is to be wound. It is thus readily apparent that the winding spindle of the winding machine must be stopped the instant that the required number of convolutions have been placed on the spool of the electromagnet. Indicators or counters are associated with the winding machines to indicate to the operator when a predetermined number of turns have been placed upon the spool of the electromagnet so that the winding machine may be stopped at the proper instant. It is readily apparent that owing to carelessness on the part of the operator the winding machine may be stopped before the required number of turns are placed upon the spool of the electromagnet or more than the required number can be placed upon the spool of the electromagnet before the winding machine is stopped.

To overcome the deficiency of winding machines of the present type in which a revolution counter is associated therewith I have devised a counter mechanism or device to be associated with a winding machine of the above type which is associated with the winding spindle of the machine. The counter mechanism of my invention may be set for any predetermined number of convolutions or turns which the winding spindle is to make to place a predetermined number of convolutions of material or wire upon the spool of an electromagnet supported by the winding spindle. The instant that the number of convolutions of wire have been placed upon the spool of the electromagnet to which the counter mechanism has been set, the counter mechanism functions to trip mechanism which stops further rotation of the winding spindle.

Another feature of my invention is the provision of a locking mechanism in association with the counter mechanism which is adapted to lock the counter mechanism after the same has been set for a predetermined number of revolutions of the winding spindle in its set position so that when the counter mechanism is tripped after a predetermined number of revolutions of the spindle shaft setting means are provided for resetting the counter mechanism to again place the winding spindle in operative association with the counter mechanism to again allow the spindle shaft to rotate a predetermined number of revolutions according to the setting of the counter mechanism.

Another feature of my invention is the provision of means associated with the counting mechanism which is actuated the instant that the counting mechanism has tripped after a predetermined number of convolutions have been placed on the winding spool to actuate clutch mechanism associated with the winding spindle to disengage the same from the driving means to prevent further rotation of the winding spindle.

Still another feature of my invention is the provision of a gripping means which normally grips the driving means of the counting mechanism to transmit movement to the counting mechanism to actuate the same and the means provided for operating the gripping means to disassociate the counting mechanism from the driving means to permit the same to be set for any number of convolutions.

The above features as well as others will be more fully hereinafter described in the ensuing specification and appended claims.

For a more complete understanding of my invention reference may be had to the accompanying drawings in which like references in the several views denote like parts and in which:

Fig. 1 is a front elevation of a winding ma-

chine illustrating the counting mechanism of my invention operatively associated therewith;

Fig. 2 is a plan view of Fig. 1;

Fig. 3 is a rear view of Fig. 1 with the cover plate removed and parts in section to more clearly illustrate the counter mechanism in association with the mechanism of the winding machine;

Fig. 4 is a left side elevation of Fig. 1 with parts broken away to clearly illustrate the driving mechanism for the counting mechanism;

Fig. 5 is a sectional view of the winding machine and counter mechanism looking down into the interior of the enclosing casings to illustrate another view of the mechanism;

Fig. 6 is a full sized view of the counter mechanism with its enclosing casing in section;

Fig. 7 is a rear view of Fig. 6;

Fig. 8 is a sectional view along the line 8—8 of Fig. 7 looking in the direction of the arrows;

Fig. 9 is a sectional view along the line 9—9 of Fig. 7;

Fig. 10 is a sectional view along the line 10—10 of Fig. 6;

Fig. 11 is a perspective view of the gripping device which is associated with the driving means of the counting mechanism;

Fig. 12 is a perspective view of the block for pivotally supporting a lever; and

Fig. 13 is a perspective view of the lever for actuating the gripping device.

Referring now more in detail to my invention as illustrated in the accompanying drawings, the winding machine with which I associate the counting mechanism of my invention is of an approved type and comprises a suitable enclosing casing or housing H which encloses the mechanism of the winding machine. The counting mechanism C of my invention with which the winding machine is associated is also enclosed by a suitable casing or cover cap CC.

A spindle shaft 2 extends through suitable orifices in the respective ends of the housing H and counterbores in the said ends receive ball bearings 3 and 4 which rotatably support the spindle shaft 2. A pulley wheel 5 is slidably and loosely supported on one end of the spindle shaft 2 and is connected to a power shaft through the agency of a suitable belt to drive the same. A hand wheel 6 for manually rotating the spindle shaft 2 is suitably secured thereto and a clutch mechanism M associated with the pulley wheel 5 maintains the same normally in engagement with the hand wheel 6 which is secured to the spindle shaft 2 to rotate the same and the function of the clutch mechanism M and its operation in association with the counting mechanism C will be more fully hereinafter described.

The spool head support 8 secured to one end of the spindle shaft 2 and which forms one of the supports for the electromagnet spool to be wound is associated with a tail stock T slidably supported on a rod suitably secured to the housing H and for a more complete understanding of the operation of the tail stock T for supporting a spool reference may be had to a copending application of mine filed July 17, 1925 and bearing Serial No. 44,160.

