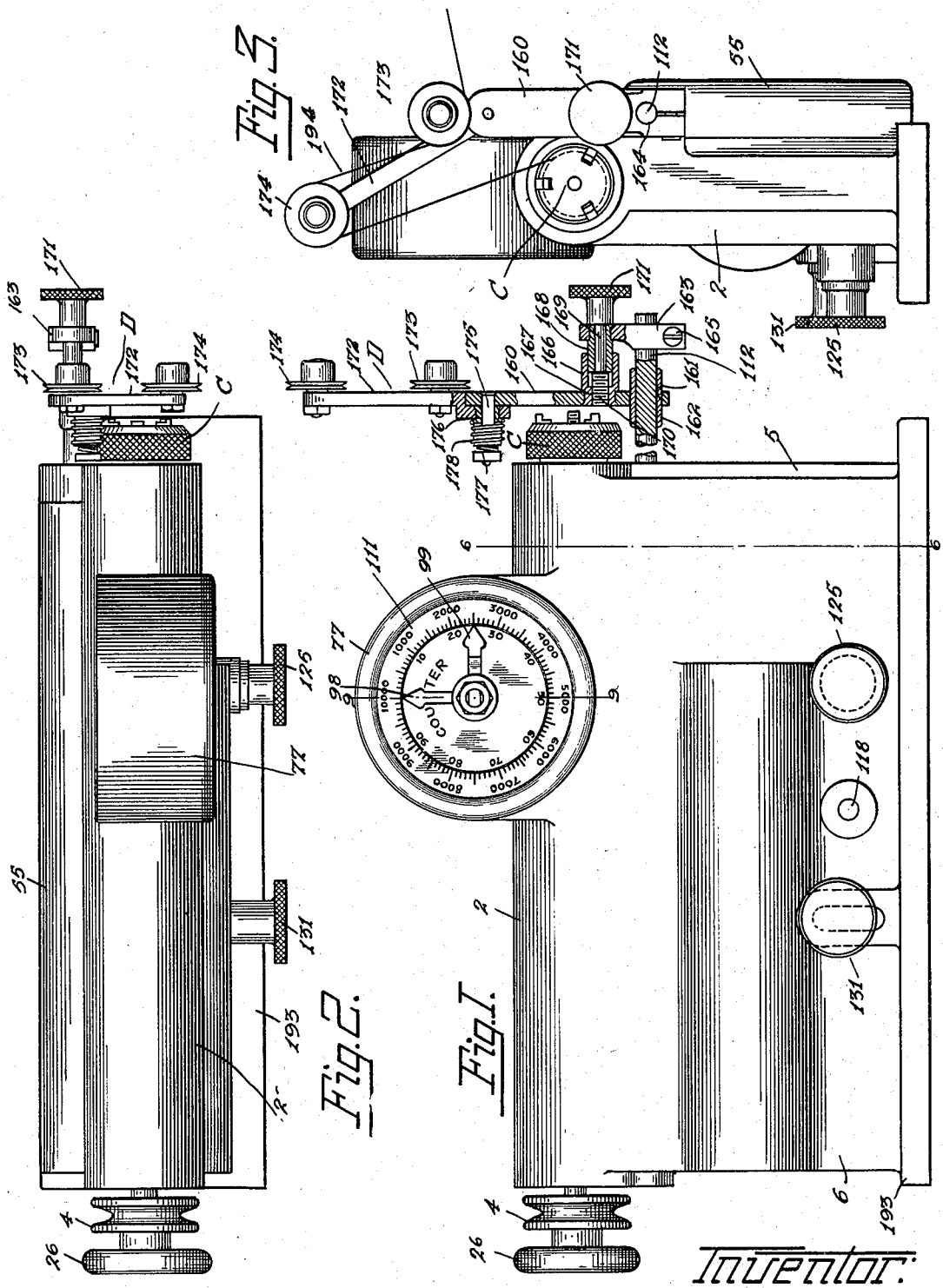
Dec. 14, 1926. 1,610,280

M. B. GROUT

WINDING MACHINE

Filed Oct. 16, 1924 4 Sheets-Sheet 1



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WINDING MACHINE

Filed Oct. 16, 1924 4 Sheets-Sheet 2

Fig.1.

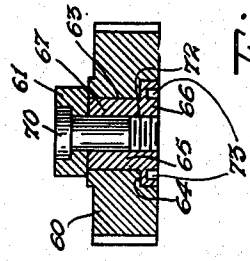


Fig.5.

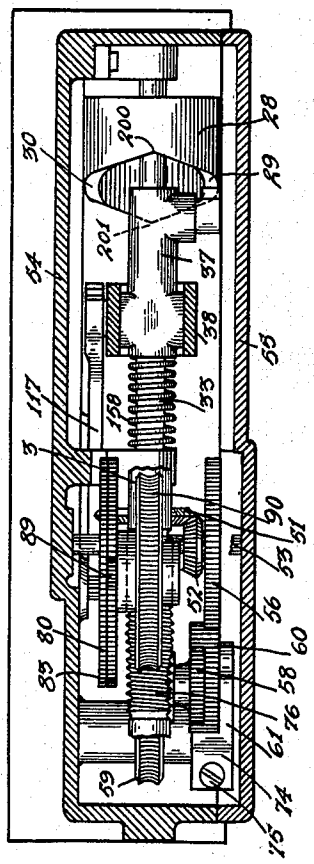
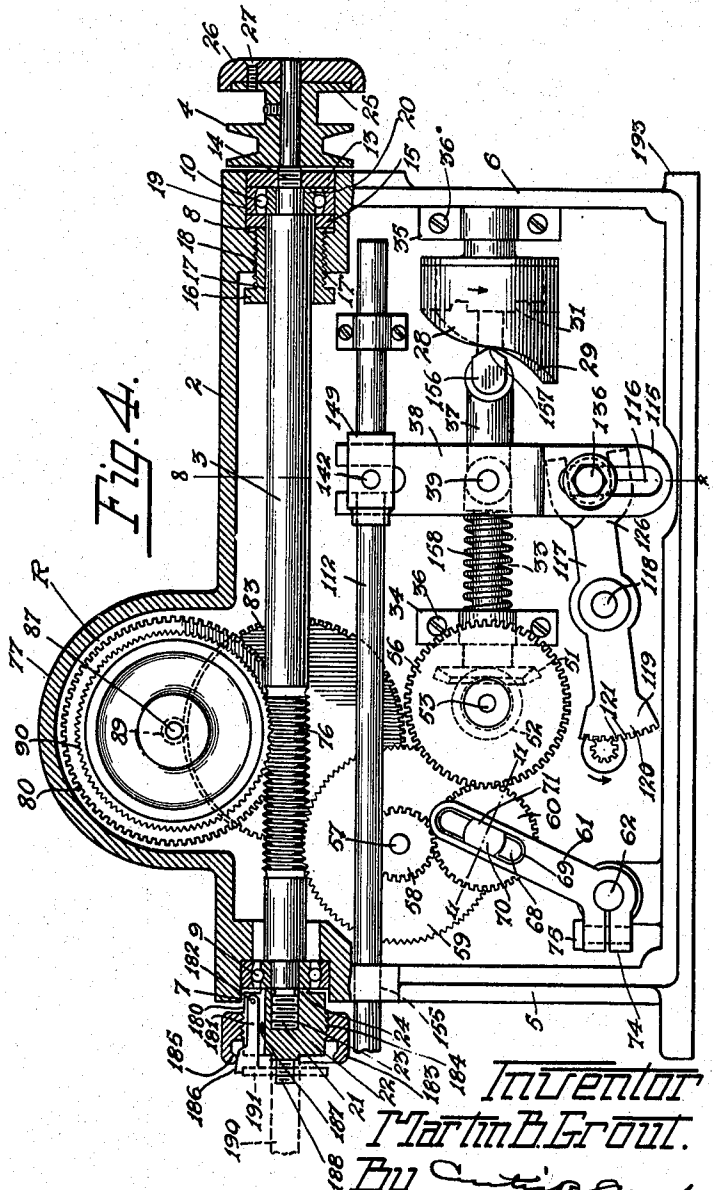


Fig.4.



