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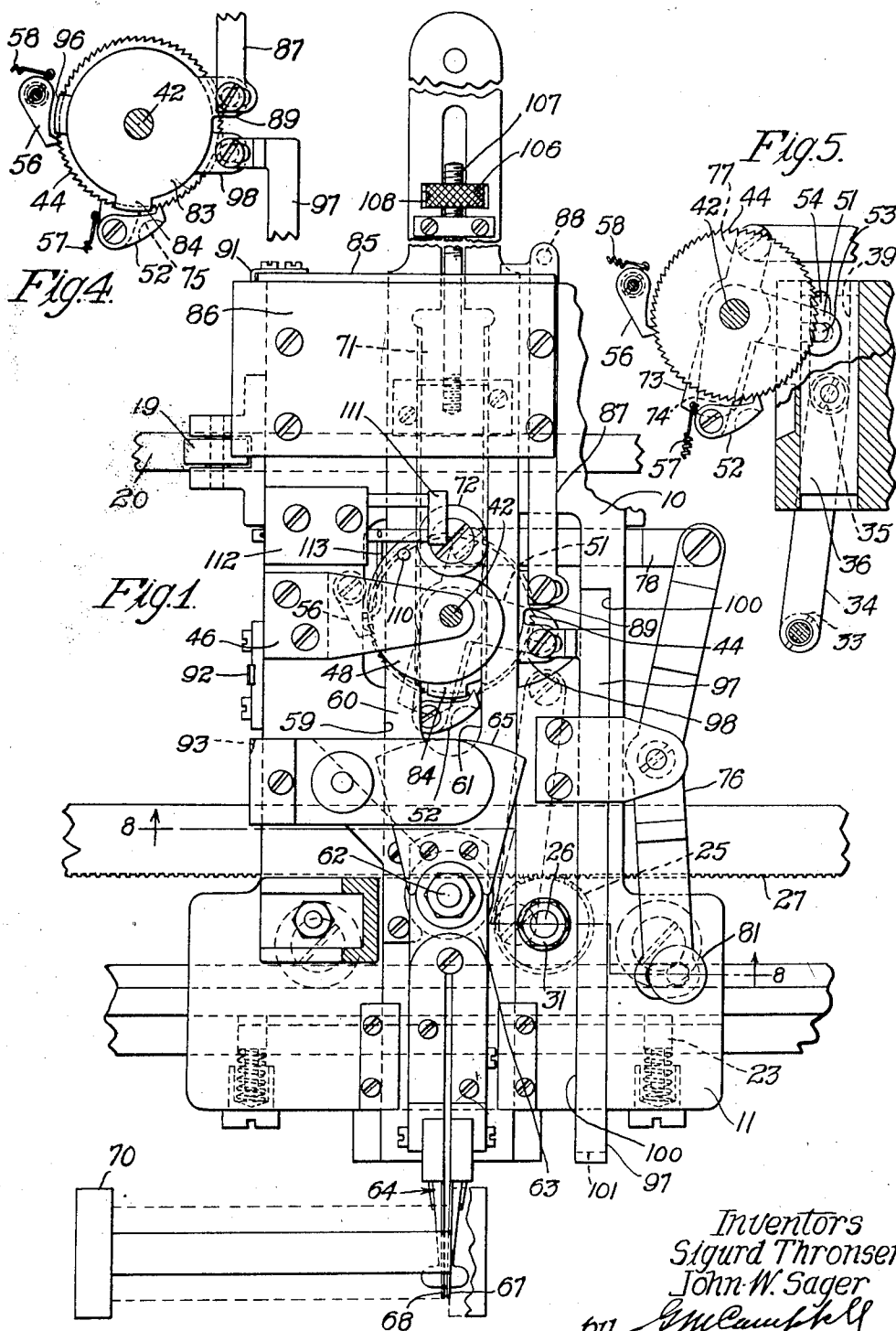
S. THROSEN ET AL