Cam members 9 and 10 are provided which cooperate to bring about the to and fro movement of a rocker arm R. The cam member 10 is suitably secured to a shaft 11 which is rotatably supported by a pair of bearings 12 and 13 secured to the housing H by suitable screws. The rocker arm R is pivotally secured to a sleeve member 14 slidably supported on the shaft 11 and the cam member 9 which is associated with the cam member 10 is secured to the sleeve 14 and the function of the cam members 9 and 10 in association with the sleeve 14 and its pivotally supported rocker arm R will be more fully hereinafter described. The end of the shaft 11 which extends through the bearing 13 has secured to it a bevel gear 15 which meshes with a bevel gear 16 secured to a transverse shaft 17 which is rotatably supported in suitable bearings in the front wall of the housing H and the removable rear cover. A gear wheel 18 is also secured to the transverse shaft 17 for purposes as will presently be described. Another transverse shaft 19 rotatably supported in bearings in the housing H and rear cover has secured to it a pinion 20 and a worm gear 21. A compound gear which comprises a pinion 22 and a gear 23 meshes respectively with the gear 18 and pinion 20 and is adjustably and rotatably supported on an arm 24 which is adjustably secured to a stud 25 suitably secured to the housing H in any suitable manner.

The spindle shaft 2 has a worm portion 26 cut thereon and meshes with the worm gear 21 secured to the transverse shaft 19. Now as the spindle shaft 2 rotates the worm 26 which meshes with the worm gear 21, causes rotation of the worm gear 21 and through the agency of the pinion 20 on the transverse shaft 19 and the gear wheel 23 which meshes with the pinion 20, the pinion 22 which meshes with the gear wheel 18 and the bevel gear 16 on the transverse shaft 17, and the bevel gear 15 on the shaft 11 rotary motion is transmitted to the shaft 11, and the cam member 10 secured thereto also rotates. The winding machine as illustrated is also provided with a revolution counter RC and forms an integral part of the winding machine and through a suitable train of gearing including the worm gear 30 which meshes with the worm 26 on the spindle shaft 2 and gears 31 and 32 and pinions 33 and 34 motion is transmitted to the revolution counter

RC and for a more complete understanding of the revolution counter RC reference may be had to the copending application of mine previously mentioned.

The rocker arm R which is pivotally supported upon the member 14 which is slidably supported upon the shaft 11 is associated with adjustable means at its one end to control the length of the stroke of the reciprocating shaft 35 upon which the distributing arm D is secured, and as the reciprocating shaft 35 is secured to the rocker arm R, thus through the medium of this adjustable means various lengths of coils may be wound. The cam members 9 and 10 as before described are secured respectively to the shaft 11 and the sliding sleeve member 14 and as the profile or lead of the cam faces of the cams 9 and 10 are the same they mesh or match when the distributing bar or reciprocating shaft 35 is in its extreme left position as illustrated in Figs. 3 and 4. The cam member 9 secured to the sliding sleeve 14 on the shaft 11 is held in engagement with the cam 10 by means of a helical spring 36 around the shaft 11. Now as the shaft 11 is rotated through the agency of the train of gearing as before described the cam 10 secured thereto also rotates and the lead angle of this rotating cam 10 engages the lead angle of the cam 9 supported on the sliding sleeve 14 and forces the sleeve 14 and its supported cam 9 and rocker arm R to the left with reference to Fig. 3 against the normal compression of the spring 36 causing the rocker arm R to rock about its respective pivotal point to move the reciprocating shaft 35 to the left with reference to Fig. 3. When the sleeve 14 and its supported parts have reached their limit of travel in that direction and start their travel in the opposite direction, the sleeve 14, and its supported parts are moved in the opposite direction under the influence of the compressed spring 36 with the lead angle of the cam 9 following the lead angle of the rotating cam 10 on the shaft 11 and the rocker arm R rocking about its pivotal point moves the reciprocating shaft 35 in the opposite direction. The revolution counter RC is also operated through the agency of the train of gearing associated therewith as before described to operate the revolution counter and indicate to the operator the number of convolutions that are being placed upon the electromagnet spool supported between the spool support 8 on the spindle shaft 2 and the tail stock T. While I have described in a general way the essential parts of the winding machine as illustrated and their functions, for a clearer and more detailed description of the apparatus and the operation of the winding machine reference may be had to the copending application previously referred to.

The transverse shaft 19 which supports the worm gear 21 and pinion 20 extends through the front face of the housing H and this protruding end has secured thereto a worm 40. The end of the shaft 19 which supports the worm 40 extends into an orifice 41 in the front wall 42 of the enclosing casing CC and serves as an additional bearing for the shaft 19. A shaft 43 extending at right angles to the shaft 19 is supported in orifices in the respective ends of the casing CC which serve as bearings for rotatably supporting the said shaft 43. The shaft 43 has a worm gear 44 secured thereto which meshes with the worm 40 on the shaft 19 and through the agency of the worm 40 and the worm gear 44 motion is transmitted to the shaft 43 to operate the counter mechanism as will presently be described.

