C. E. ANDERSON.

WIRE WINDING MACHINE.

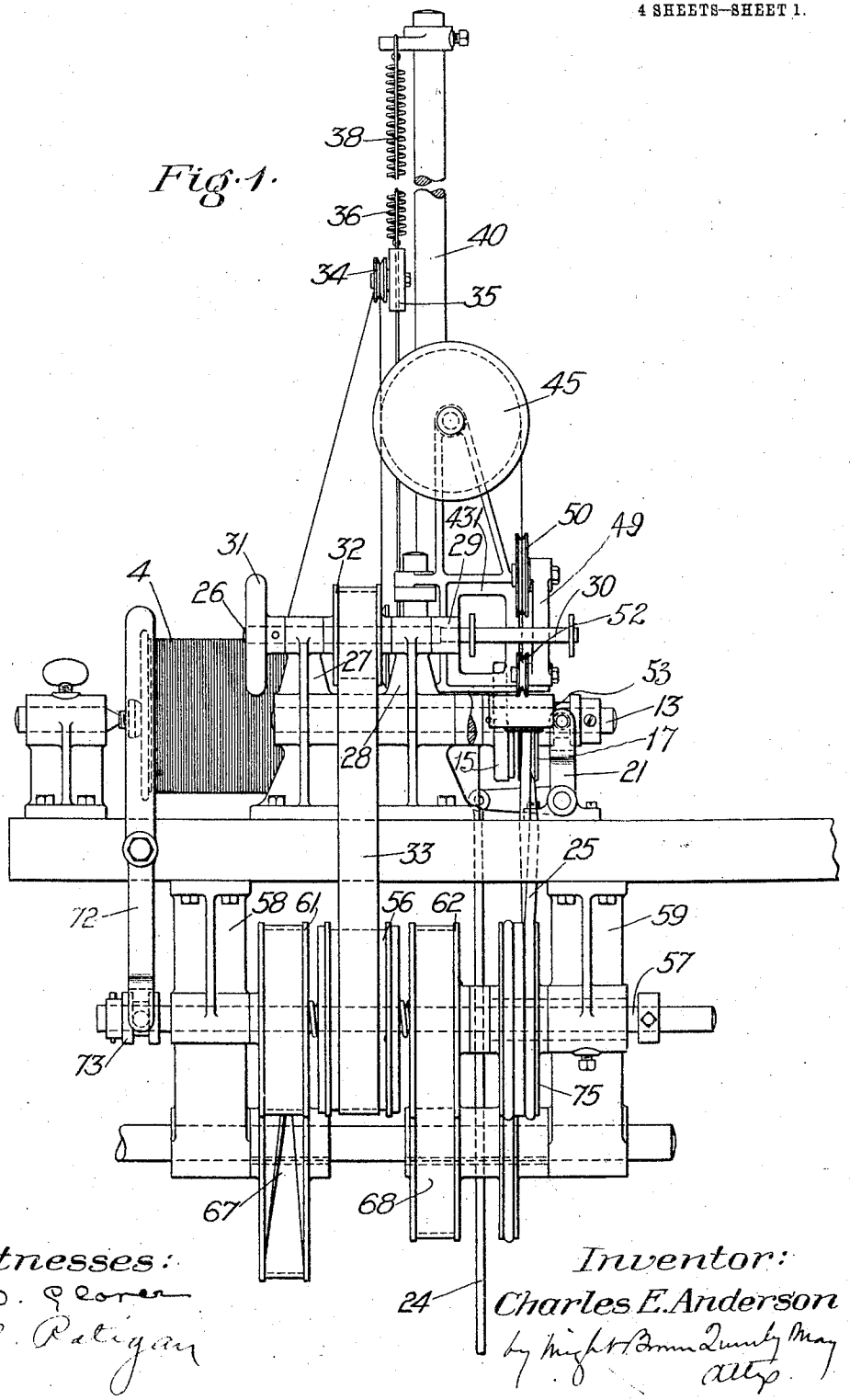
APPLICATION FILED JULY 11, 1907.

1,054,891.

Patented Mar. 4, 1913.

4 SHEETS—SHEET 1.

Fig. 1.