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WINDING MACHINE

Filed Oct. 16, 1924 4 Sheets-Sheet 3

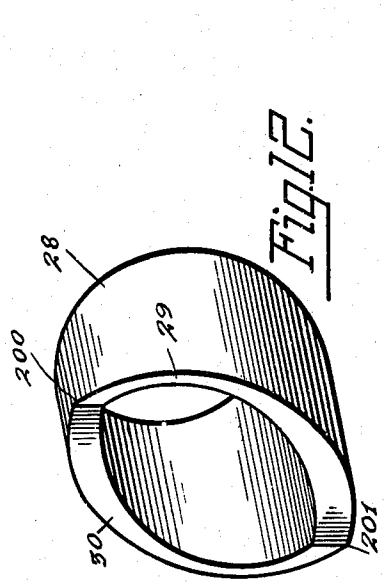


Fig. 12.

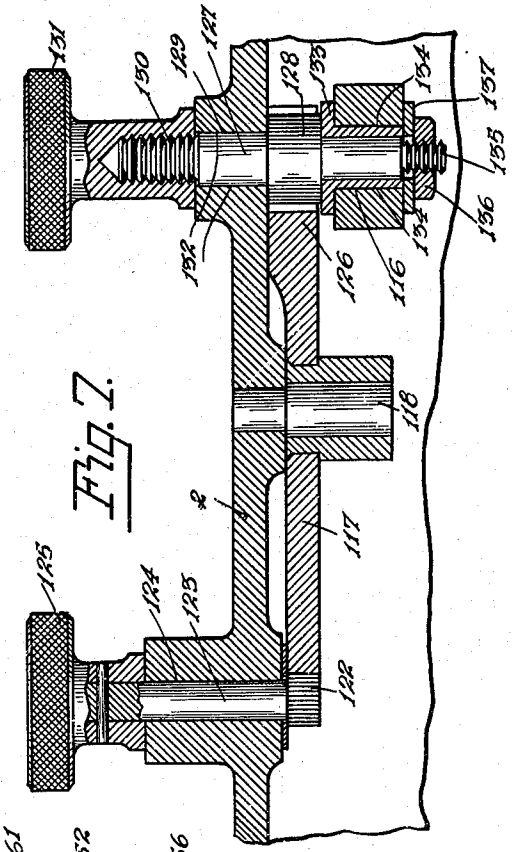


Fig. 7.

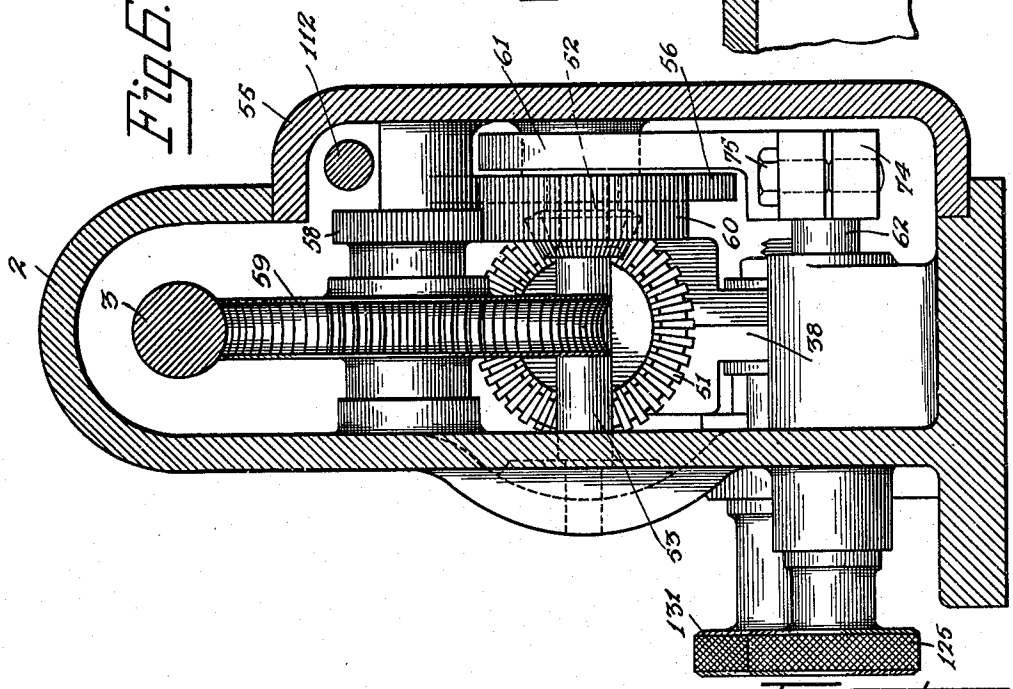


Fig. 6.

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WINDING MACHINE

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Fig. 9.

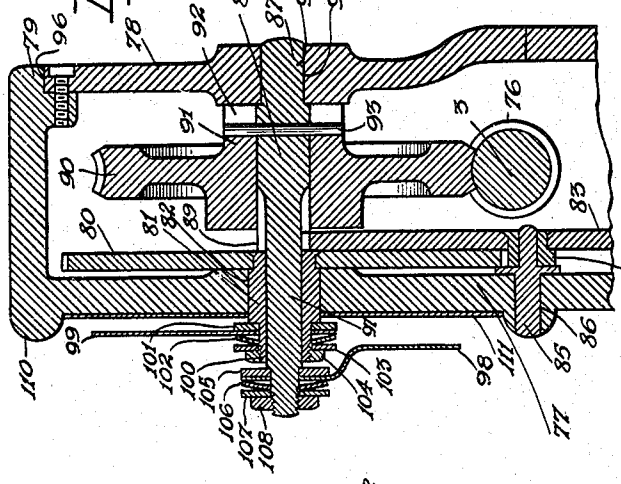


Fig. 10.

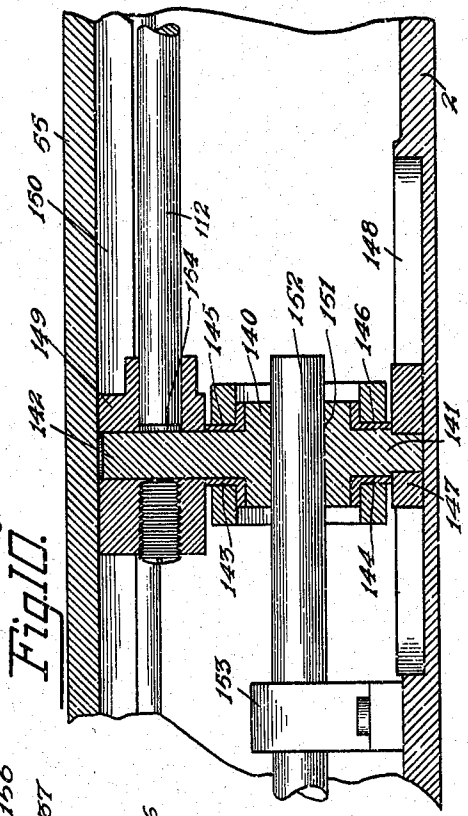
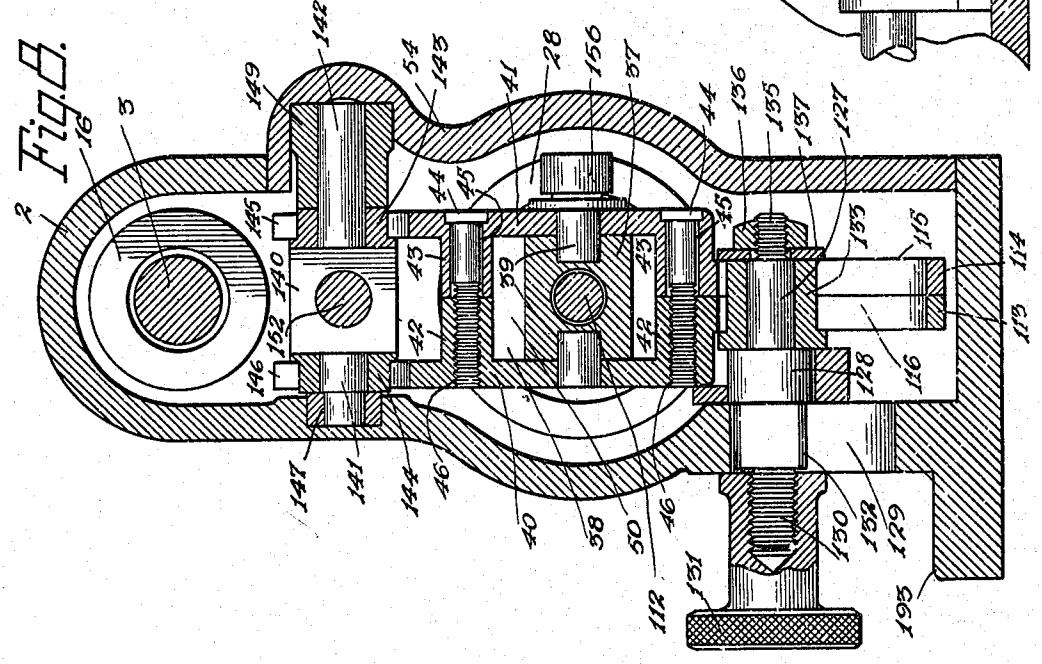


Fig. 4.