The counting mechanism C comprises a sleeve member 45 which is adapted to loosely support a worm gear 46 which is provided with a counter bore 47 which receives an annular shoulder 48 integrally formed with the sleeve 45 to position the same on the sleeve member 45. A cup shaped gripping member 49 is provided with a peripheral slot 50 extending through the wall of the member 49 and another slot 51 at right angles to the peripheral slot 50 is cut in the wall of the member 49 to intersect the peripheral slot 50 and this slot 51 in association with the peripheral slot 50 forms a pair of expandable wings 52 and 53 for purposes as will presently be described.

The member 49 is provided with an integrally formed rearwardly extending collar 54 and an integrally formed rearwardly extending sleeve 55 which is provided with an orifice 56 of a size to permit this member 49 to fit around the sleeve 45. The worm gear 46 on the sleeve 45 is provided with a counter bore 57 of a size to receive the split or gripping portion of the member 49 and the depth of the counterbore 57 in the worm gear 46 is substantially the same as the width of the split or gripping portion formed by the wings 52 and 53 which may rest wholly within the counterbore 57 for purposes as will presently be described. The cup shaped gripping member 49 is fixed to the sleeve 45 in any suitable manner so that the same moves with the sleeve 45 when the same is rotated as will be more fully hereinafter described.

The casing CC which houses the counting mechanism is provided with a cup shaped portion and a central orifice 58 in this cup shaped portion is of a size to receive the enlarged intermediate portion of the sleeve 45 which when thus positioned in the said orifice 58 causes the annular shoulder 48 on the sleeve 45 to engage the inner face of the cup portion of the casing CC. An indicator arm 59 provided with an integrally formed sleeve extension 60 on the sleeve 45 is pinned to the sleeve 45 by means of a pin 61 as clearly illustrated in Fig. 8, and the indicator arm 59 and member

49 when secured to the sleeve 45 which is supported in the orifice 58 in the casing 60 rotatably secures the same in the bearing 58 against longitudinal movement.

A block 62 which is secured to the rear face 63 of the member 49 by means of suitable screws is provided with a circular orifice 64 and a slot 65 which is connected with the orifice 64. Another slot 166 cut at right angles to the slot 65 and orifice 64 and intersecting them provides means for permitting the insertion of the actuating lever 66 so the same may be pivotally suspended in the orifice 64. The lever 66 is provided with a cylindrical portion 67 integrally formed therewith and disposed at right angles to the lever 66. One end of this cylindrical portion 66 is shaped to form an operating or actuating head 68 which is provided with flat faces 69 and 70 for purposes as will presently be described. The lever 66 is provided with a flattened portion 71 which registers with the slot 65 in the top face of the block 62 to allow the cylindrical portion 67 integrally formed with the lever 66 to enter the circular orifice 64 lying below the slot 65.

The cylindrical portion 67 when inserted in the orifice 64 places the lever 66 in a position opposite the slot 166 which is at right angles to the slot 65 and orifice 64 which permits the lever 66 to be now dropped down through the slot 166. Then lever 66 when moved into this position is pivotally suspended in the block 62 and the block 62 and its pivotally supported lever 66 is now secured to the bottom face 63 of the cup member 49 with the protruding end 72 of the lever 66 extending through a suitable orifice 73 in the bottom 74 of the member 49 into the annular recess 75 formed by the collar 54 and sleeve 55 integrally formed with the member 49, and with the actuating head 69 of the cylindrical portion 67 of the lever 66 resting in the slot 51 in the member 49 for purposes as will now be described.

A bracket 76 secured in the annular recess 75 of the cup member 49 has secured to its projecting arm 77 a pin 78 which supports a helical spring 79 one end of which engages the arm 77 of the bracket 76, the other end of which engages the end 72 of the protruding lever 66 and the spring 79 thus forces the end 72 of the pivoted lever 66 to the left as clearly illustrated in Fig. 10. The cylindrical portion 67 of the lever 66 rotates in the orifice 64 in the block 62 due to this movement of the lever 66 and places the faces 69 and 70 of the actuating head 68 in an angular position relative to the faces 80 and 81 of the slot 51 in the member 49. The internal diameter of the member 49 is eccentrically disposed relative to its outside diameter so that the cross section of the wall of the member 49 at the slot 51 is thicker than the cross-section of the wall diametrically opposite the slot 51. The wall of the member 49 adjacent to the ends of the peripheral slot 50 are comparatively thin due to the eccentric relation of the internal and outside diameter of the member 49 to give the wings 52 and 53 which are formed by the slots 50 and 51 a spring effect so that the free ends of the wings 52 and 53 may be expanded by suitable means for purposes as will presently be described.