1,471,634

SEMI-AUTOMATIC WINDING MACHINE

Filed Aug. 5, 1921

3 Sheets-Sheet 1



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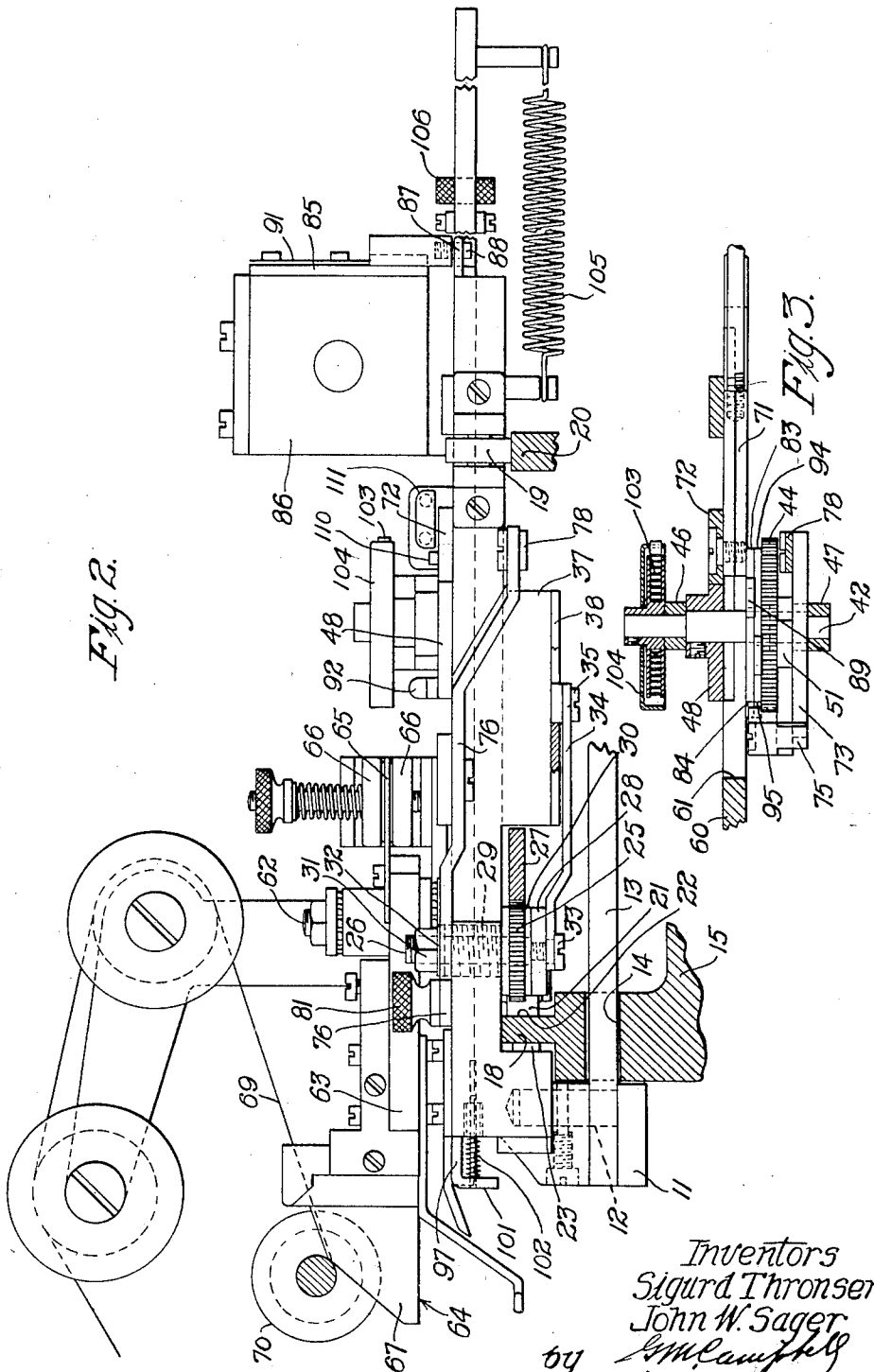
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3 Sheets-Sheet 2