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UNITED STATES PATENT OFFICE.

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WINDING MACHINE.

Application filed October 16, 1924. Serial No. 743,953.

My invention relates to winding machines which are used for winding a material, such as a strand of wire, into electro-magnet coils, and has to do more particularly with a coil winding machine such as is used in the winding of conducting wire upon a suitable spool to serve as a winding for an electromagnet, and an object of my invention is to provide a machine of the above type which is simple in construction, and by which the work of winding an electromagnet coil may be done in a rapid, efficient and economical manner.

Various types of winding machines have been devised for winding electromagnet coils, in which a distributing arm secured to a reciprocating shaft or distributing bar distributes the wire from a supply source from left to right, and vice versa, but these machines have been bulky and somewhat unsatisfactory. The travel of the distributing bar is controlled by suitable mechanism to place the required number of convolutions on the spool which is supported on the rotatable winding spindle.

A feature of my invention is the provision of a novel cam arrangement in association with a reciprocating shaft or distributing bar and suitable gearing mechanism, which accomplishes the to and fro movement of the distributing bar which carries the distributing arm from left to right, and vice versa, to place a predetermined number of convolutions of wire on the spool supported by the winding spindle.

Another feature of my invention is the provision of a rocker arm in associaton with a sliding member operatively associated with the cam which, through the medium of a train of gearing rotates to bring about the rocking of the rocker arm to which the distributing bar is connected.

Another feature of my invention is the provision of adjusting means associated with the rocker arm which provides means whereby the angle of tilt of the rocker arm may be changed at will to increase or decrease the distance of travel of the distributing bar from left to right, and vice versa, to make the winding machine of my invention applicable to winding electro-magnet coils of varying lengths.

Another feature of my invention is the provision of a revolution counter in association with the winding spindle, which, through the medium of a train of gearing, operates the revolution counter to give a usual indication of the number of convolutions that are being placed on the spool. The revolution counter is integrally associated with the mechanism of the winding machine and is contained in the same housing that encloses the other mechanism of the winding machine.

Still another feature of my invention is the provision of adjustable means for the distributing arm which is slidably secured to the distributing bar so that the distributing arm may be moved to the right or left along the distributing bar so as to permit the distributing arm to be placed in alignment with the spool secured to the winding spindle.

The above features of my invention, as well as others, will be more fully hereinafter described, and for a more complete understanding of my invention reference may be had to the accompanying drawings in which like reference characters in the several views denote like parts, and in which:

Fig. 1 is a front elevation of the winding machine of my invention illustrating the distributing arm in an intermediate position;

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

Fig. 3 is a right side elevation of Fig. 1;

Fig. 4 is a rear view of Fig. 1 with the cover plate removed and parts in section to more clearly illustrate the interior mechanism;

Fig. 5 is a sectional view of the winding machine looking down into the interior with the enclosing casing in section to illustrate another view of the mechanism;

Fig. 6 is a full sized sectional view along the line 6—6 of Fig. 1;

Fig. 7 is a fragmentary sectional view illustrating the adjusting means in association with the rocker arm;

Fig. 8 is a sectional view along the line 8—8 of Fig. 4 clearly illustrating the rocker arm and its associated parts;

Fig. 9 is a sectional view along the line 9—9 of Fig. 1 to clearly illustrate the revolution counter mechanism;

Fig. 10 is a sectional view along the line 10—10 of Fig. 4 to clearly illustrate another view of the rocker arm and its parts;

Fig. 11 is a sectional view along the line 11—11 of Fig. 4;

Fig. 12 is a perspective view of the cam member.

Referring now more in detail to my invention as illustrated in the accompanying drawings, the winding machine comprises a suitable enclosing casing or housing 2 which encloses the mechanism of the winding machine of my invention.

A spindle shaft 3 has secured thereto a pulley wheel 4 which is connected to a power shaft through the agency of a suitable belt, the said power shaft being in turn connected to a suitable starting and stopping means, and, as the power transmission for starting the spindle shaft 3 forms no part of my invention, it is not shown in the drawings. The ends 5 and 6 of the housing 2 are provided with counter bores 7 and 8 through which the spindle shaft 3 extends, and ball bearings 9 and 10 are provided which rest in the counter bores 7 and 8 in the ends 5 and 6 of the housing 2, and rotatably support the spindle shaft 3. A lock nut 13 is provided which has screw-threaded engagement with the threaded portion 14 of the spindle shaft 3, and a collar 15 fits loosely on the shaft 3, which rests in the counter bore 8. An adjustable member 16 provided with a central orifice 17 is slipped on the spindle shaft 3, and its extended body portion 17′ is threaded and is adapted to have screw-threaded engagement with a suitable tapped orifice 18 in the housing 2. The lock nut 13 when threaded in position on the shaft 3 engages a bearing bushing 19, and the adjustable member 16 engages the collar 15 and moves the same into engagement with the ball race 20. The collar 15 and lock nut 13 retain the ball bearing 10, as a whole, in the counter bore 8, and the adjustable member 16 engaging the collar 15 may be adjusted in its tapped orifice 18, and through the agency of the loose collar 15, any lateral movement of the spindle shaft 3 may be taken up. The chuck C which is secured to the threaded end of the spindle shaft 3 comprises a body portion 22 which is provided with a tapped orifice 23 into which the end 21 of the spindle shaft 3 is threaded. The body portion 22 of the chuck C is provided with an annular shoulder 24 which engages the ball bearing 9. The pulley wheel 4 which is secured to the spindle shaft 3 is provided with an integrally formed flange 25, which has secured thereto a knob 26, by means of a screw 27, and permits the manual rotation of the winding spindle 3, when the operator prepares a new spool which is held by the chuck C.

A cam member 28 is provided which is tubular in form, and is provided with a pair of receding helical faces 29 and 30, and a collar 31 of a size to receive the tubular cam member 28 supports the cam member 28, and is secured thereto by means of screws which pass through suitable orifices in the peripheral face of the cam member 28, and have screw-threaded engagement with suitable tapped orifices in the collar 31. The collar 31 is provided with a central orifice for receiving a shaft 33 to which the collar 31 and its supported cam member 28 are secured, as a whole, in any suitable manner, as by means of a key or a set screw. The shaft 33 which supports the collar 31 and the cam member 28, as a whole, is rotatably supported by a pair of bearings 34 and 35 secured to the housing 2 by means of screws 36 and 36′.

A rocker arm 38 comprises a pair of rectangular shaped plate members 40 and 41, each of which is provided with a pair of integrally formed lug extensions 42 and 43, which, when the halves 40 and 41 are placed together register with each other, and screws 44 which pass through suitable orifices 45 in the lug extensions 43 of the half 41, have screw-threaded engagement with suitable tapped orifices 46 in the lug extensions 42 of the half 40 and secures the members 40 and 41 together to form the rocker arm 38. An opening 50 is formed between the lug extensions 42 and 43 when the members 40 and 41 are thus assembled, and this opening is of a size to receive the head of the sliding member 37 which is provided with a pair of orifices which receive pivot pins 39 to pivotally support the rocker arm 38 on the member 37. The sliding member 37 is provided with a central orifice through which the shaft 33 extends and upon which the sliding member 37 and its pivoted rocker arm 38, as a whole, are slidably supported.

The end of the shaft 33 which extends through the bearing 34 has secured to it a bevel gear 51 which meshes with a bevel pinion 52, secured to a transverse shaft 53, which shaft 53 is rotatably supported in suitable bearings in the front wall 54 of the housing 2 and the rear removable cover 55. A gear wheel 56 is also secured to the transverse shaft 53 upon which the bevel pinion 52 is secured for purposes as will presently be described. Another transverse shaft 57 rotatably supported in suitable bearings in the front wall 54 of the housing 2, and the removable rear cover 55 has secured to it a pinion 58 and a worm gear 59, also for purposes as will presently be described.

A gear wheel 60, which meshes with the gear wheel 56 on the transverse shaft 53 and with the pinions 58 of the transverse shaft 57, is adjustably and rotatably supported on an arm 61, which arm 61 is also adjustably secured to a stud 62 which stud

62 is suitably secured to the housing 2 in any suitable manner.