The faces 69 and 70 of the acutating head 68 of the lever 66 being angularly disposed relative to the faces 80 and 81 of the slot 51 in the cup shaped member as before described, the diametrically opposite edges 82 and 83 of the actuating head 68 engage the respective faces 80 and 81 of the slot 51 and spring or spread the wings 52 and 53 of the split portion of the member 49. As this split portion of the member 49 lies wholly within the counterbore 57 of the worm gear 46 the expansion of the wings 52 and 53 of the split portion of the member 49 causes the circumferential faces of the wings 52 and 53 to firmly grip the circumferential face of the counterbore 57 of the worm gear 46 for purposes as will presently be described. A lever 85 is pivotally secured in the annular recess 75 of the member 49 by means of a pivot pin 86 and is operatively associated with the end 72 of the lever 66. A trigger rod 87 extends through the sleeve 45 and a pin 88 secured to the trigger rod 87 extends through a longitudinal slot 89 in the sleeve 45 into the annular recess 75 and lies beneath the free end of the lever 85. The spring 79 around the pin 78 secured to the bracket 76 maintains the end 72 of the lever 66 in engagement with the face 90 of the lever 85 and the tension of the spring 79 against the end 72 of the lever 66 is such as to maintain the free end 91 of the pivoted lever 85 in engagement with the pin 88 secured to the trigger rod 87 to maintain the same in its out or normal position for purposes as will presently be described. A setting member 92 provided with a central orifice 93 is of a size to permit the same to fit on the sleeve extension 60 of the indicator 59. The setting member 92 is provided with an orifice 94 which is adapted to receive a pin 95 which rests therein, one end of the pin 95 resting against the face of the sleeve extension 60 of the indicator 59 the other end of which is provided with an angular face which is adapted to be engaged by the tapered body of a set screw 96 which has threaded engagement with a tapped orifice in the finger grip 97 of the setting member 92. When the screw 96 is turned down the tapered body portion of the same engages the angular face which extends from the orifice 94 to force the opposite end of the pin 95 down against the face of the sleeve extension 60 of the indicator 59 which is secured to the sleeve 45 to lock the said setting member 92 to the indicator 59 for purposes as will presently be described. The mechanism of the counting de-

vice as just described is contained within the casing CC as just described and when assembled forms a self contained counting mechanism which may be associated with a winding machine as illustrated, by securing the casing CC and the enclosed counting mechanism to the housing H by means of screws 100 which pass through suitable orifices in the ears 101 integral with the casing CC and have screw threaded engagement with suitable tapped orifices in the housing H. The sleeve 45 of the counting mechanism extends through a suitable orifice 102 in the housing H and this orifice 102 and the orifice 58 in the casing CC serve as bearings for the sleeve 45. The trigger rod 87 which lies in the sleeve 45 protrudes beyond the end of the sleeve 45 and is associated with suitable clutch mechanism as will now be described.

The setting member 92 is provided with an integrally formed flange 103 provided with a notch 104 which cooperates with a trigger 105 slidably supported in a bearing 106 secured to the casing CC. The trigger 105 is secured to a post 107 which is in turn secured to a slidable bar 108 resting in a horizontal groove 109 cut in the front face of the housing H and a rearwardly extending stud 110 secured to the bar 108 at its one end extends through an elongated slot 111 in the housing H into the interior of said housing. A bracket 112 secured to the inner face of the housing H rotatably supports a pin 113 having secured thereto an arm 114 which is operatively associated with the protruding end of the trigger rod 87 supported in the sleeve 45. A second arm 115 secured to the pin 113 supported by the bracket 112 is connected with the stud 110 secured to the slidable bar 108 by means of the link connection 116 for purposes as will presently be described. The other end of the sliding bar 108 has secured thereto a stud 117 which extends through a slot 118 in the housing H and this stud 117 is in turn secured to a link 119 which extends through a suitable orifice in the end wall of the housing H. The other end of the link 119 is pivotally secured by a hinge connection 120 to a clutch actuating arm 121 which arm 121 is in turn secured to the housing H by means of the hinge connection 122, and this clutch arm 121 is operatively associated with the pulley wheel 5. A sleeve 123 secured to the spindle shaft 2 is provided with an integrally formed flange 124 which rests in the counter bore 125 of the pulley wheel 5. A plurality of helical springs 126 rests between the flange 124 of the sleeve and a thrust bearing 127 loosely supported on the sleeve 123 and contained within the counter bore 125 of the pulley wheel 5. The pulley wheel 5 is provided with a sleeve extension 128, the end of which is provided with ratchet teeth 129 and the hand wheel 6 associated with the pulley wheel 5 is provided with a sleeve extension which is also provided with ratchet teeth 130. The tension of the springs 126 supported between the flange 124 and thrust bearing 127 in such as to force the pulley wheel 5 to the right with reference to Fig. 3 to normally maintain the teeth 129 on the sleeve extension 128 of the pulley wheel 5 in engagement with the teeth 130 on the sleeve extension of the hand wheel 6 to form a ratchet clutch to transmit movement to the spindle shaft 2 as will be more fully hereinafter described. The free end of the clutch arm 121 is bifurcated and the respective arms 131 of the bifurcated end engage the face of the pulley wheel 5 for purposes as will presently be described.