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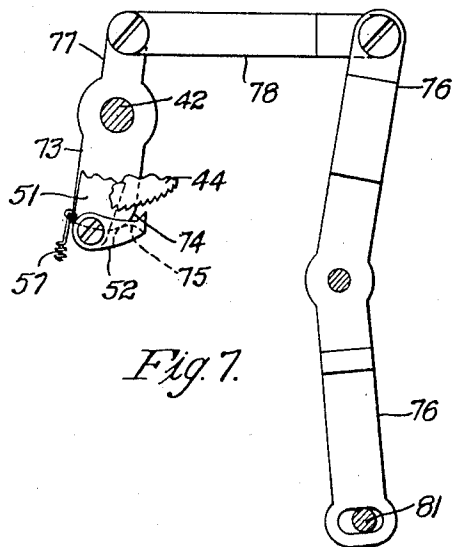
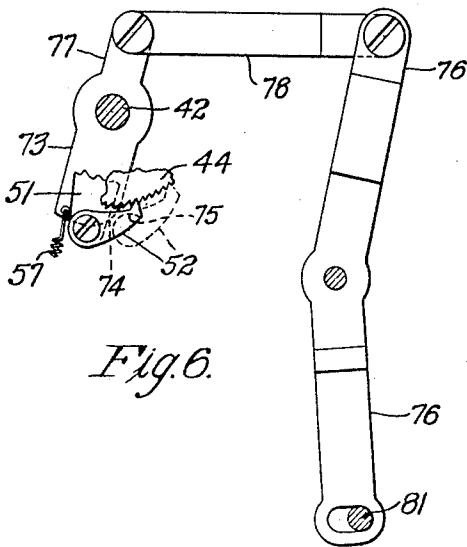
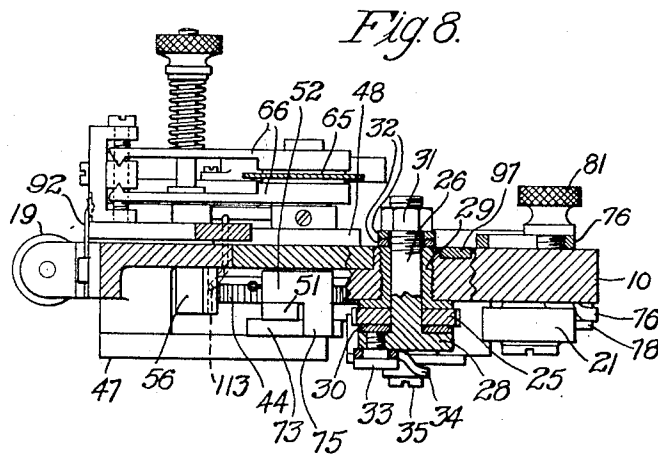
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S. THROSEN ET AL

SEMI-AUTOMATIC WINDING MACHINE

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE.

SIGURD THRONSEN AND JOHN WILLIAM SAGER, OF CHICAGO, ILLINOIS, ASSIGNORS
TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A COR-
PORATION OF NEW YORK.

SEMIAUTOMATIC WINDING MACHINE.

Application filed August 5, 1921. Serial No. 489,954.

To all whom it may concern:

Be it known that we, SIGURD THRONSEN and JOHN WILLIAM SAGER, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Semiautomatic Winding Machines, of which the following is a full, clear, concise, and exact description.

This invention relates to semi-automatic winding machines, and more particularly to a feeding device to be used with such machines. The invention is especially adapted for use with the winding machine shown and described in U. S. Patent to Arthur H. Adams No. 1,117,620 issued November 17, 1914.

The object of the invention is to provide an improved wire feeding means which will automatically serve and lay the wire on the winding spool or bobbin in uniformly even, smooth layers.