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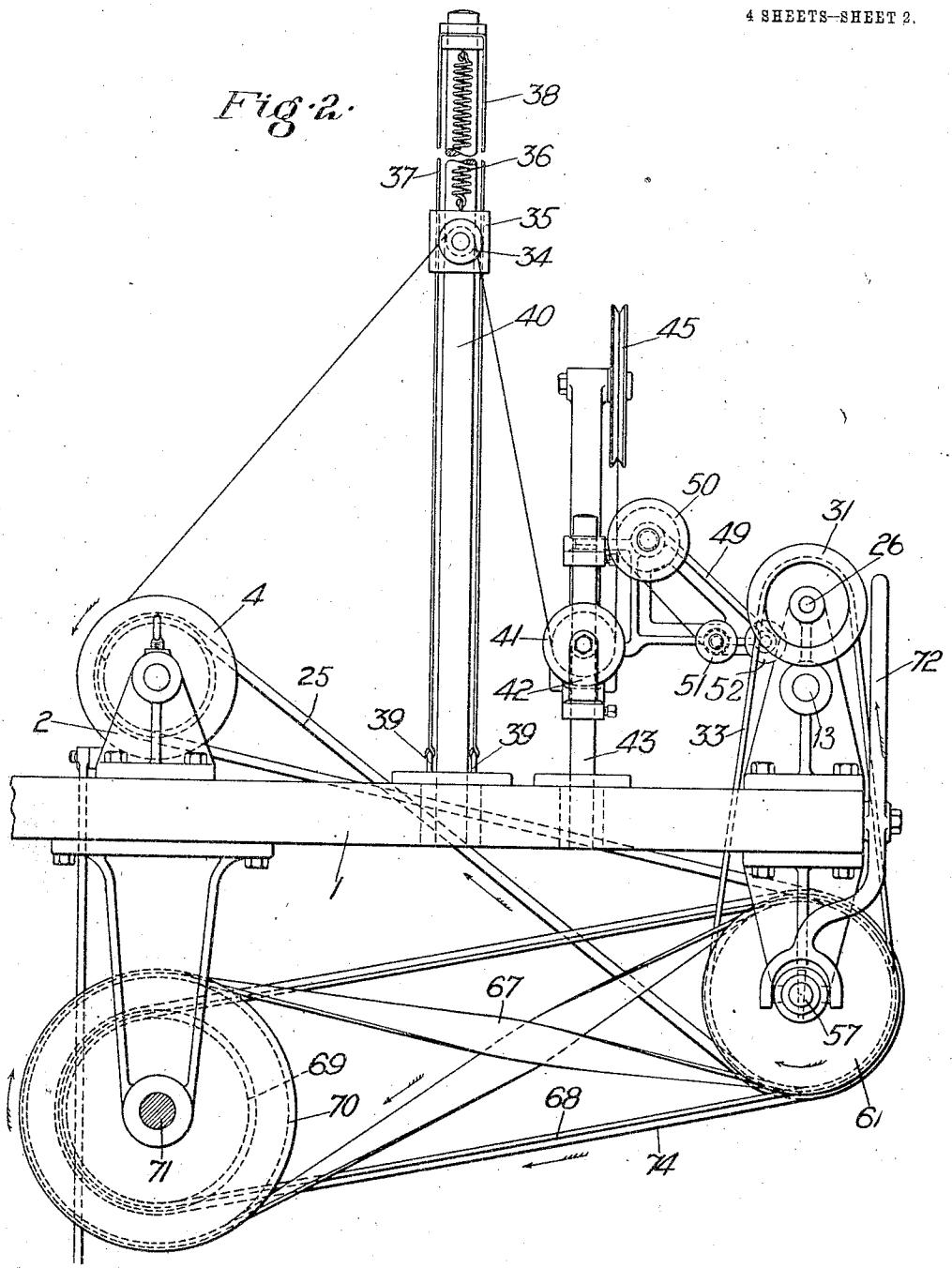
4 SHEETS—SHEET 2.

Fig. 2.



