To all whom it may concern:

Be it known that I, DAVID E. GRAY, a citizen of the United States, residing at Hinsdale, in the county of Dupage and State of Illinois, have invented a new and improved Automatic Winding-Machine, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to mechanism adapted to automatically wind tape or ribbon of any description, or any similar material that may be wound, upon reels, and it is an object of my invention to construct a machine adapted to automatically cause a reel to engage the material to be wound, to wind on such reel a predetermined quantity of material, to interrupt the winding operation when such quantity has been placed upon the reel, to sever the material, to remove the wound reel from the winding position, and to advance an empty reel into the winding position.

It is a further object of my invention to automatically supply empty reels to the machine, to cover the reels after they are wound, and to remove the reels from the winding machine after being thus covered.

All of the operations above described are accomplished automatically, the only service from an attendant being that required to keep the winding machine supplied with a stock of covers and empty reels.

The several drawings illustrating my invention are as follows:

Figure 1 is a side view of my machine, part of the mechanism being shown in section to better illustrate its construction; Fig. 2 is a top view of the mechanism shown in Fig. 1, and in addition there is indicated in Fig. 2 the means employed for regulating the amount of material wound upon each reel; Fig. 3 is a right-hand end view of the mechanism shown in Fig. 1; Fig. 4 is a detail view of the means used to determine the amount of material wound on each reel; Fig. 5 is a detail view of the means employed to cause the operation of the mechanism used for placing empty reels upon the winding spindles and for placing covers upon the wound reels; Fig. 6 is a detail view of a cam mechanism used in connection with the advancing of a wound reel from the winding position, as will be explained; and Fig. 7 is a detail view of cam mechanism used in connection with the mechanism shown in Fig. 5, as will be explained.

Similar numerals refer to similar parts throughout the several views.

Referring to the drawings, the main shaft 1 of the machine has secured thereon a cylindrical member 2, the closed left-hand end of which serves to support this member from the shaft 1. Adjacent to the member 2, and on its right-hand side, a disk 3 is loosely supported upon the shaft 1. This disk 3 has formed thereon a plurality of arms 4 extending outward to the right from the plane of the disk. A second disk 5 is similarly supported from the shaft 1 and secured to the disk 3. The disk 5 has arms 6 formed thereon, corresponding to the arms 4 formed upon the disk 3, such arms 6 extending to the left and into the member 2. The arms 4 and 6 together constitute bearings for the winding spindles 7, upon which gears 8 are loosely mounted in such a position as to engage an internal gear 9 formed on the inner surface of the member 2. Rotation of the gear 8 is caused to rotate the spindle 7 by a friction clutch 10, which is pressed against the side of the gear 8 by a spring 11, a disk of suitable material 12 being interposed between the clutch 10 and the gear 8 to take the wear resulting from the frictional engagement. The clutch 10 is connected to the spindle 7 by means of a pin 13 in the spindle, which cooperates with a slot 14 formed in the hub of the clutch 10.

As a result of this construction, when the gear 8 carried by one of the spindles 7 is rotated, if the spindle is free to rotate, the engagement between the gear 8 and the friction clutch 10 serves to rotate the spindle 7, but if for any reason the spindle is not free to rotate, the frictional engagement between the gear 8 and such spindle permits the spindle to remain at rest without injuring the mechanism or the material that is wound by means of the spindle. The spindle 7 has located thereon between the arms 4 and 6 a number of collars 15, 16 and 17, which serve to keep the gear 8 and friction clutch 10 engaging the same in their proper operative
positions. Each spindle 7 carries upon its right-hand end a hub 18, upon which the reel 19 used to receive the material to be wound is adapted to fit. While any form of reels that it is convenient to use may be employed, it is desirable that reels adapted to automatically engage the material be employed. The use of reels designed to automatically engage the material to be wound is preferable, since the operation of the machine is facilitated thereby. A sliding sleeve 20 terminating in a flange 21 at its left-hand end is provided upon each spindle 7 to remove the reel 19 from the hub 18 when desired, this being accomplished by moving the sleeve 20 to the right against the action of the spring 22 located around the spindle 7 within such sleeve.

The outer periphery of the disk 3 has formed therein a plurality of notches 23 adapted to engage a dog 24 pivoted at 25 to a support 26. The dog 24 is normally retained in engagement with one of the notches 23 by the action of a spring 27. The dog 24 and the notches with which it is adapted to cooperate are so conformed, as indicated in Fig. 3, that if the disk 3 is forcibly moved angularly the dog 24 is forced out from the notch with which it is in engagement and the disk 3 and parts carried thereby are free to rotate upon the shaft 1.

The member 2 has pivoted upon its outer surface at 28 a lever 29, which may occupy either one of two positions as a result of the action of the spring 30. The right-hand end of this lever extends beyond the right-hand edge of the member 2 into the path of lugs 31 carried by the disk 3 when such lever is moved to one of its positions, the other position of the lever, however, serving to clear the lug 31 from such engagement. The spring 30 is connected to the lever 29 and the member 2 in such a manner that as the lever is moved from one of its positions to the other, the center line of the spring 30 passes the center of the pivot 28, as a result of which the tendency of the spring 30 is to hold the lever 29 in either position to which it may be moved.