The invention in general consists in improved mechanical means for maintaining a constant spaced relationship between the wire feeding arm and the last layer of wire on the spool, the distance between the feeding arm and the wire on the spool being such that it merely allows clearance space for the rotation of said spool.

In the drawings:

Fig. 1 is a partial plan view of the wire feeding mechanism embodying the invention;

Fig. 2 is a complete side elevation thereof;

Fig. 3 is a partial vertical sectional elevation of the mechanism for retracting the wire guarding means from the spool spindle;

Fig. 4 is a plan view of the ratchet pawl releasing cams with their operating links shown partially;

Fig. 5 is a plan view of the means for actuating the driving pawl and the adjustable cam which regulates the effective stroke thereof with their operating connections shown partially;

Fig. 6 is a plan view of the regulating means for the cam which regulates the effective stroke of the driving pawl shown set for a maximum stroke;

Fig. 7 is a similar view but set for a shorter stroke, and

Fig. 8 is a vertical sectional view taken on the line 8—8 of Fig. 1.

The driving elements for the spool to be wound and the mechanism for reciprocating the arm which feeds the wire across the spool while it is rotating and for adjusting the lead of the arm are identical with that disclosed in U. S. Patent No. 1,117,620 and consequently will not be illustrated and described in this application.

In the drawings 10 represents a base plate of the wire feeding mechanism upon which is a head block 11. Loosely mounted in the head block 11 by a suitable pin indicated at 12 in dotted lines in Fig. 2 is a reciprocating arm 13 which in its reciprocation back and forth operates in a suitable slot 14 formed in the frame 15 of the winding machine. The forward end of the base plate 10 slides on a track or runway 18 formed on the frame 15 and at its rear end is equipped with rollers 19 suitably secured at each side, which rollers ride on a second track or runway 20 formed on the frame 15. At the forward end of the base plate near the sides and on the bottom thereof are guide rollers 21 which roll against a vertical face 22 of the track 18, thereby locking the base plate against longitudinal displacement on the frame 15. Spring pressed pins 23 are mounted in the base plate 10 and bear against the track 18 opposite to the rollers 21.

A gear 25 carried on the bottom of the base plate and loosely mounted on a stud 26 meshes with a stationary rack 27 secured to the frame 15 of the winding machine. The stud 26 has formed at one end a disk 28, the other end passing through a flanged bushing 29 screw threaded into the base plate and flush with the upper face thereof. Positioned between the disk 28 and the bottom face of the gear 25 is a suitable friction member 30 preferably of leather. Screw threaded to that end of the stud 26 which projects above the upper face of the base plate is a nut 31 with split washers 32, 32 therebetween.

By adjusting the nut 31 and thereby the split washers 32, 32 the friction between the gear 25 and the stud 26 (the purpose of which will be described later in this specification) can be regulated. Eccentrically

mounted on the disk 28 by a shouldered stud 33 is a link 34 which is connected by a stud 35 to a slide 36 carried in a housing 37 formed in the base plate 10. Secured to the under side of the housing 37 and between the slide 36 and the link 34 is a cover and guide plate 38 provided with a slot 39 which limits the movement of the gear 25 through the connecting link 34 to a one-half revolution on its stud 26 for each reversal of movement of the wire feeding mechanism. As the wire feeding mechanism moves to one side the gear is caused to revolve through its engagement with the stationary rack 27 and through the friction member 30 positioned between the disk 28 and the gear 25 the disk 28 revolves and thereby causes the slide 36 to move through its connection with the link 34. When the stud 35 reaches the end of the slot 39 in the guide plate 38 a slippage will occur between the gear 25 and the disk 28, thereby allowing the gear 25 to continue to rotate in the same direction until the mechanism is reversed. Keyed to the lower end of a shaft 42 positioned centrally of the base plate 10 is a ratchet wheel 44. The shaft 42 passes through a suitable slot formed in the base plate and is secured in position by suitable shoulders formed on its ends bearing against upper and lower bearing plates 46 and 47 secured to the base plate. Secured to the shaft 42 above the ratchet 44 with its lower face flush with the top surface of the base plate is a cam 48. Loosely mounted on the shaft 42 at the under side of the ratchet is a bell crank lever 51, the long arm of which carries a pawl 52 while the shorter arm thereof has secured thereto a pin 53 which engages a slot 54 formed in the slide 36. Suitably secured to the under face of the base plate is a retaining pawl 56. The pawls 52 and 56 are connected with suitably mounted springs 57 and 58 for normally holding them in engagement with the teeth on the ratchet.