To adjustably support the gear wheel 60 on the arm 61 (Fig. 11), the gear wheel 60 is provided with a central orifice 63 and a counter bore 64 and a lock nut 65 having a circular head 66 and a body portion 67, resting, respectively, in the counter bore 64 and the central orifice 63 in the gear wheel 60. The arm 61 (Fig. 4) is provided with a longitudinal slot 68 and a channel 69 and a bolt 70 provided with a rectangular shaped head 71 resting in the channel 69, the body of the bolt 70 extending through the longitudinal slot 68 in the arm 61. The lock nut 65 is provided with a central orifice 72 which is partially threaded to permit screw-threaded engagement with the threaded end of the bolt 70. When the lock nut 65 and bolt 70 are in position as just described, the gear wheel 60 is thus supported on the arm 61, and the said arm 61 and supported gear wheel 60 may now be adjusted in mesh with the gear wheel 56 on the transverse shaft 53, and the pinion 58 on the transverse shaft 57, the bolt 70 permitting the gear wheel 60 and its supported parts to be moved up and down in the longitudinal slot 68 of the arm 61, as the case may be. When in this position, the lock nut 65 may be turned down on the bolt 70, by means of a suitable spanner wrench for which I provide a pair of orifices 73 in the head 66 of the lock nut 65 to secure the gear wheel 60 in its adjusted position in mesh with the gear wheel 56 and pinion 58. The arm 61 is provided with an integrally formed lug 74 which is split, and a screw 75 passing through a suitable orifice in the upper slit portion of the lug 74 has screw-threaded engagement with a suitable tapped orifice in the lower split portion of the lug 74 to clamp the arm 61 on its supporting stud 62. The gear wheel 60 is thus rotatably supported on the arm 61 with the body portion 67 of the lock nut 65 forming a bearing upon which the gear wheel 60 rotates.

The spindle shaft 3 has a worm portion 76 cut thereon and meshes with the worm gear 59 secured to the transverse shaft 57 to which the pinion 58 is secured. Now, as the spindle shaft 3 is rotated, the worm 76 which meshes with the worm gear 59, causes rotation of the said worm gear 59, and through the agency of the pinion 58 on the transverse shaft 57 and the gear wheel 60, rotatably supported on the arm 61 and the gear wheel 56 and the bevel pinion 52 on the transverse shaft 53, and the bevel gear 51 on the shaft 33, rotary motion is transmitted to the shaft 33 which carries the cam member 28 to cause rotation of the cam member 28.

The winding machine of my invention is provided with a revolution counter R for the usual purposes, and which forms an integral part of the winding machine. The housing 2 is provided with a semi-circular shaped extension 77 integrally formed with the housing 2 and which, when the cover cap 78 is in position in the circular opening in the rear face 79 of the extension 77, encloses the revolution counter mechanism. The revolution counter mechanism comprises a gear wheel 80 provided with a hub member 81 suitably secured to the gear wheel 80. The hub 81 extends through a suitable orifice 82 in the face of the housing extension 77 and rotatably supports the gear wheel 80. A gear wheel 83 having a pinion member 84 secured to it in any suitable manner, are, as a whole, rotatably supported on a stub shaft 85 which is secured in a suitable orifice 86 in the housing extension 77 by means of a drive fit, and rotatably supports the gear 83 and pinion 84. A shaft 87 is provided which extends through a central orifice in the hub 81 of the gear wheel 80, and is provided with an intermediate enlarged portion 88 upon which is cut a pinion 89 which pinion 89 meshes with the gear wheel 83. The pinion 84 which is rotatably supported on the stub shaft 85 meshes with the gear wheel 80 for purposes as will presently be described. A worm gear 90 is supported on the shaft 87 and the hub 91 of the worm gear 90 is provided with a transverse slot 92 which receives a pin 93 secured to the shaft 87. The end 94 of the shaft 87 rests in a suitable orifice 95 in the cover cap 78 which rests in a circular opening 96 in the housing extension 77 and forms a bearing for this end of the shaft 87. The other end 97 of the shaft 87 extends through the hub 81 of the gear wheel 80, and this hub 81 serves as the other bearing for the shaft 87. The worm gear 90 meshes with the worm 76 on the spindle shaft 3, and rotation of the spindle shaft 3 causes rotation of the worm gear 90. Rotation of the worm gear 90 is also transmitted to the shaft 87 upon which the worm gear 90 is supported, due to the slot 92 and pin 93 connection between the worm gear 90 and the shaft 87, as already described. The pinion 89 on the shaft 87 transmits rotation to the gear wheel 83 and the pinion 84 secured thereto in turn transmits rotation to the gear wheel 80 rotatably supported in the orifice 82 in the housing extension 77. The rotation of the shaft 87 and hub 81 on the gear wheel 80 will rotate the indicator arms 98 and 99, respectively, secured thereto for purposes as will presently be described.

The hub 81 secured to the gear wheel 80 protrudes through the central orifice 82 in the housing extension 77, and its reduced end portion 100 is threaded. The indicator 99 is supported on the reduced portion 100 of the hub 81 between a washer 101 and a spring washer 102. A washer 103 is now placed

upon the reduced end 100 of the hub 81, and a nut 104 having screw-threaded engagement with the threaded end 60 of the hub 81 forces the washer 104 against the spring washer 102, to spring the same, causing it to grip the indicator 99 and frictionally hold it in position on the hub 81 between the washers 101 and 102 so that as the hub 81 rotates the indicator 99 will also move with it, and in addition, the indicator 99 can be moved about its hub support 81 to set the same at its zero position, as is readily understood. The shaft 87 which supports the worm gear 90 protrudes through the hub 81, and its end 97 is threaded, and the indicator 98 is supported upon the shaft 87 between a washer 105 and a spring washer 106. A washer 107 is placed against the spring washer 106, and a nut 108 having screw-threaded engagement with the threaded end 97 of the shaft 87 forces the washer 105 against the spring washer 106, springing the same causing it to grip the indicator 98 and frictionally hold it in position on the shaft 87 between the washers 105 and 106 so that as the shaft 87 rotates the indicator 98 will also move with it, and in addition, the indicator 98 may be moved about its shaft support 87 to set the same at its zero position. The housing extension 77 is provided with a circular ridge 110 forming a dished circular portion in which I place a dial 111, suitably calibrated, the outer scale reading from 1000 to 10000, and the inner scale reading from 1 to 100, and to associate the indicator arm 99 secured on the hub 81 with the 1000 to 10000 scale and the indicator arm 98 secured to the shaft 87 with the 1 to 100 scale, the gearing ratio will now be given. The pinion 89 on the shaft 87 is provided with 10 teeth and the gear wheel 83 which meshes with the pinion 89 is provided with one hundred teeth. The pinion 84 secured to the gear wheel 83 is provided with ten teeth and the gear wheel 80 on the hub 81 is provided with one hundred teeth. Thus, for each revolution of the worm gear 90, the pinion 89 on the shaft 87 will also rotate one revolution, and will cause the gear wheel 83 to make one-tenth of a revolution, and as the pinion 84 is secured to the gear 83, it also makes one-tenth of a revolution, and it being in mesh with the gear wheel 80, this gear wheel 80 in turn makes one one-hundreth of a revolution.

From this description it is readily apparent that for each revolution of the shaft 87, the indicator arm 98 thereon will have traveled one revolution, indicating that one hundred convolutions of wire have been placed on the spool secured to the winding spindle 3 by the chuck C, and the indicator arm 99 of the hub 81 will point to the first graduation of the scale. For each ten revolutions of the shaft 87, the indicator 98 will also have made ten revolutions, and the hub 81, due to the gearing ratio as just described, will have made one-tenth of a revolution and will point to one thousand on the scale.