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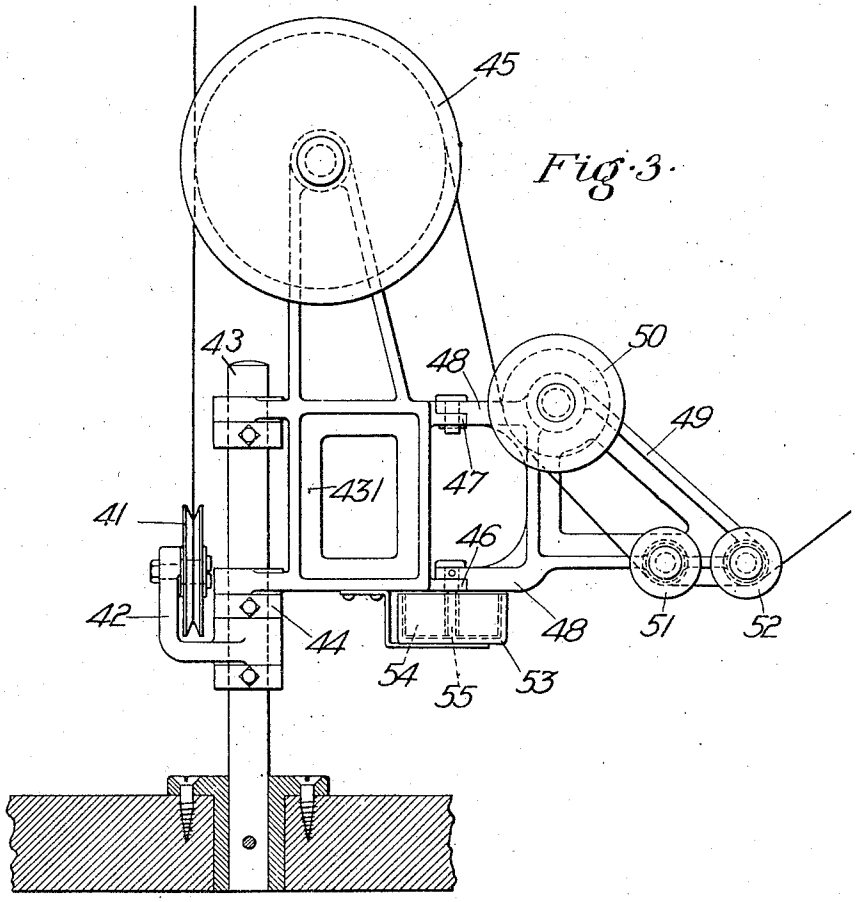


Fig. 3.

Fig. 7.

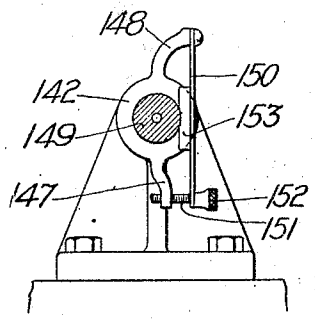
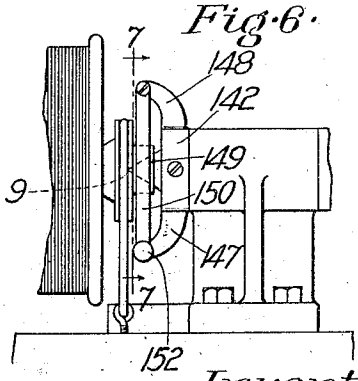


Fig. 6.



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4 SHEETS—SHEET 4.