Slidably mounted in a slot 59 formed centrally in the top surface of the base plate is a slide or plate 60 which is provided with a slot 61 through which passes the shaft 42. Pivottally mounted on the slide 60 by means of a pin 62 is a laterally adjustable plate 63 which has secured thereto at its forward end a wire guiding arm 64. Attached to the rear end of the plate 63 is a friction plate 65 which is held between a pair of oil saturated felt pads attached to plates 66, which are suitably secured to the slide 60. The purpose of the friction plate is the same as that described in U. S. patent to Sigurd Thronsen, 1,367,999, issued February 8, 1921.

The arm 64 comprises a pair of thin relatively flexible plates 67 and 68 which are exactly similar in shape and size and be-

tween which the wire 69 travels as it is wound on a spool 70. Loosely mounted on an auxiliary slide 71 (the purpose of which will be described later) and carried in suitable guideways formed in the slot 61 of the slide 60 at the rear of the cam 48 and always in engagement therewith is a cam roller 72. As the ratchet 44 is stepped forward by the pawl 52 the cam 48 is also advanced a corresponding distance and thereby the slide 60 will be given a rearward movement depending upon the movement given the ratchet 44 by the pawl 52. To permit adjustment of the mechanism whereby the plates 67 and 68 may be stepped back different distances for wires of various diameters an adjusting cam lever 73 is provided. The cam lever 73 is carried loosely on the hub of the bell crank lever 51 and rests on the lower bearing plate 47. A cam surface 74 on the lever 73 is engaged by a lug 75 projecting downward from the pawl 52 when the pawl is stepped rearward over the teeth on the ratchet, which engagement swings the pawl about its pivot thereby disengaging it from the ratchet. As clearly shown in Figs. 7 and 8, the lever 73 may be set so as to disengage the pawl from the ratchet so that the pawl will not feed the ratchet forward, or it may be set to feed the ratchet various distances by turning a suitably pivoted lever 76 which is connected with a short arm 77 of the lever 73 through a link 78.

By turning the lever 76 about its pivot in a clock-wise direction, the cam surface on the lever 73 will be moved further away from the lug 75 on the pawl 52, thereby allowing the pawl to move rearward a greater distance during the time after that end of the connecting link 33, which is connected to the disk 28, has moved one-half of the distance it travels during the winding of one layer of wire on the spool 70, and causing the pawl to more quickly engage the teeth of the ratchet 44 whereby the ratchet will be stepped forward a correspondingly greater distance. If the lever 76 is turned in a counter clock-wise direction the cam surface on the lever 73 will be moved nearer the lug 75 and consequently when the pawl is being moved rearward the lug 75 will come into engagement with the cam surface and disengage the pawl from the ratchet before it reaches its extreme rearward position with the result that the effective movement of the pawl when it is moved forward at the next reversal of the mechanism will be shortened. A thumb nut 81 is provided for locking the lever 76 in its set position. At times in the winding of a coil it is necessary to stop the winding machine to make a splice in the wire, and at this time it is necessary that the wire feeding mechanism be movable sideways without advancing the ratchet. Mount-

ed loosely on the shaft 42 and above the ratchet 44 is a disk 83 provided with a peripherally extending lug 84 which is adapted to be brought into engagement with the