Having described in detail the apparatus of the counting mechanism of my invention and the clutch mechanism associated therewith. I will now describe in detail the method employed for setting the counting mechanism so that a predetermined number of turns of material will be placed upon the spool to be wound and the tripping mechanism which automatically operates the clutch mechanism to bring about the disengagement of the driven pulley wheel 5 from the winding spindle 2 the instant that the number of turns have been placed upon the electromagnet spool at which my counting mechanism has been set.

Assuming for the purpose of illustration that 10,000 turns of material are to be placed upon an electromagnet spool supported between the spindle support 8 and the tail stock T. To set the counting mechanism of my invention for that number of turns the operator of the winding machine with which the counting mechanism is associated engages the thumb piece 140 which is rotatably secured to the trigger rod 87 and forces the trigger rod 87 in, by suitable pressure which is applied on the thumb piece 140. The pin 88 secured to the trigger rod 87 lies beneath the free end 91 of the pivoted lever 85 and as the trigger rod 87 moves in, the pin 88 engages free end 91 of the lever 85 and forces the free end 91 up with reference to Fig. 7. The lever 66 is held in engagement with the face 90 of the lever 85 under the tension of the spring 79 and as the lever 85 is tilted by the pin 88 moving in, the face 90 of the lever 85 also changes its angular position, forcing the lever 66 to the right with reference to Fig. 10 against the normal tension of the spring 79. As the lever 66 is pivotally supported in the block 62 as before described this movement of the lever 66 causes the portion 67 of the lever 66 to rotate in the orifice 64 and the actuating head is also rotated to change the angular position of the faces 69 and 70 of the actuating head 68 relative to the faces 80 and 81 in the slot 51. This movement of the actuating head 68 thus places the faces 69 and 70 parallel with the faces 80 and

81 of the slot 51 in the split portion of the member 49. As before described the wings 52 and 53 of the split portion were expanded due to the angular position of the actuating head 68 relative to the faces 80 and 81 of the slot and as the faces 69 and 70 of the actuating head 68 assume a position parallel with the faces 80 and 81 in the slot 51 the wings 52 and 53 move from their expanded to a collapsed position under the influence of the tension under which they were placed when expanded. With the pressure still maintained on the trigger rod 87, the operator now grasps the hand grip 97 of the member 92 and rotates the member 92 in a clock-wise direction relative to Fig. 1. The wings 52 and 53 of the split portion of the member 49 having moved from their expanded positions have released their grip from the inner circumferential face of the counter bore 57, of the worm gear. The member 49 and indicator arm 59 are secured to the sleeve 45 and as the member 92 is made fast to the sleeve extension 60 of the indicator 59 by the pin 95 and set screw 96, any movement of the member 92 will also cause movement of the member 49 and indicator 59. The wings 52 and 53 of the member 49 having released their grip from the inner circumferential face of the counter bore 57 of the worm gear 46, the member 92 may now be rotated in a clock-wise direction until the pointer 142 on the indicator arm 59 registers with the 10,000 mark on the dial 143 secured to the face of the cup shaped portion of the casing CC. When the indicator arm is set at the 10,000 mark, pressure is released from the trigger rod 87 and the spring 79 which was compressed due to the movement of the lever 66 to the right again forces the lever 66 to the left causing the portion 67 to rotate about its pivotal support in the block 62 to again place the faces 69 and 70 of the actuating head 68 in angular position relative to the faces 80 and 81 of the slot 51 to expand the wings 52 and 53 to again cause them to grip the inner circumferential face of the counter bore 57 of the worm gear 46 to maintain the member 49 and indicator 59 in their advanced position with the pointer 142 of the indicator arm 59 registering with the 10,000 mark on the dial 143. The set screw 96 which locks the member 92 to the sleeve 60 of the indicator arm 59 is now loosened to relieve the pressure from the pin 95 and the member 92 may now be turned about the sleeve 60 of the indicator arm 59 to place the notch 104 in the peripheral edge of the flange 103 of the member 92 in a position to permit the nose of the trigger 105 to enter the notch 104. With the notch 104 in the flange 103 in this position relative to the trigger 105 the screw 96 is again tightened to force the pin 95 down into engagement with the sleeve extension 60 of the indicator arm 59 to again lock the member 92 to the indicator 59. The indicator arm 59 having been set with relation to the 10,000 mark on the dial 143 and the notch 104 in the flange 103 having been set with relation to the trigger 105 the indicator arm 59 and member 49 may now be restored to starting position as now will be described. The trigger rod 87 is again forced in, in a manner as before described to allow the faces 69 and 70 of the actuating head 68 to position themselves parallel with the faces 80 and 81 of the slot 51 to permit the wings 52 and 53 to move from their expanded position thus releasing the gripping effect caused by the expansion of the wing 52 and 53 as already described. The trigger rod 87 moving in, under pressure as just described engages the arm 114 pivoted in the bracket 112 and rotates the same, and as the arm 115 is also secured to the pin 113 to which the arm 114 is secured, the said arm 115 moves to the right relative to Fig. 5. The link connection 116 between this arm 115 and the stud 110 secured to the sliding bar 108 forces this bar 108 to the right relative to Fig. 5 and causes the link 119 which connects the clutch arm 121 with the bar 108, to move this clutch arm 121 to the right against the tension of a spring 145 supported on the link 119. This movement of the clutch arm 121 to the right permits the springs 126 to act upon the pulley wheel 5 moving the teeth 129 in the end of the sleeve extension 128 of the pulley wheel 5 into engagement with the teeth 130 in the end of the sleeve extension of the hand wheel 6 secured to the spindle shaft 2. This movement of the bar 108 to the right also moves the trigger 105 secured to the post 107 to the right removing the nose of the trigger 105 from the notch 104 in the flange 103 of the member 92. A spiral spring 146 having one end secured to the collar extension 54 of the member 49 and its other end secured to the casing CC is placed under additional tension when the cup shaped member was rotated as before described. The member 49 is free to move due to the wings 52 and 53 having restored from their expanded position as already described and the member 49 and the sleeve 45 to which it is secured are now restored to their normal position under the tension of the spring 146, and as the indicator arm 59 is also secured to the sleeve 45 and the member 92 is in turn locked to the sleeve extension 60 of the indicator arm 59, they also assume their normal positions with the pointer 143 of the indicator arm 59 pointing to zero.