The rocker arm 38 which is pivotally supported upon the sliding member 37 is associated with adjustable means which controls the length of the stroke of the distributing bar 112, upon which the distributing arm D is secured, the distributing bar 112 being secured to the rocker arm 38 and through the medium of this adjustable means various lengths of coils may be wound, as will now be described. The rectangular plates 40 and 41 which form the rocker arm 38 are provided with depending members 113 and 114 which, when the plates 40 and 41 are secured together, form a depending leg 115, which is provided with a slot 116, for purposes as will presently be described. A lever 117 pivoted intermediate of its ends by means of a pivot pin 118 secured to the housing 2 co-operates with the rocker arm 38 for adjusting the length of stroke of the distributing bar 112. The end 119 of the pivoted lever 117 is provided with an arcuate face 120, provided with teeth 121 which mesh with a pinion 122 integrally formed upon a rod 123 which extends through an orifice 124 in a boss formed integrally with the housing 2, and its protruding end has pinned to it a knob 125 which may be turned to rotate the pinion 122 which is in mesh with the toothed rack on the arcuate face 120 of the end 119 of the lever 117 for purposes as will presently be described. The end 126 of the lever 117 is bifurcated and straddles an enlarged intermediate portion 128 of a stud 127, which extends through a slot 129 in the housing 2. The protruding end 130 of the stud 127 is threaded to receive a knob 131, which is used for clamping purposes, as will presently be described. The portion of the stud 127 which rests in the slot 129 in the housing 2 is provided with flat faces 132 which register with the sides of the slot 129, and permit the stud 127 to be raised or lowered in the said slot 129, but prevents the same from turning therein. A bushing 133 provided with flat faces 134 rests in the slot 116 in the depending leg 115 of the rocker arm 38, and is adapted to slide in the said slot 116 for purposes as will presently be described. The end 135 of the stud 127 extends through a central orifice in the bushing 133 in the slot 116, and its protruding end 135 is threaded to receive a nut 136, a suitable washer 137 being placed between the nut 136 and the face of the depending leg 115 of the rocker arm 38. The portion of the stud 127 that extends through the bushing 133 is slightly longer than the bushing 133, so that when the nut 136 is turned down, the washer 137 will be locked but at the same time allow the

bushing 133 to rock on the stud 127 and permit the bushing to slide in the slot 116. The knob 131 which is threaded upon the end 130 of the stud 127 which protrudes through the slot 129 in the housing 2, when turned down locks the stud 127 in its adjusted position, which adjustment is obtained through the agency of the lever 117 and knob 125, secured to the rod 123, which is provided with the pinion 122, which meshes with the toothed rack on the lever 117.

A square block 140 provided with integrally formed studs 141 and 142 are adapted to receive bushings 143 and 144 which rest in the slots 145 and 146 in the upper ends of the plates 40 and 41 which form the rocker arm 38. The block 140 rests between the upper ends of the plates 40 and 41 of the rocker arm 38, when in position with its supported bushings 143 and 144, resting in the slots 145 and 146, and the end of the stud 141 which protrudes through the bushing 144 supports a shoe 147 which rests in a slot or channel 148 cut in the inner face of the housing 2. The end of the stud 142 which protrudes through the bushing 143 has secured thereto, by means of a set screw, a shoe 149 which rests in a slot or channel 150 cut in the inner face of the cover cap 55, when the same is in position, and secured to the housing 2. The block 140 is provided with a central orifice 151, which is adapted to receive a guide rod 152 which is adapted to be secured therein by means of a drive fit. This guide rod 152 extends through a guide bearing 153, and serves as a guiding means for the rocker arm 38 in its to and fro travel, as will presently be described. The shoe 149 secured to the stud 142 is provided with an orifice 154 which is adapted to receive the end of the distributing bar 112, and secured therein by means of a drive fit. This distributing bar 112 extends through an aligned orifice 155 in the side 5 of the housing 2 to which the distributing arm D is secured.

The sliding member 37 to which the rocker arm 38 is pivotally secured, and which member 37 and arm 38, as a whole, are slidably supported on the shaft 33, has secured to it by suitable means, a cam follower member 156 which is provided with a knife edge nose 157, which is held in engagement with either of the faces 29 and 30 of the cam member 28, depending upon the position of the cam member 28, by means of a helical spring 158 around the shaft 33, and which spring 158 rests between the bearing 34 which supports the shaft 33 and the sliding member 37 on the shaft 33.

Referring now to Figs. 1 to 3, I show a distributor arm D secured to the reciprocating shaft or distributing bar 112.

The distributor D comprises a plate 160 provided with an orifice 161 which is adapted to receive a bushing 162 which is held therein by means of a force fit, and the plate 160 and its bushing 162 are in turn slidably supported on the distributing bar 112. A split clamping member 163 is provided with an orifice 164 which permits the same to be slipped onto the distributing bar 112, and a clamping screw 165 when tightened, clamps the member 163 on the distributing bar 112. The plate 160 has secured to it a sleeve member 166 provided with an internally threaded portion 167, and an enlarged portion which enlarged portion is adapted to receive a sleeve member 168 secured to the clamping member 163. A pin 169 provided with a threaded end portion 170 extends through the sleeve member 168 on the clamping member 163, its threaded end portion 170 having screw-threaded engagement with the threaded portion 167 of the sleeve 166 secured to the member 160. The pin 169 is provided with a knob 171 which facilitates the turning of the pin 169, and when the plate 160 slidably supported on the distributing bar 112 and the clamping member 163 are operatively linked together by means of the rotatable pin 169, the knob 171 secured thereto rests against the clamping member 163 and the sleeve 168 secured thereto extends into the sleeve member 166 secured to the plate 160. With the parts just described linked together by means of the rotatable pin 169, it may readily be seen that when the pin 169 is turned to the right or left with reference to Fig. 2, the plate 160, which is slidably supported on the distributing bar 112, is moved to the right or left, as the case may be. This is accomplished by reason that the clamping member 163 is secured to the distributing bar 112, and as the plate 160 is slidably supported on the distributing bar 112, the turning of the knob 171 secured to the pin 169 causes the threaded end 170 of the pin 169, which is in threaded engagement with the threaded portion 167 of the sleeve 166 secured to the plate 160, to move the same to the right or left, for purposes as will presently be described. The sleeve 168 on the clamping member 163 which extends into the sleeve 166 on the plate 160 serves as guiding means for the plate 160 as it is moved to the right or left, and also maintains the plate 160 slidably mounted on the distributing bar 12 in its vertical position. An arm 172 pivotally secured to the plate 160 supports a pair of ball bearing guide wheels 173 and 174 for the usual purpose of guiding the wire from the source of supply to the coil secured in the chuck C. The plate 160 is provided with a pin 175 secured to its upper end, and the arm 172 is provided with a stud 176 which is provided with a suitable orifice through which the pin 175 extends. The end of the pin 175 protrudes through

the stud 176 and is threaded and adapted to receive a thumb nut 177. A helical spring 178 of a size to be slipped over the stud 176 on the arm 160 rests between the face of the arm 160 and the thumb nut 177, so that as the thumb nut 177 is turned down, the spring 178 is placed under tension forcing the face of the arm 172 against the face of the plate 160 so that the arm 172 may be set in any adjustable position and be held in this position by means of the frictional engagement between the face of the arm 172 and the face of the plate 160. The means for adjusting the plate 160 and its pivoted adjustable arm 172, as a whole, to the right or left, will be more fully hereinafter described.

The chuck C for gripping the electromagnet spools 190 is provided with a body portion 22 which, as already described, is secured to the spindle shaft 3 and is provided with slots 180 in which the jaws 181 are pinned by the pivot pins 182. An internally threaded ring member 183 has screw-threaded engagement with the threaded portion 184 of the body 22 of the chuck, and is provided with an annular internal lip 185. The jaws 181 are provided with tapered faces 186, and through the agency of helical springs 187 which rest between the jaws 181 and the bottom of the slots 180, the free ends of the jaws 181 are forced outward. The body portion 22 is also provided with a threaded stud 188 integrally formed therewith and the core of the spool 190 in its one end is provided with a suitable tapped orifice which is adapted to be threaded on the threaded stud 188 to rotatably secure it to the spindle shaft 3, as shown dotted in Fig. 4. To secure the spool 190 against rotation relative to the spindle shaft 3, after being threaded upon the stud 188, the ring member 183 is turned to be moved forward causing its lip 185 to engage the tapered faces 186 of the jaws 181, forcing them inward against the tension of the helical springs 187, causing the jaws 181 of the chuck C to engage the head 191 of the spool 190 and grip the same to clamp the spool 190 in the chuck C against movement of the spindle shaft 3.

The removable cover cap 55 is secured to the housing 2 by suitable screws which have screw-threaded engagement with suitable tapped orifices in the housing 2. This cover cap 55 may be removed to permit access to the mechanism of the machine. The housing 2 is also provided with a suitable base 193 and the machine may be secured to a suitable table and a strand of wire 194 from a suitable source of supply lead over the guide wheels 173 and 174 on the adjustable arm 172 of the distributor D to the spool 190 to be wound.