- 5 pawl 52 to disengage it from the ratchet by the release of an armature 85 of a magnet coil 86 inserted in the circuit of the winding machine when the circuit is opened to stop the machine. (See Figs. 3 and 4).
 10 The coil 86 is suitably secured to the base plate 10 at the rear thereof and its armature 85 is connected to one end of a link 87 by a pin 88. The opposite end of the link 87 is connected with a lug 89 formed on the
 15 disk 83. When the circuit is opened the armature is released and is moved outwardly by a leaf spring 91, which movement through the link 87 turns the disk 83 in a counter clock-wise direction to move the lug
 20 84 thereon into engagement with the pawl 52 to disengage it from the ratchet 44.

- The wire feeding mechanism may now be moved sideways to make a splice or for any other reason, without advancing the ratchet
 25 and consequently the position of the slide 60, and when the circuit is closed the armature will be attracted, which will move the disk back to its original position, thereby allowing the pawl 52 to engage the ratchet
 30 44. At this time the slide 60 may, for convenience when splicing, be moved rearward and held in this position during the splicing by the action of a leaf spring 92 mounted on the base plate 10 engaging a
 35 suitable surface 93 formed on the support for the plates 66 carried by the slide 60. (See Figs. 1 and 2). The retaining force of the spring 92 counteracts the force of a spring provided for drawing the slide 60 forward.

- 40 After winding a coil it is necessary to release the pawl 52 and 56 from the ratchet to allow the slide 60 to be brought forward so that the wire guiding plates 67 and 68 may be properly set for the next coil to be
 45 wound. Carried loosely on the shaft 42 directly below the disk 83 is a second disk 94 provided with a pair of peripherally extending lugs 95 and 96, which are adapted to be brought into engagement with the pawls
 50 52 and 56 respectively to disengage them from the ratchet 44 by the movement of a slide 97. The slide 97 is connected at its rear end to a lug 98 formed on the disk 94, and its forward end extends a short distance
 55 forward of the base plate 10 and is guided in a suitable guide-way 100 formed in the top surface of the base plate. The forward end of the slide 97 is bent downward to form a lip 101 which has suitably mounted
 60 between it and the end face of the base plate a spring 102 adapted to return the slide to its normal position after its release. A clock spring 103 with its inside end suitably connected to the shaft 42 and its out-
 65 side end fastened to a stationary housing 104

functions to return the cam 48 to its initial position when both ratchet pawls are disengaged. At the same time a tension spring 105, one end fastened to a downwardly projecting pin secured to the slide 60 with its
 70 other end secured to a pin projecting from the under side of the base plate 10, functions to return the slide 60 with the wire guiding plates 67 and 68 carried thereby back to their initial position. When a
 75 spool is placed in the machine to be wound, the wire guiding plates 67 and 68 are moved a proper distance from the core of the spool by means of an adjusting nut 106.

The adjusting nut 106 is threaded onto one
 80 end of a rod 107, the opposite end of which is secured to the auxiliary slide 71 carried on the slide 60, which slide carries the cam roller 72. The nut 106 is positioned in an opening 108 formed in the slide 60, and by
 85 turning the nut 106 on the threaded rod 107 in one direction or the other the cam roller 72 carried on the slide 71 will be held stationary against the cam 48, due to the action
 90 of the spring 105, with the result that the slide 60 will be moved forward or backward, thereby carrying the plates 67 and 68 closer or further away from the core of the coil to be wound.

Projecting from the upper face of the
 95 cam 48 and at the high point thereof is a pin 110 which engages a suitably spring pressed plunger 111 mounted in a support 112 which is carried on the base plate 10. The plunger 111 carries a forwardly and
 100 downwardly projecting pin 113 (see Figs. 1 and 8), which when the plunger 111 is moved against the action of its spring moves the retaining pawl 56 about its pivot and disengages it from the ratchet 44. The purpose
 105 of the plunger 111 and the pin 110 is to act as a safety device in case the motor of the winding machine is switched on accidentally or intentionally and is not stopped as is done in the normal operation there-
 110 of when a spool is completely wound. With the pin 113 disengaging the pawl 56 from the ratchet 44 the driving pawl 52 will continue to move, but the ratchet will not be
 115 advanced and thereby no damage will result from the continued operation of the pawl 52.