When the indicator arm 59 restores to normal or zero position as just described the notch 104 in the member 92 moves away from the nose of the trigger 105 a distance equal to the distance that the indicator 59 will travel from zero to 10,000 which I have assumed is the number to which the counting mechanism has been set, for purposes as will presently

be described. The member 49 has a depending ear 150 integrally formed therewith which engages a stop 151 secured to the casing CC when the member 49 is restored to normal under the tension of the spring 146. After the indicator arm assumes its normal position pressure which was applied to the trigger rod 87 is released and spring 79 again forces the lever end 72 against the face 90 of the pivoted lever 85 to restore the same and this movement of the lever 85 also restores the trigger rod 87. The faces 69 and 70 of the actuating head 68 again assume an angular position relative to the faces 80 and 81 of the slot 51 to again expand the wings 52 and 53 to cause them to again grip the inner circumferential face of the counter bore 57 of the worm gear 46. The notch 104 in the member 92 having been moved from the trigger 105, the said trigger 105 now engages the peripheral edge of the flange 103 of the member 92 and the bar 108 and its connected parts are prevented from assuming their normal position under the influence of the compressed spring 145.

The counting mechanism is now set and the operator now actuates the starting pedal of suitable power means which through the agency of a suitable belt is connected to pulley wheel 5. The pulley wheel 5 now rotates and as the ratchet tooth clutch associated with pulley 5 and hand wheel 6 is in mesh motion is transmitted to the spindle shaft 2. The rotation of the spindle shaft 2 through the agency of the train of gearing previously described causes rotation of the shaft 19 which supports the worm 40 in the casing CC of the counting mechanism and through the agency of the worm gear 44 which meshes with worm 40 the shaft 43 is rotated. A worm 155 on the shaft 43 meshes with worm gear 46 loosely supported on the sleeve 45 and the rotation of the worm 155 causes rotation of the worm gear 46. The wings 52 and 53 having been expanded, grip the inner circumferential face of the counter bore 57 of the worm gear 46 as before described and the rotation of the worm gear 46 is transmitted to the member 49. The member 49 being secured to the sleeve 45, the said sleeve 45 also rotates and as the indicator arm 59 is also secured to the sleeve 45 it also rotates as does the member 92 which is locked to the sleeve extension 60 of the indicator arm 59.

The mechanism of the winding machine is actuated to move the reciprocating shaft 35 to and fro to place the convolutions of material on the spool of the electromagnet in successive layers. The rotation of the worm gear 46 and the parts associated therewith continue rotation and the instant that the indicator or pointer 142 of the indicator arm 59 reaches the 10,000 mark on the dial 143 at which the counting mechanism was set, the notch 104 in the flange 103 of the member 92 is opposite the nose of the trigger 105. The spring 145 around the link 119 which connects the bar 108 with the clutch arm 121 having been compressed due to the movement of the bar 108 as before described now acts to force the bar 108 to the left with reference to Fig. 5, to move the nose of the trigger 105 into the notch 104. This movement of the bar 108 also causes the clutch arm 121 to move about its pivot 122 and as the bifurcated end 131 thereof engages the face of the pulley wheel 5 the pulley wheel 5 is moved along the sleeve 123 against the tension of the springs 126 in the pulley wheel 5 causing the teeth 129 of the sleeve extension 128 of the pulley wheel 5 to disengage the teeth 130 in the sleeve extension of the hand wheel 6 secured to the spindle shaft 2, arresting further rotation of the spindle shaft 2 the instant that the indicator arm 59 reaches the 10,000 mark on the dial 143.