Having described the apparatus through the agency of which the cam member 28 is rotated, and the apparatus associated therewith for controlling the length of stroke of the distributing bar 112, I will now describe the operation of the winding machine and the adjusting means for adjusting the length of the stroke of the distributing bar 112 from left to right, and vice versa. Now, when the clutch pedal of the power drive (not shown) is actuated, the belt connection between the source of power and the pulley 4 on the spindle shaft 3 will rotate the spindle shaft 3. The worm 76 on the shaft 3 meshes with the worm gear 59, causing rotation of the worm gear 59, and through the agency of the pinion 58 on the transverse shaft 57 upon which the worm gear 59 is secured, and the gear wheel 60 rotatably supported on the arm 61 and the gear wheel 56 and bevel pinion 52 on the transverse shaft 53, and the bevel gear wheel 51 on the shaft 33 rotary motion is transmitted to the shaft 33 which carries the cam member to cause rotation of the cam member 28. In the drawings I show the distributing bar 112 in an intermediate position, that is, half way between its left and right adjusted position, and with reference to Fig. 4, the arrow indicated on the cam member 28 indicates the direction of travel of the cam member 28 and with this direction of travel, the distributing bar 112 is traveling to the right with reference to Fig. 4.

As the cam member 28 rotates, the nose 157 of the cam follower member 156 follows the contour of the receding pitch face 29 of the cam member 28, and through the agency of the helical spring 158 which bears against the sliding member 37, the said member 37 and its pivotally supported rocker arm 38 as a whole, continue their travel to the right with reference to Fig. 4, but as the stud 127 which is used for adjusting the length of stroke of the distributing bar 112 passes through the slot 116, in the depending leg 115 of the rocker arm 38, as before described, is locked in its adjusted position in the slot 129 in the housing 2 by means of the locking knob 131, the rocker arm 38 rocks about this point and pivots about its pivot pins 39 in the sliding member 37 and causes the upper end of the rocker arm 38 to tilt to the right. The shoes 147 and 149 supported on the block 140 resting in the upper end of the rocker arm 38 now slides to the right in their respective channels 148 and 150. The tilting of the upper end of the rocker arm 38 to the right in a downward direction is permitted, due to the fact that the studs 142 and 143 of the block 140 which support the same in the rocker arm 38 rest in the bifurcated ends of the rocker arm 38, and at the same time permit the shoes 147 and 149 of the block 140 to move in a horizontal plane to the right. The bushing 144

in the slot 116 in the leg 115 of the rocker arm 38 is slidably secured therein, as previously described, and as the lower end of the leg 115 of the rocker arm 38 moves to the left the bushing around the locked stud 127 rotates thereon to permit this movement to the left in an upward direction of the leg 115 of the rocker arm 38. The guide rod 152 secured to the shoe slides through the guide bearing 153 and the combination of the guide rod 152 and the block 140 permits a free movement of the shoes 147 and 149 in their respective channels 148 and 150, and as the distributing bar 112 is secured to the shoe 149, as before described, it also moves to the right. The movement to the right of the distributing bar 112 continues until the nose 157 of the cam follower 156 reaches the base 200 of the cam face 29 of the cam member 28 in which position the distributing bar 112 is in its extreme right position with reference to Fig. 4. The nose 157 of the cam follower 156 now engages the pitch face 30 of the cam member 28, causing the nose 157 to follow the contour of the cam face 30, thus forcing the sliding member 37 and its supported pivoted rocker arm 38 to the left, causing the upper end to swing to the left to cause the shoes 147 and 149 to move to the left in their respective channels 148 and 150. This movement of the rocker arm 38 and its associated parts continues to the left until the nose 157 of the cam follower 156 reaches the apex 201 of the cam 28 and the instant that the nose 157 of the cam follower 156 passes the apex 201, the cam face 29 of the cam member 28 is again engaged and the sliding members 37 and its pivoted rocker arm 38 and its associated parts again move to the right with reference to Fig. 4, under tension of the compressed spring 158.

From the above description it may be seen that the tilting of the upper end of the rocker arm 38 from left to right, and vice versa, causes the shoes 147 and 149 to travel in a like direction, and as the distributing bar 112 is secured to the shoe 149, the said distributing bar 112 also receives this to and fro movement. It will also be seen that the rotation of the cam member 28, through the agency of the cam follower 156, sliding member 37, the rocker arm 38 and the shoes 147 and 149 brings about the movement of the reciprocating shaft or distributing bar 112 from left to right, and vice versa, and that for one complete revoluton of the cam member 28, the distributing bar 112 will have traveled from left to right and from right to left, and as the distributing arm 172 is secured to the bar 112, two layers of convolutions of wire have been placed on the spool 190 gripped by the chuck C secured to the spindle shaft 3.

The length of the stroke of the distributing bar 112 is adjustable, and to this end I provide the pivoted lever 117, one end of which is provided with a toothed rack 120 which is in mesh with the pinion 122, and its other end being bifurcated, straddles the enlarged intermediate portion 128 of the stud 127 which extends through the slot 129 in the housing 2 and the slot 116 in the leg 115 of the rocker arm 38, as already described. Now, to adjust the stroke of the distributing bar 112 the rocking knob 131 which is in the threaded engagement with the threaded end 130 of the stud 127, is loosened or unscrewed to permit the stud to be moved in the slot 129 in the housing 2 and the slot 116 in the leg of the rocker arm 38. As shown in Fig. 8, the stud 127 is in its extreme upper position in which position the distributing bar 112 moves from left to right and vice versa, its maximum distance or stroke, which in the instant case is about two and one-eighth inches. Now to decrease the stroke, the locking knob 131 is loosened as just described to permit the adjusting knob 125 to be turned. This knob 125 when turned in the direction of the arrow, as indicated in Fig. 4, causes the pinion 122 associated with the knob 125, and which is in mesh with the toothed rack on the adjusting lever 117 to rock the lever about its pivot 118 and move the bifurcated end which straddles the stud 127 downward. This movement of the end of the lever 117 also moves the stud 127 down and as the bushing 133 is supported on the stud 127 it moves down in the slot 116 in the leg 115 of the rocker arm 38. This movement of the stud 127 and its supported bushing 133 in the slot 116 increases the distance between the horizontal slidable pivoted center of the rocker arm 38 and the fixed locking center, which in this case is the stud 127. This increase of distance between the pivoted centers 39 of the rocker arm 38 intermediate of its ends, and the fixed locking center or stud 127 about which the bushing 133 supported thereon rocks, decreases the distance that the upper end of the rocker arm 38 tilts from left to right, and vice versa, and as the distributing bar 112 is secured to the shoe 149, which is associated with this tilting end of the rocker arm 38, the distance that the distributing bar 112 travels from left to right and from right to left is decreased.

From the above description, it is readily apparent that the distributing bar 112 is provided with adjusting means for accurately adjusting the length of its stroke, and it is also apparent from the description that the adjusting means is micrometric in that it provides an infinite number of adjustable positions for the fixed locking center or stud 127 to provide an infinite number of length of travel of the distributing bar 112. When an adjustment of the distributing bar is obtained for a certain

length of coil to be wound, the locking knob 131 is again tightened to clamp the stud 127 in its adjusted position in the slot 129 in the housing 2, to maintain the adjustment. From this it is apparent that the machine of my invention is adaptable for various lengths of coils, and that it is a simple matter to change the stroke or distance of travel of the distributing bar 112 by this simple adjusting means without the necessity of changing gears or substituting cams provided with different pitch cam faces.

Spools, such as are illustrated in dotted line in Fig. 4, upon which the convolutions of wire are wound, are provided with spool heads between which these convolutions of wire are wound to form the electromagnet. The distance between the spool heads must at all times be fairly constant, as a certain number of convolutions of wire in layers must be placed on the spool between the spool heads for a coil of a predetermined ohmic resistance. Now, it often happens, due to the inaccuracies in manufacture, the distance between the spool heads varies slightly, and as a predetermined number of convolutions of wire must be placed thereon, if no provisions were made for adjusting the distributing bar 112 to overcome this, it may be readily seen that if the distance between the spool heads was a trifle over its fixed predetermined dimensions, that there would be a slight space between the inner faces of the spool heads and the layers of wire on the spool, permitting these unsupported ends to loosen, whereas, if this distance is below its fixed predetermined dimension, the first few end turns of each end of the layers would pile up and form a bulge at each end of the coil, which would be magnified as each successive layer is placed thereon. With the adjustable means for giving the distributing bar 112 an infinite number of lengths of travel from left to right, and right to left, it is readily apparent that after the first layer of convolutions of wire are placed on the spool, the operator can readily observe either of these discrepancies, and in either case, the operator may adjust the distributing bar 112 to increase or decrease the distance of travel from left to right, and vice versa, to overcome this variance of distances between the spool heads by the simple adjusting means which includes the knob 125 and its associated lever 117.