The shaft 1 is adapted to be driven from a shaft 32, which may be any main operating shaft, communication between such shafts being accomplished by gears 33 and 34 secured to the shafts 32 and 1, respectively. The shaft 1 has secured thereto a second gear 35 meshing with a gear 36 loosely mounted upon the shaft 32. The gear 36 is rigidly secured to a sprocket wheel 37, over which a chain 38 is adapted to run.

It is to be noted that the gear 35 is small relatively to the gear 36, as a result of which the sprocket wheel 37 will rotate slowly relatively to the shaft 1 when the shaft 32 is rotated. The chain 38 is designed to hang loosely on the sprocket wheel 37, and to operate the lever 29 to move it from one of its positions to the other for the sake of terminating the winding operation. It is therefore desirable that the chain 38 be adjustable, which may be readily accomplished by removing some of the chain or adding to it, as a result of which the winding interval may be made shorter or longer, as desired. The chain 38 carries on one of its links a cam 39 so disposed as to engage the left-hand end of the lever 29 as the member 2 rotates. This engagement throws the left-hand end of the lever outward, as a result of which the right-hand end engages one of the lugs 31, and the rotation of the member 2 therefore causes the dog 24 to be disengaged from the notch 23 in which it had been located, and the disk 3 and parts carried thereby are rotated bodily with the member 2 until the left-hand end of the lever 29 engages the cam 40, rigidly supported from the frame of the machine by the arm 41. This engagement throws the left-hand end of the lever 29 inward, and causes the lever to be disengaged from the lug 31, which occurs at practically the same time that the notch 23 in the disk 3 immediately following the one which had engaged the dog 24 comes into engagement with such dog. Since the disk 3 is released from the member 2 and engaged by the dog 24 at practically the same instant, it follows that the disk 3 and parts carried thereby are not further rotated, but are held at rest, continued rotation of the member 2, however, serving through the gears 8 and friction clutches 10 to rotate the spindles 7. There are as many notches 23 and lugs 31 as there are spindles 7, and these notches and lugs are so disposed upon the outer periphery of the disk 3 as to bring the seven spindles successively into proper winding position as the lever 29 is engaged by the cam 39. As shown in Fig. 1, the spindle 7 which is in the upper position is assumed to be in the winding position, and the proper direction of rotation of the shaft 1 to operate the machine is over away from the observer.

In the machine shown in the drawings four spindles are provided, from which it follows that when the desired amount of material has been wound upon the reel 10 and the winding operation has been interrupted by the cam 39 engaging the lever 29, the wound reel is moved around a quarter of a rotation of the disk 3 so that it occupies a position on the far side of the machine, as shown in Fig. 1, and by this same rotation of the disk 3 an empty reel located on the spindle 7 which was previously toward the observer is now carried into winding position. Thus as each reel has wound thereon the desired quantity of material, the mem-
ber 2 and disk 3 are advanced a quarter of a rotation, as a result of which the wound reel during the second interval of advance from the winding position is removed from the hub 18 on the spindle 7 by the engagement of the flange 21 with the cam 42, which is rigidly supported by means of a suitable bracket 43 and so conformed as to lie in the path of the flanges 21 as they are advanced from the far side of the machine, as shown in Fig. 1, to the bottom position. The engagement between the cam 42 and one of the flanges 21 moves the flange 21 and sleeve 20 carried thereby to the right upon the spindle 7 against the action of the spring 22, as a result of which the reel 19 is slipped off from the hub 18 carried by the spindle 7. When the flange 21 has advanced sufficiently to be disengaged from the cam 42, the spring 22 serves to partly restore the sleeve 20 to the position shown in the drawings.

In connection with the winding apparatus proper described above, mechanism is provided for placing empty reels upon the hubs 18 as they are advanced step by step to the winding position, and also for placing upon the wound reels suitable covers after such reels have been advanced from the winding position. Mechanism is also shown for severing the material as it is about to be engaged by the empty reel coming into the winding position immediately after a wound reel has been removed from such position.

The mechanism for placing empty reels upon the hubs 18 consists in the following: A disk 44 is supported upon the shaft 1, but free to revolve therewith. This disk has a cylindrical portion 45 the edge of which is conformed to cause reciprocation of a rod 46 supported in suitable bearings in a position practically parallel with the shaft 1 and so disposed that a roller 48 carried by the rod 46 rides upon the cam edge of such cylindrical surface 45. A spring 49 serves to keep the roller 48 as far to the right, as shown in Fig. 1, as the cam 45 will permit the roller to be moved. The rod 46 carries upon its left-hand end an angle member 50, the vertical portion of which is circularly formed upon its lower edge and has secured thereto a carrier 51.