The operator now releases the clutch pedal of the power means to disconnect the power from the belt which drives the pulley wheel 5 which stops further rotation of the pulley wheel 5. She now removes the finished electromagnet from the spool supports and inserts another. To reset the counting mechanism, pressure is again applied to the trigger rod 87 to effect movement of the actuating head 68 associated with lever 66 to permit the wings 52 and 53 to collapse and release their grip from the circumferential face of the counter bore 57 in the gear wheel 46. The sliding bar 108 having been moved due to the movement of the trigger rod 87 as before described against the tension of the spring 145, the nose of the trigger 105 is withdrawn from the notch 104 in the member 92 to permit the restoration of the indicator arm 59, and member 92 under the influence of the spring 146. Upon restoration of the member just described to normal, pressure is released from the trigger rod 87 to permit the actuating head 68 to again expand the wings 52 and 53 to again grip the face of the counter bore 57 in the worm gear 46. The pointer 142 of the indicator arm 59 is now at normal or zero position and the notch 104 is again positioned as before described. The nose of the trigger 105 again engages the peripheral flange 103 of the member 92, and the bar 108 is thus maintained in its actuated position against the tension of spring 145. With the bar 108 thus positioned the springs 126 in the pulley wheel 5 again force the teeth 129 associated with the pulley wheel 5 into engagement with the teeth 130 associated with hand wheel 6. The operator of the winding machine now steps on the starting pedal to connect the driving means to the belt which drives the pulley wheel 5 and through the agency of the ratchet tooth clutch com-

prising the teeth 129 and 130 the spindle shaft 2 is again rotated to drive the counting mechanism as before described.

For the purpose of description I have assumed that the counting mechanism was set to trip when 10,000 convolutions of material are placed on the spool. It is readily apparent from the previous description that the indicator arm 59 may be set for any number up to 50,000 turns and through the agency of the tripping mechanism which includes the member 92 which is set relative to the indicator 59 so that the instant the redetermined number of turns have been placed on the spool the tripping mechanism comprising the member 92, trigger 105 and sliding bar 108 is actuated to operate the clutch mechanism including the pulley wheel 5 and hand wheel 6 to prevent further rotation of the spindle shaft.

While I have illustrated and described one particular embodiment of my invention operating in connection with a particular type of winding machine it is to be understood that the counting mechanism of my invention is applicable to other types of winding machines and that changes and modifications will also suggest themselves to those skilled in the art and I therefore aim to cover all changes and modifications as come within the spirit and scope of the appended claims.

Having described my invention what I claim as new and desire to secure by United States Letters Patent is:

1. The combination of a counting device and winding machine associated therewith, a spindle shaft for said winding machine and power means for driving the same, a sleeve member for said counting device, a trigger member supported in said sleeve member, a worm gear loosely supported on said sleeve, a train of gearing associated with said spindle shaft for rotating said worm gear, gripping means comprising a member having a pair of expanding wings secured to said sleeve for gripping said worm gear to rotate the same, said trigger member adapted to cause said expanding wings to collapse to permit said counting device to be set to permit a predetermined number of revolutions of said spindle shaft, and means associated with said setting means operated when said spindle shaft has made a predetermined number of revolutions to disassociate said spindle shaft from said power means.

2. The combination of a counting device and winding machine associated therewith, a spindle shaft for said winding machine and power means for driving the same, a sleeve member for said counting device, a trigger member supported in said sleeve member, a worm gear loosely supported on said sleeve, a train of gearing associated with said spindle shaft for rotating said worm gear, a counterbore in said gear and gripping means comprising a member having a pair of expanding wings and secured to said sleeve and normally engaging said counterbore to associate said sleeve with said worm gear to rotate said sleeve, means including said trigger member for collapsing said expanding wings to permit the setting of said counting device for a predetermined number of convolutions of said spindle shaft and clutch means associated with said setting means and operated thereby to disassociate said spindle from said power means when the said spindle shaft has made a said predetermined number of revolutions.

3. The combination of a counting device and winding machine associated therewith, a spindle shaft for said machine and power means for driving the same, a spool supported by said spindle for receiving convolutions of material, a train of gearing associated with said spindle shaft and gripping means having a pair of expanding wings for driving said counting device, means for collapsing said wings whereby said counting device may be set to permit a predetermined number of convolutions of material to be placed on said spool and tripping means associated with said setting means operating when said predetermined number of convolutions have been placed on said spool to disassociate said spindle shaft from said power means.