It sometimes happens that the distance between the spool heads is constant, but, due to the manufacturing inaccuracies, the heads are placed at varying distances along the core of the spool, so that when they are clamped in the chuck C, the first layer when wound on the core will reveal this discrepancy, and I provide the adjustable means associated with the distributing arm 172 so that the operator by turning the knob 117 of the threaded pin 169 will move the plate 160 slidably supported on the distributing bar 112, and its pivotally supported distributor arm 172, as a whole, to the right or left, as the case may be, to center the spool with relation to the distributor arm 172, so that the convolutions will be placed thereon the full distance between the spool heads without a piling up at one end of the core and a space between the end of the layer and the face of the spool head, as would be the case if this adjustment were not provided.

From the foregoing it is readily apparent that the rotation of the drive shaft not only causes the winding of convolutions of wire upon the magnet spool, but also causes the movement of the distributor member back and forth, and that the mechanism for accomplishing this result is very compact and enclosed in a casing away from dust and injury.

If it is desired to place a different number of convolutions of wire on the spool, all that is necessary to do is to change the gearing ratio between the drive shaft and the distributing member. It will be noted that the arm 61 is provided with a slot so that different size gears may be secured to this arm in mesh with gears 59 and 56.

The rotation of the drive shaft also transmits motion to the gears associated with the counter mechanism thereby causing the hands of the counter to visualize the number of revolutions of the driving shaft. The counter mechanism is all enclosed in a housing or casing, and is so situated that the visualizing mechanism of the counter device is immediately before the operator of the winding machine.

As before mentioned, the operator can change the distance of travel of the feeding mechanism while the winding machine is in operation, and the operator can also adjust the distributing mechanism to feed further to the right or left while the machine is in operation.

While I have described one particular embodiment of my invention, it is to be understood that the same is not limited to the specific disclosure, but is to cover all the changes and modifications that come within the scope of the appended claims.

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

1. A winding machine comprising an enclosing casing, a winding spindle and a distributing member extending therefrom, means attached to and enclosed within said casing for transmitting motion from said winding spindle to said distributing member to cause a reciprocating movement thereof, said means including a cam shaft and a cam member secured thereto and a sliding

member on said cam shaft associated with said cam member for moving said distributing member in its reciprocating movement, and adjusting means extending without the casing for regulating the reciprocating movement of said distributing member while said machine is in operation.

2. A winding machine comprising an enclosing casing, a winding spindle and a distributing bar extending therefrom, means attached to and enclosed within said casing for transmitting motion from said winding spindle to said distributing bar to cause said distributing bar to travel from left to right and vice versa, said means including a cam shaft and a cam member secured thereto and a sliding member on said cam shaft associated with said cam member for moving said distributing bar, and adjusting means for regulating the extent of travel to the left and right of the distributing bar.

3. A winding machine comprising an enclosing casing, a spindle extending across said casing, driving means connected to one end of said spindle, a distributing member parallel with said spindle extending from said casing, means enclosed within said casing for transmitting motion from said spindle to said distributing member, said means including a cam shaft and a cam secured thereto and a sliding member on said cam shaft associated with said cam member for causing to and fro movement of said distributing member, and a revolution counter mechanism enclosed within said casing and associated with said spindle.

4. A winding machine comprising an enclosing casing, a winding spindle extending across said casing, driving means connected to one end of said spindle, coil supporting means connected to the other end of said spindle for securing a coil to said spindle, a distributing member parallel with said winding spindle extending from said casing, a distributer arm secured to said distributing member adjustable thereon relative to said coil, means within said casing for transmitting to and fro movement from said winding spindle to said distributing member, counter mechanism enclosed within said casing, gearing between said spindle and said counter mechanism and driven by said winding spindle for operating said counter mechanism.

5. A winding machine comprising an enclosing casing, a winding spindle extending from said casing provided with driving means and means for holding a winding spool, a distributing member parallel with said winding spindle extending from said casing, a train of gearing including a worm gear and a worm on said spindle for transmitting motion to said distributing member, a distributer arm secured to said distributing member adjustable relative to said winding spool, counter mechanism enclosed within said casing, and a second worm gear associated with the worm on said spindle and gearing associated with said second worm gear for driving said counter mechanism.

6. A winding machine comprising an enclosing casing, a winding spindle extending from said casing provided with driving means and with means for chucking a winding spool, a distributing member parallel with said winding spindle, extending from said casing, a worm gear, a cam shaft and a cam secured thereto, a train of gearing including a worm on said spindle, said worm gear for operating said cam to transmit motion from left to right and vice versa, to said distributing member, a second worm gear associated with said worm, and counter mechanism and gearing associated with said second worm gear and enclosed within said casing for registering the convolutions of material placed upon a winding spool.

7. A winding machine of the class described including a winding spindle, a rocker arm, a train of gearing operatively associating said winding spindle and said rocker arm, a reciprocating member connected to said rocker arm, a cam shaft and a cam secured thereto, a sliding member on said cam shaft to which said rocker arm is pivotally secured, said cam shaft rotated through said train of gearing to cause means secured to said sliding member to follow said rotating cam to cause said rocker arm to move to cause movement of said reciprocating member.

8. A winding machine of the class described including a rotatable winding spindle, a reciprocating member, a cam shaft and a cam member secured thereto, a train of gearing for connecting said cam member with said winding spindle, a sliding member on said cam shaft and a rocker arm pivotally secured to said sliding member, a cam follower member secured to said sliding member, supporting means on said rocker arm for securing said reciprocating member thereto, said cam follower member being adapted to follow said cam member to rock said rocker arm to cause to and fro movement of said reciprocating member.

9. A winding machine of the class described including a rotatable winding spindle, a cam member, a rotatable shaft supporting said cam member, a train of gearing for transmitting motion from said winding spindle to said cam shaft, a sliding member on said cam shaft, a rocker arm pivotally secured to said sliding member, a cam follower member secured to said sliding member, and a reciprocating member secured to said rocker arm, said cam follower member being adapted to follow said cam member to move said rocker arm to cause to and

fro movement of said reciprocating member.

10. A winding machine of the class described including a rotatable winding spindle, a cam member, a rotatable cam shaft supporting said cam member, a train of gearing for transmitting motion from said winding spindle to said cam shaft, a sliding member on said cam shaft, a rocker arm pivotally secured to said sliding member, a cam follower member secured to said sliding member, a reciprocating member secured to said rocker arm, said cam follower member being adapted to follow said cam member to cause said sliding member to move to and fro along said shaft, and means for rocking said pivoted rocker arm to cause to and fro movement of said reciprocating member.

11. A winding machine of the class described including a rotatable winding spindle, driving means connected to said winding spindle, a cam member, a rotatable cam shaft supporting said cam member, a train of gearing for transmitting motion from said winding spindle to said cam shaft, a sliding member on said cam shaft, a rocker arm pivotally secured to said sliding member, a cam follower member secured to said sliding member, a reciprocating member secured to said rocker arm, and spring means for holding said cam follower in engagement with said cam to follow the said cam member to move said rocker arm to cause to and fro movement of said reciprocating member.

12. A winding machine of the class described including a rotatable winding spindle, driving means connected to said winding spindle, a cam member, a rotatable cam shaft supporting said cam member, a train of gearing for transmitting motion from said winding spindle to said cam shaft, a sliding member on said cam shaft, a rocker arm pivoted intermediate of its ends to said sliding member, an adjustable stud connected to one end of said rocker arm, a reciprocating member secured to said rocker arm, a cam follower member secured to said sliding member, and spring means for holding said cam follower in engagement with said cam to follow said cam follower to rock said rocker arm about said stud to cause to and fro movement of said reciprocating member.

13. A winding machine of the class described including a winding spindle, a rotatable cam shaft supporting a cam member, a train of gearing for transmitting motion from said winding spindle to said cam shaft, a sliding member on said cam shaft, a cam follower on said member, a rocker arm pivoted intermediate of its ends on said sliding member, an adjustable stud extending through a slot in said rocker arm, a pair of shoes supported in the other end of said rocker arm resting in channels in the casing of said machine, said cam follower in its travel along said cam causing to and fro movement of said sliding member to rock said arm about said stud to move said shoes in a to and fro movement in said channels, and a reciprocating shaft secured to one of said shoes also moving said shaft in a to and fro movement.