Fig. 4

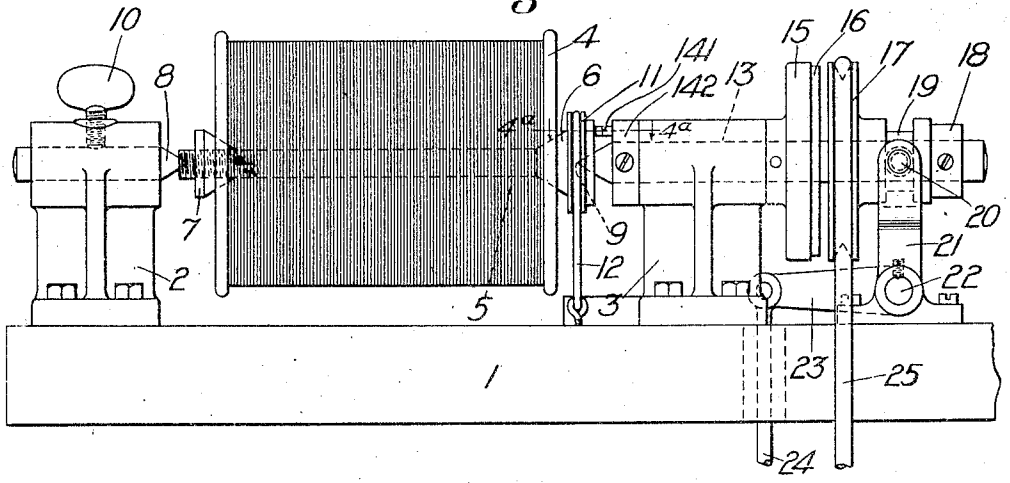


Fig. 5.

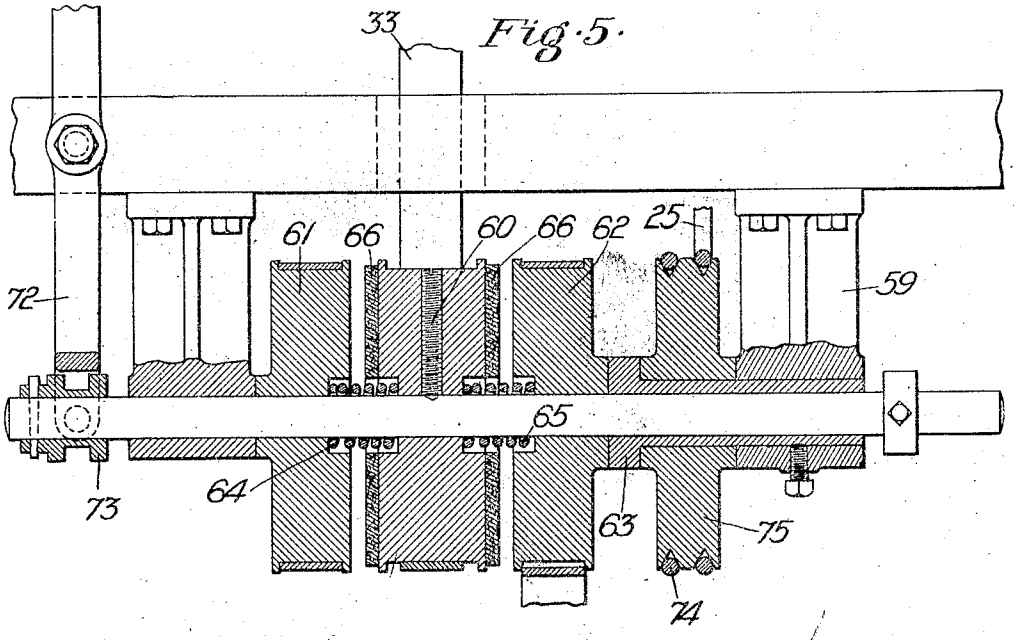
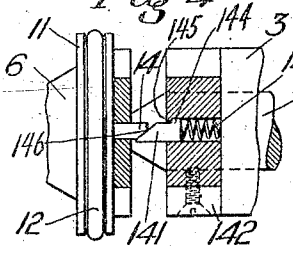


Fig. 4a.



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UNITED STATES PATENT OFFICE.

CHARLES ERASTUS ANDERSON, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO AMERICAN ELECTRICAL WORKS, OF PHILLIPSDALE, RHODE ISLAND, A CORPORATION OF RHODE ISLAND.

WIRE-WINDING MACHINE.

1,054,891. Specification of Letters Patent. Patented Mar. 4, 1913.

Application filed July 11, 1907. Serial No. 383,212.

To all whom it may concern:

Be it known that I, CHARLES ERASTUS ANDERSON, of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Wire-Winding Machines, of which the following is a specification.