The operation of the wire feeding mechanism is as follows:

The lead of the reciprocating arm 13 is
 120 adjusted for the diameter of the wire which is to be wound and the circuit changing devices are set for the length of the spool on which the wire is to be wound, as is done in the above mentioned patent. The distance
 125 which the wire guiding plates 67 and 68 are stepped back during the movement of the mechanism from one side to the other, which distance is governed by the diameter of the wire, is adjusted by loosening the
 130

thumb nut 81 and swinging the lever 76 in one direction or the other, which will move the cam surface 74 closer or further away from the lug 75 on the pawl 52, thereby regulating the effective stroke of the pawl 52 for turning the ratchet. The wire guiding plates are brought the proper distance from the core of the spool to be wound by turning the nut 106. By closing the circuit of the winding machine in starting it the armature 85 is moved inward by the magnet coil 86 which moves the lug 84 from engagement with the driving pawl 52 and allows it to engage the ratchet 44.

As the wire feeding mechanism moves to one side the gear 25 is revolved by its engagement with the stationary rack 27, and due to the friction member 30 positioned between the gear and the disk 28 and the slot 39 in the plate 38, the disk 28 is turned one half of a revolution. During the first half of this movement the pawl 52 (which is connected to the disk 28) turns the ratchet 44, which through the cam 48 carried on the same shaft, cam roller 72, and slide 60 causes the wire guiding plates 67 and 68 to be stepped back a distance equal to the diameter of the wire being wound. During the second half of the movement of the disk 28, while the mechanism is moving to one side, the pawl 52 is moved backward on the ratchet 44 the same distance which the ratchet was advanced during the first part of the movement preparatory to the next reversal of the wire winding mechanism. When the coil has been wound with the required number of layers of wire the circuit of the winding machine is opened and the spool removed and an empty spool put in position. At this time the wire guiding blades 67 and 68 have been halted at their extreme rearward movement in guiding the last layer of wire on the spool just finished, and it is necessary to bring them forward for their proper setting for the winding of the next spool. By pushing the slide 97 rearward, the pawls 52 and 53 are disengaged from the ratchet 44 by the lugs 95 and 96 and thereafter the clock spring 103 returns the ratchet and the cam 48 to their initial position. This movement of the cam 48 allows the slide 61 with the wire guiding blades 67 and 68 to return to their forward position through the engagement of the cam 48 with the roller 72 and the action of the spring 105. After the plates 67 and 68 have been positioned the proper distance from the core, the circuit is closed and the operation of the machine will be the same as for the spool previously wound.

What is claimed is:

1. In a winding machine, the combination of a rotatable spindle, a wire guiding means, means for moving said means longitudi-

nally of said spindle, and mechanically actuated mechanism actuated by the longitudinal movement of said guiding means for successively retracting said guiding means from the spindle a predetermined amount.

2. In a winding machine, the combination of a rotatable spindle, a wire guiding means, means for moving said means longitudinally of said spindle, mechanism for retracting said guiding means from the spindle a predetermined amount, and means including a frictionally operated device controlled by the longitudinal movement of said guiding means to actuate said retracting mechanism.

3. In a winding machine, the combination of a rotatable spindle, a wire guiding means, means for moving said means longitudinally of said spindle, a pawl and ratchet mechanism for retracting said guiding means from the spindle a predetermined amount, and means actuated by the longitudinal movement of said guiding means to actuate said pawl and ratchet mechanism.