14. A winding machine of the class described including a winding spindle, means on one end of said winding spindle for supporting a coil, a reciprocating member, means within the casing of said winding machine for transmitting motion from said winding spindle to said reciprocating member, said means consisting of a train of gearing, a cam shaft, a cam member rotatably secured thereto, a cam follower adapted to engage said cam member to impart a to and fro movement to a slidable member supported by said cam shaft and adapted to cooperate with a rocker arm, means associated therewith for regulating the travel of said reciprocating member, adjusting means associated with said rocker arm when moved to change the distance of travel of said member in its reciprocating movement, and a distributer arm on said reciprocating member adjustable thereon relative to said coil.

15. A winding machine of the class described including a winding spindle, a cam shaft and a cam member secured thereto rotated by a train of gearing connected with said winding spindle, a sliding member on said cam shaft moved in a to and fro direction by said cam member, a rocker arm pivoted to said sliding member, an adjustable stud connected to said rocker arm and a reciprocating member also secured thereto, said rocker arm moving about said stud by the to and fro movement of said sliding member on said cam shaft to cause a predetermined movement of said reciprocating member, and means for adjusting said stud in relation to said rocker arm to increase or decrease the throw of said rocker arm to change the distance of travel of said reciprocating member.

16. A winding machine of the class described including a winding spindle, a cam shaft and a cam member secured thereto, a train of gearing for transmitting motion from said winding spindle to said cam shaft and said cam member, a sliding member on said cam shaft moved in a to and fro direction by said cam member, a stud extending through a slot in the casing of said machine and slidably secured to a rocker arm pivoted on said sliding member, locking means for locking said stud in said slot in said casing, said rocker arm rocking about said stud through the agency of the to and fro movement of said sliding member, a reciprocating

member on said cam shaft secured to said rocker arm moving through a predetermined distance in its to and fro movement, due to the rocking of said rocker arm, and means for changing the position of said stud in said rocker arm to increase or decrease the throw of said rocker arm to change the distance of travel of said reciprocating member.

17. A winding machine comprising an enclosing casing, a spindle extending across said casing, driving means connected to one end of said spindle, coil supporting means supported on the other end of said spindle, a distributing member extending through said casing, a distributing arm secured to said distributing member, and means for adjusting said arm relative to a coil in said coil supporting means.

18. A winding machine comprising an enclosing casing, a winding spindle having driving means connected to one end of said spindle, a coil supporting chuck on the other end of said spindle, a distributing member extending through said casing, a distributing arm slidably secured to said distributing member, and means for adjusting said arm relative to a coil in said coil supporting chuck.

19. A winding machine comprising an enclosing casing, a winding spindle having driving means connected to one end of said spindle and a coil supporting chuck on the other end of said spindle, a distributing member extending through said casing, a distributing arm slidably supported on said distributing member, and means secured to said distributing member associated with said distributing arm for adjusting said arm relative to a coil in said chuck.

20. A winding machine comprising an enclosing casing, a winding spindle having driving means connected to one end of said spindle and a chuck for clamping a winding spool on the other end, a distributing member extending through said casing, a distributing arm slidably supported on said distributing member, and a threaded member supported by means secured to said distributing member connected with said distributing arm for adjusting said arm relative to a winding spool in said chuck.

21. A winding machine comprising an enclosing casing, a winding spindle having driving means connected to one end of said spindle and a chuck on the other end for clamping a winding spool, a distributing member extending through said casing, a distributing arm slidably supported on said distributing member, a clamping member secured to said distributing member, a threaded pin rotatably supported in said clamping member and in threaded engagement with said distributing arm for adjusting said arm relative to a winding spool in said chuck.

22. A winding machine comprising an enclosing casing, a winding spindle having driving means connected to one end of said spindle and a chuck for clamping a winding spool on the other end, a distributing member extending through said casing, a distributing arm pivotally secured to an arm support, said arm support being slidably supported on said distributing member, a clamping member secured to said distributing member, a threaded pin rotatably supported in said clamping member and in threaded engagement with said arm support to adjust said arm support and arm as a whole to the right or left along said distributing arm relative to a winding spool in said chuck.

23. A winding machine of the character described including a rotating shaft and means at its one end for supporting a winding spool, a reciprocating distributing member operated by said shaft by means consisting of a train of gearing, a cam shaft, a cam member rotatably secured thereto, a cam follower adapted to engage said cam member to impart a back and forth movement to a slidable member supported by said cam shaft, a rocker arm cooperating with said slidable member to impart a back and forth movement to said distributing member, means for adjusting the distance of movement of said distributing member while said shaft is rotating, and means on said distributing member adjustable thereon relative to said winding spool while said member is moving.

24. A winding machine of the character described including a rotating shaft and means at its one end for supporting a winding spool, a distributing member operated by said shaft by means consisting of a train of gearing, a cam shaft, a cam member rotatably secured thereto, a cam follower adapted to engage said cam member to impart a back and forth movement to a slidable member supported by said cam shaft, a rocker arm cooperating with said slidable member to impart a back and forth movement to said distributing member, said distributing member operating to move back and forth predetermined distances, means for adjusting the distance said distributing member travels in one direction while said shaft is rotating, and means on said distributing member adjustable thereon relative to said winding spool while said member is moving back and forth.

25. A device of the character described including a rotating shaft and a chuck secured to its one end for supporting a coil, a distributing member operated by said shaft by means consisting of a train of

gearing, a cam shaft, a cam member rotatably secured thereto, a cam follower adapted to engage said cam member to impart a back and forth movement to a slidable member supported by said cam shaft, a rocker arm cooperating with said slidable member to impart a back and forth movement to said distributing member, said distributing member operating to move back and forth pre-determined distances, means for adjusting the distance said distributing member travels in one direction while said shaft is rotating, and means on said distributing member adjustable relative to said coil while said member is moving back and forth, said mechanism being enclosed in a dust-proof housing.

26. A winding machine of the character described including a dust-proof housing, a rotating shaft extending through said housing and a chuck secured to its one end for supporting a winding spool, a distributing member slidably supported in said housing and extending within said housing, means associated with said shaft and said distributing member adapted to move said member to and fro pre-determined distances, said means consisting of a train of gearing, a cam shaft, a cam member rotatably secured thereto, a cam follower adapted to engage said cam member to impart a to and fro movement to a slidable member supported by said cam shaft and cooperating with a rocker arm to impart a to and fro movement to said distributing member, means without said housing for determining the distance said distributing member will move in one direction and an arm on said member adjustable relative to said coil without effecting the distance of travel of said member.

27. A winding machine of the class described including a dust-proof housing, a rotary shaft extending without said housing, means secured to one extending end for supporting a winding spool, a distributing member operated by said shaft and extending within said housing, said distributing member adapted to move to and fro predetermined distances, a train of gearing, a cam shaft, a cam member rotatably secured thereto, a cam follower adapted to engage said cam member to impart a to and fro movement to a slidable member supported by said cam shaft and cooperating with a rocker arm to move said distributing member to and fro, adjusting means within said housing but extending without said housing for adjusting the length of the path of travel of said distributing member, and an arm on said member movable relative to said winding spool independent of the adjustment of said member.

28. A winding machine of the character described including a dust-proof housing, a rotary shaft extending without said housing, a distributing member secured to a shaft extending within said housing, a rocker arm having its one end linked to said distributor member and a pivot adjustably secured to its other end, an arm member pivoted intermediate of its ends having its one end linked with said adjustable pivot of said rocker arm, a pinion supported by said housing and meshing with a toothed rack on the other end of said arm member, and means for rotating said pinion to rock said arm member to change the pivotal point of said rocker arm for regulating the length of travel of the distributing member, and adjusting means for determining the distance the distributing member will move in one direction.

29. A winding machine of the character described including a dust proof housing, a rotary shaft extending without said housing, a distributing member secured to a shaft extending within said housing, a rocker arm having its one end linked to said distributer member and a pivot adjustably secured to its other end, an arm member pivoted intermediate of its ends having its one end linked with said adjustable pivot of said rocker arm, a pinion supported by said housing meshing with a toothed rack on the other end of said arm member to change the pivoted point of said rocker arm for regulating the length of travel of the distributing member, and adjustable means for determining the distance the distributing member will move in one direction, both of said adjusting means being operable while said shaft is rotating.

Signed by me at Chicago, in the county of Cook, and State of Illinois, this 14th day of October, 1924.

MARTIN B. GROUT.