This invention relates to a machine for winding magnetic spools, bobbins, coils, resistances and all similar windings where bare or insulated wire is spirally applied to a supporting core or spool.

The special object of this invention is to enable improperly wound layers of wire to be unwound from the bobbin, spool or magnet and wound up again upon the supply spool from which it was previously drawn in first being wound, and to accomplish this result without allowing the wire to become slack. This and other objects of the invention are carried into effect by the machine illustrated in the accompanying drawings and described and claimed in the following specification.

Of the drawings,—Figure 1 represents a front elevation of the machine. Fig. 2 represents a side elevation of the same. Fig. 3 represents a detail elevation of the arm for guiding the wire as the same is wound upon the spool or bobbin. Fig. 4 represents an elevation of the supply spool and the supporting and driving means for the same. Fig. 4ª represents a side elevation of one of the pins for driving the supply spool, showing the manner in which the same is mounted. Fig. 5 represents a sectional view of the under driver by which the bobbin or spool on which the wire is wound is driven in either direction and by which the supply spool may be driven reversely to re-wind wire on the supply spool and draw it from the coil-receiving bobbin. Figs. 6 and 7 represent a different form of driving device for retarding the supply spool and driving the same rearwardly.

The same reference characters indicate the same parts in all the figures.

Referring to the drawings, 1 represents a table or bench by which the parts of the machine are supported.

2 and 3 are standards which carry centers for supporting the supply spool 4 whence the wire used in making the electro-magnetic or other coil is drawn. The spool is held centrally upon an arbor or spindle 5 having a conical head 6 at one end and a tapered nut 7 threaded upon its other end, which clamp and center the spool. The arbor 5 is hung so as to rotate between the centers 8 and 9 in the standards, of which the former is adjustable and is clamped by the set-screw 10. Upon the head 6 of the arbor is mounted a pulley 11 around which passes a belt or cord 12 fastened to the bench 1 and capable of being varied in tension to exert a frictional resistance on the pulley to give the necessary tension for holding the wire taut as it is drawn from the spool.

In a bearing in the standard 3 is a shaft 13 which engages with the arbor 5 through pins 14 and 141, the former being carried by the arbor or spindle and the latter by a collar 142 fastened to the shaft 13. The pin 141 projects from the face of the collar 142 approximately parallel with shaft 18, being set in a socket in the collar and pressed outward by a spring 143. A shoulder 144 on the pin engages a lip 145 on the collar and thereby prevents the pin from being wholly expelled from the collar. The outer end of the pin 141 is beveled, while the end of the pin 14 is preferably square. These pins are equi-distant from the axis of the shaft and arbor so that when either is rotated, it will engage the other. The engagement with pin 41 occurs on the beveled face 146 thereof, and when the latter is acting as the driver, and a greater resistance is opposed by the wire than the friction which the beveled face exerts on the pin 14, the pin 141 will be forced backward against the pressure of the spring and will be thereby enabled to slip past and relieve the tension. Fastened to the shaft so as to rotate therewith is a disk 15 having on one face a frictional covering 16, and beside the disk is a pulley 17 loose on the shaft, being held thereon by a collar 18. In the hub of the pulley is a groove 19 in which enter pins 20

carried by a forked arm 21 which is fastened to a rock-shaft 22. Also mounted upon the rock-shaft is an arm 23 which is connected through a link 24 with a treadle (not shown). A spring associated with the treadle tends to raise the link, and through the arms 23 and 21, to move the pulley 17 away from the disk 15. When these parts are thus separated, the spool and shaft 13 are free to turn in the direction caused by the drawing off of the wire, but when the pulley is pressed against the frictional surface, the spool is driven by the latter in the reverse direction. A belt 25 passes over the pulley 17 and is driven in the necessary direction to turn the spool as above described.

At the front of the machine is a shaft 26 turning in bearings in the standards 27 and 28. On the shaft is a chuck 29 of any suitable description, having clamping jaws, by which is grasped one end of a magnetic core 30 or any other spool, bobbin or the like on which the wire is adapted to be wound. 31 is a hand-wheel by which the shaft and core may be turned, and 32 is a pulley over which a driving belt 33 passes for driving them by power.