4. In a winding machine, the combination of a rotatable spindle, a wire guiding means, means for moving said means longitudinally of said spindle, a pawl and ratchet mechanism for retracting said guiding means from the spindle a predetermined amount, a co-operating rack and gear associated with and relatively operated through the longitudinal movement of said guiding means to actuate said pawl and ratchet mechanism, and means controlled by the relative movement of said rack and gear for actuating said pawl and ratchet mechanism.

5. In a winding machine, the combination of a rotatable spindle, a wire guiding means, means for moving said means longitudinally of said spindle, a pawl and ratchet mechanism for retracting said guiding means from the spindle, means for regulating the effective movement of said pawl and ratchet mechanism whereby the amount of retraction of said guiding means may be varied, and means controlled by the longitudinal movement of said guiding means to actuate said pawl and ratchet mechanism.

6. In a winding machine, the combination of a rotatable spindle, a wire guiding means, means for moving said means longitudinally of said spindle, a pawl and ratchet mechanism for retracting said guiding means from the spindle, an adjustable member adapted to be set to engage the driving pawl at various points in its movement whereby the effective movement thereof may be varied and consequently the amount of retraction of said guiding means, and means controlled by the longitudinal movement of said guiding means to actuate said pawl and ratchet mechanism.

7. In a winding machine, the combination

of a rotatable spindle, a wire guiding means, means for moving said guiding means longitudinally of said spindle, mechanism for retracting said guiding means from the spindle a predetermined amount during the longitudinal movement thereof, and means associated with said guiding means and said moving means and actuated upon the stopping of the longitudinal movement thereof whereby said guiding means may be moved manually in a longitudinal direction without a further retraction thereof from the spindle by said retracting mechanism.

8. In a winding machine, the combination of a rotatable spindle, a wire guiding means, means for moving said guiding means longitudinally of said spindle, a pawl and ratchet mechanism for retracting said guiding means from the spindle a predetermined amount during the longitudinal movement thereof, means controlled by the longitudinal movement of said guiding means to actuate said ratchet and pawl mechanism, means including an electromagnet associated with said guiding means and said moving means and actuated upon the stopping of the longitudinal movement thereof to disengage the driving pawl from the pawl and ratchet mechanism whereby said guiding means may be moved manually in a longitudinal direction without a further retraction thereof from the spindle by said pawl and ratchet mechanism.

9. In a winding machine, the combination of a rotatable spindle, a wire guiding means, means for moving said means longitudinally of the spindle, and stepping means actuated by the longitudinal movement of said guiding means for successively retracting said guiding means from the spindle a predetermined amount.

10. In a winding machine, the combination of a rotatable spindle, a wire guiding means, means for moving said means longitudinally of said spindle, stepping means

for retracting said guiding means from said spindle a predetermined amount, and means actuated by the longitudinal movement of said guiding means to actuate said stepping means.

11. In a winding machine, the combination of a rotatable spindle, a wire guiding means, a device to detract said guiding means a predetermined amount, and means comprising a frictionally actuated stepping means for operating said retractive means.

12. In a winding machine, the combination of a rotatable spindle, a wire guiding means, means for moving said means longitudinally of said spindle, means actuated by the longitudinal movement of said guiding means for retracting said guiding means a predetermined amount, and a safety means to prevent actuation of the retractive means beyond a certain predetermined point.

13. In a winding machine, the combination of a rotatable spindle, a wire guiding means, means for moving said means longitudinally of said spindle, means including a stepping means operated by the longitudinal movement of said guiding means to retract said guiding means a predetermined amount, and adjustable means for regulating the rate of retraction of said guiding means.

14. In a winding machine, the combination of a rotative spindle, a wire guiding means, means for moving said means longitudinally of said rotatable spindle, means for retracting said guiding means from said rotatable spindle a predetermined amount, and a reciprocating member actuated by said guiding means to operate said retractive means.

In witness whereof, we hereunto subscribe our names this 20th day of July A. D., 1921.

SIGURD THRONSEN.
JOHN WILLIAM SAGER.