4. The combination of a counting device and winding machine associated therewith, a spindle shaft for said winding machine and power means for driving the same, a spool supported by said spindle for receiving convolutions of material, a train of gearing associated with said spindle shaft and gripping means having a pair of expanding wing members for driving said counting device, means for collapsing said expanding wing members to set said counter device to permit a predetermined number of convolutions of material to be placed on said spool, clutch mechanism associated with said winding spindle and said setting means and tripping means associated with said setting means actuated when said predetermined number of said convolutions have been placed on said spool to operate said clutch mechanism to disassociate said spindle shaft from said power means.

5. The combination of a counting device and a winding machine associated therewith, a spindle shaft for said winding machine and power means for driving the same, a sleeve member for said counting device, a trigger member extending within said sleeve, a worm gear loosely supported on said sleeve, a train of gearing associated with said spindle shaft for rotating said worm gear, a counterbore in said worm gear and gripping means comprising a pair of expanding wing members secured to said sleeve and normally engaging said counterbore to associate said sleeve with said worm gear to rotate said

sleeve, an indicator arm secured to said sleeve, means including said trigger member for collapsing said gripping means to permit manual movement independent of said worm gear of said indicator and sleeve to set said indicator for a predetermined number of revolutions of said spindle shaft.

6. The combination of a counting device and a winding machine associated therewith, a spindle shaft for said winding machine and power means for driving the same, a sleeve member for said counting device, a trigger member extending within said sleeve member, a worm gear loosely supported on said sleeve, a train of gearing associated with said spindle shaft for rotating said worm gear, a counterbore in said worm gear and gripping means comprising a pair of expanding wing members secured to said sleeve and normally gripping said counterbore to rotate said sleeve, an indicator arm secured to said sleeve and a dial associated therewith, a setting member adjustably secured to said indicator, means including said trigger member for affecting said gripping means to permit manual movement of said indicator arm independent of said worm gear relative to said dial for a predetermined number of revolutions of said dial and means for moving said setting member to position the same relative to the position of said indicator.

7. The combination of a counting device and a winding machine associated therewith, a spindle shaft for said winding machine and power means for driving the same, a sleeve member for said counting device, a trigger member extending within said sleeve member, a worm gear loosely supported on said sleeve, a train of gearing associated with said spindle shaft for rotating said worm gear, a counterbore in said worm gear and gripping means comprising a pair of expanding wing members secured to said sleeve and normally gripping said counterbore to rotate said sleeve, an indicator arm secured to said sleeve and a dial associated therewith, a setting member adjustably secured to said indicator, means including said trigger member for affecting said gripping means to permit manual movement of said indicator arm independent of said worm gear relative to said dial for a predetermined number of revolutions of said spindle shaft and means for moving said setting member to position the same relative to the position of said indicator and a clutch mechanism associated with said setting member affected by the same when said spindle shaft has made said predetermined number of revolutions to disassociate said spindle shaft from said power means.

8. A counting device of the character described comprising an enclosing casing and a driven spindle associated therewith, a rotatable sleeve, a trigger member extending within said sleeve, a worm gear loosely supported on said sleeve, a train of gearing between said spindle and said worm gear for driving the same, a counterbore in said worm gear, gripping means comprising a pair of expanding wing members secured to said sleeve lying within said counterbore normally gripping the same to transmit rotation to said sleeve, an indicator arm secured to said sleeve for indicating the revolutions of said spindle on a dial secured to said casing, setting means for setting said counting device for a predetermined number of revolutions of said spindle, and tripping means operated when said number of revolutions have been made to arrest rotation of said spindle.

9. A counting device of the character described comprising an enclosing casing and a driven spindle shaft associated therewith, a worm gear and a sleeve supported by said casing loosely supporting said gear, a train of gearing between said spindle and said gear for driving the said gear, a counterbore in said gear and gripping means comprising a pair of wing members secured to said sleeve and lying wholly within said counterbore, said wing members normally expanded and gripping said counterbore in said worm to rotate said gripping means and said sleeve, an indicator arm secured to said sleeve for indicating the number of revolutions of said spindle on a dial secured to said casing, setting means for setting said counting device for a predetermined number of revolutions of said spindle, and tripping means associated with said setting means operated when said number of revolutions have been made to arrest movement of said spindle.

10. An automatic winding machine of the character described including means for automatically winding convolutions of material upon a core member, a driven spindle shaft associated therewith, automatic means for stopping the operation of said winding machine when a predetermined number of turns have been placed upon said core, a worm gear operatively associated with said spindle shaft, gripping means comprising a member having a pair of normally expanded wings adapted to engage said worm gear whereby said automatic means are operatively associated with said spindle shaft, and means for setting said automatic means to operate the same when any desired number of turns have been placed upon said core.

Signed by me at Chicago, in the county of Cook and State of Illinois, this 3rd day of November, 1926.

MARTIN B. GROUT.