Between the supply spool and the coil-receiving core 30 are guiding devices for properly leading the wire to the coil receiver. These guiding devices include a spring-controlled pulley 34 for always keeping the wire under uniform tension, preventing breakage of the wire from excessive strain and also taking up any slack which may be caused by unequal speed of the coil receiver and supply spool. The pulley 34 is rotatably mounted on a carrier block or frame 35, sustained by a spring 36 and guided upon wires 37 and 38 extending from eyes 39 on the base to the top of a supporting column 40. The spring 36 has sufficient length and flexibility to give the guide pulley a wide range of movement up and down on the wires.

After leaving the pulley 34, the wire passes over a second guide pulley 41 in the same plane therewith, which is carried by a bracket 42 on a post or column 43. On the same column is a swivelly-mounted swinging frame 431 supported by collars 44, which carries a pulley 45 over which the wire passes after leaving the pulley 41. These pulleys are so arranged that the receiving side of the former is in vertical alinement with the point where the wire leaves the latter so that there will be no danger of the wire slipping from either pulley as the frame is angularly moved. This frame carries ears 46 47 to which are pivoted arms 48 on a second swinging frame 49, which carries guide pulleys 50 51 and 52. These pulleys successively engage and lead the wire to the coil receiver after it is delivered from the pulley 45. By reason of the pivotal mounting of the frames 431 and 49, which are normally arranged at right angles to each other, a movement of the delivery pulley 52 in two directions, that is, longitudinally of the coil receiver and also toward and away from the same, is permitted. As the wire is wound upon the core, the delivery roll 52 is caused to move and to guide the wire from one end to the other thereof, causing the convolutions to lie closely side by side without kinks.

In order to steady the frame 49 and prevent its swinging excessively, I provide a deadening or retarding device consisting of a cup or tank 53 supported below the frame 431, into which extend blades or vanes 54 carried by a shaft 55 secured to the second frame or crane 49. The tank preferably contains a somewhat viscous fluid, such as heavy oil, which sufficiently deadens or retards the motion of the frame 49 to keep it from swinging appreciably after the cessation of a lateral impulse.

It will be noted that the frames 431 and 49 together constitute an articulated wire guide, of which one portion extends approximately parallel and the other perpendicular to the axis of the coil receiver. Thereby the guide is adapted to conduct the wire to its proper position on the receiver and to move away from the latter as its diameter increases, as well as to move toward the same when wire is unwound therefrom and a decrease in diameter takes place.

As before stated, the coil receiver is driven by the belt 33. This belt passes over a pulley 56 on a counter-shaft 57 which passes loosely through bearings in hangers 58 and 59 beneath the bench. The shaft is movable endwise as well as rotatable in bearings, and the pulley is securely fastened thereto so as to partake of all of its movements, the fastening means being permissibly a set-screw 60, shown in Fig. 5. Flanking the tight pulley are loose pulleys 61 and 62 contained between the hanger 58 and the end of a sleeve 63 surrounding the shaft and fixed within the hanger 59. Springs 64 and 65 are interposed between the tight pulley and the loose pulleys so as to hold the latter away from the former. Layers 66 of frictional material are contained between the adjacent faces of the pulleys.

The loose pulleys are connected by belts 67 and 68 with pulleys 69 and 70 respectively, on a main driving shaft 71. The belt 67 is crossed and the belt 68 open, so that the pulleys rotate in opposite directions. A shipping lever 72 is pivoted to the bench and has a forked end carrying pins which enter a peripheral groove in a collar 73 fixed to one end of the shaft. As will be readily apparent, swinging of the lever will move

the shaft endwise and carry the fast pulley into frictional contact with either of the loose pulleys so that the coil receiver 30 may be caused to turn in either direction at will. When the shipping lever is released by the operator, the springs immediately separate the pulleys so that the coil receiver comes to rest.

A third belt 74 is driven by the shaft 71 and passes about a pulley 75 loosely mounted upon the sleeve 63. This pulley also is surrounded by the belt 25 which passes about the pulley 17 to drive the spool 4, as above described. All the belts are preferably driven in the directions indicated by the arrows in Fig. 2.

In winding the wire upon the coil receiver, the shipping lever is thrown over so as to connect the fast pulley 60 with the pulley 61. This causes the coil-receiver to be turned in left-hand rotation to wind up the wire on the bobbin or core and draw the wire from the supply spool. This action continues as long as the wire continues to be laid smoothly and evenly on the coil receiver. In case any inaccuracy occurs, and the convolutions become either too widely spaced or too much crowded together, so that one climbs up on another, the incorrectly wound portions can be immediately withdrawn by reversing the rotation of the coil receiver and driving the spool backwardly. After the incorrectly-wound coils have been removed, the coil receiver is again started in the forward direction and the supply spool released so that the winding may continue as before.

In making the reversal for back winding, the pulley 17 is first engaged with the friction surface of the disk 15 by pressure on the operating treadle, and subsequently the shipping lever 72 is thrown over to reverse the bobbin. This mode of procedure insures that the wire will be kept taut, and thereby eliminates danger of bends and kinks being formed by reason of the wire being released from the bobbin before being taken up on the supply spool. The yielding guide 34 compensates for the wire which is wound up on the spool before the bobbin is started reversely. This feature, that is, the capability of back winding, to take off improperly wound parts of the wire, is of the greatest importance, since it permits any amount of wire, even the whole coil, if necessary, to be replaced on the supply spool in condition to be again wound upon the coil when necessary.

In Figs. 6 and 7, I have shown a construction in which the same device serves both as a tension to hold the wire taut while being drawn from the supply spool, and as the driver for rotating the spool reversely to rewind the wire. In this construction the tension device 12 and the driving pins 14 and 141 are omitted, being replaced by arms 147 and 148 secured to the collar 142, while the spindle or arbor is formed with a cylindrical drum portion 149. The arms project beyond the center 9 so as to lie in the same perpendicular plane with the drum, and secured to one of them, as 148, is a spring strip 150. This strip is notched at the end adjacent to the arm 147 through which passes a screw 151 threaded into the last-named arm. This screw has a knurled finger-hold 152 by which it may be turned to draw the end of the spring toward or allow it to separate from the arm 147.

A piece of felt or other frictional material 153 is fastened to the spring so as to bear against the drum 149. By turning the screw 151, the pressure with which the felt acts may be made greater or less, thereby varying the tension of the wire and governing the pull which the driving shaft 13 exerts when driven to re-wind the wire.

It will be noted that both forms of rewinding driver act on the same principle, that is, they turn the spool through friction which may be made of great enough force to wind the wire suitably, while permitting slip in case the tension becomes too great, in order to eliminate danger of breaking or stretching the wire or the insulation of the latter. The frictional resistance of the pin 141 is reinforced and governed by the spring 143, while that of the drive, shown in Figs. 6 and 7, is governed by the spring 150 and screw 151.

I claim:—

1. In a winding machine, a coil receiver, a supply spool, mechanism for driving the coil receiver to wind a strand thereon and draw the same from the supply spool, said driving mechanism being reversible to unwind the strand from the coil receiver, and devices including a driver constantly turning in the direction of backward rotation of the spool and normally disconnected therefrom, adapted to be independently connected with the spool, for backwardly driving the supply spool to rewind thereon the strand released from the coil receiver.

2. In a winding machine, in combination, a revolving coil receiver, driving mechanism therefor including oppositely moving intermediate elements adapted to turn the same in either direction, a supply spool, driving connections between said driver and the supply spool including a clutch member normally disconnected, whereby the spool is free to turn so as to allow a strand to be drawn therefrom, and adapted to be rendered operative independently of the driving elements for the coil receiver for turning said spool in a direction to rewind the strand thereon.

3. In a winding machine, the combination of a supply spool, a coil receiver, means for rotating the coil receiver to wind wire thereon, and mechanism constructed and arranged to be brought into and out of frictional engagement with the supply spool independently of the coil-receiver-rotating means, and adapted to be so rotated as to drive the spool in reverse direction for rewinding wire thereon.

In testimony whereof I have affixed my signature, in presence of two witnesses.

CHARLES ERASTUS ANDERSON.

Witnesses:
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GEO. C. PARKER.