The horizontal portion of the angle member 50 extends to the right from the vertical portion, and is so conformed that when the member 50 is moved to the left by the action of the cam 45 the horizontal portion passes under the spout 52, from which empty reels are delivered at intervals to the carrier 51. The rod 46 and carrier 51 secured thereto are reciprocated by the cam 45 in such a manner that after an empty spindle has come to the position nearest to the observer, as shown in Fig. 1, the cam 45 rotates so as to move the rod 46 to its extreme left-hand position, as a result of which, since the rod 46 is located in line with this position of the spindle 7, the carrier 51 is moved far enough to the left so that the member 50 presses the empty reel on to the hub 18 and into its proper winding position. Immediately thereafter, owing to continued rotation of the cam 45, the spring 49 draws the rod 46 to its extreme right-hand position, which permits another empty reel to drop from the spout 52 into the carrier 51.

The proper timing and operation of the cam 45 and the mechanism employed to deliver the empty reels one at a time to the spout 52 is accomplished as follows: The disk 44 has formed at one point in its periphery a notch 53 with which a dog 54 pivoted at 55 from a suitable support is caused to cooperate by the action of a spring 56. The engaging surfaces of the notch 53 and dog 54 are such, as indicated in Fig. 3, as to prevent rotation of the disk 44 unless a considerable rotary effort is exerted upon the disk, in which event the dog 54 is forced out of engagement with the notch 53, and rotation of the disk 44 is permitted. The shaft 1 has secured thereto, adjacent to the hub of the disk 44, a collar 57 having a projecting lug 58 formed therein in such a position as to engage a lever 59 pivoted to the disk 44 at 50, when such lever is moved inward toward the shaft 1. The lever 59 is similar to the lever 29 in that it may occupy either one of two positions, being retained in either position by the action of the spring 61. A lever 62 pivoted at 63 from the framework of the machine is adapted to cooperate with the lever 59 to move the lever 59 inward when the lever 62 is operated. The lever 62 is connected by a link 64 with the dog 24 in such a manner that when the dog 24 is forced outward and out of engagement with one of the notches 23 by the cooperation of the lever 29 and one of the lugs 31, the lever 62 is operated to move the lever 59 with which it is in engagement to its inner position, where it is held by the action of the spring 61. As the shaft 1 continues to rotate, the lug 58 on the collar 57 engages the lever 59 and forcibly disengages the dog 54 from the notch 53, and rotates the cam 45. This rotation continues until the end of the lever 59 engages the cam 65, which engagement throws the lever 59 outward and out of engagement with the lug 58. The lever 59 and lug 58 are disengaged by this operation at practically the same instant that the notch 53 is again engaged by the dog 54, as a result of which a single rotation of the disk 44 has been permitted. It is to be noted in this connection that the lever 62 is returned to its normal position by the engagement of the dog 24 with one
of the notches 23 before the disk 44 has made a complete rotation.

As a result of the mechanism just described, it will be seen that when a reel has wound thereon the desired amount of material, the engagement of the disk 3 by the lever 29 carried on the member 2 operates by means of the dog 24, link 64, lever 62, and lever 59 to start rotation of the disk 44.

At the same instant, the disk 3 begins to rotate to bring the lower spindle, shown in Fig. 1, into position nearest the observer, or the proper position to receive the empty reel on the carrier 51. In order that the cam 45 may not advance the carrier 51 prematurely, a delay surface is provided to permit the empty hub 18 to come into position opposite the rod 46 before that part of the cam 45 serving to move the carrier 51 to its extreme left-hand position reaches the roller 48. The right-hand end of the horizontal portion of the member 50 engages one arm of a bell crank 66 pivoted at 67 to the frame of the machine, the other arm of which is connected by a link 68 with levers 69—69. These levers 69—69 are pivoted at 70—70 to the sides of a receptacle 71 terminating at its lower end in the spout 59, such receptacle being adapted to contain empty reels horizontally disposed, as indicated. The levers 69 have secured at their pivotal ends escapement dogs 72—72 so conformed that as the member 50 is reciprocated these dogs are rocked upon the pivots 70 so as to disengage the lower one of the empty reels and at the same time engage the remaining reels to prevent their descending into the spout 59. The disengaged reel drops of its own weight, and, due to the action of the inclined wall of the spout 59, it is turned into vertical position to be dropped into the carrier 51 when the member 50 is moved to its extreme right-hand position.

The mechanism employed to cut off the material is as follows: The link 64 is adapted to engage, by means of a pin 73 carried thereby, one end of a bell crank lever 74 pivoted at 75 from a suitable support. The other end of the bell crank 74 is connected by a link 76 with a lever 77 supported by a pin 78 from the side of the receptacle 71. The pin 78 engages a slot 79 formed in the right-hand end of the lever 77, such lever being held in its left-hand position by the action of a spring 80. The left-hand end of the lever 77 is adapted to cooperate with a projection 81 formed on a lever 82 pivoted at 83 to a bracket secured to the side of the receptacle 71. The lever 82 is formed at its lower end to constitute a shear blade 84.

The lever 82 has pivoted near its lower end a second shear blade 85 adapted to cooperate with the shear blade 84, and provided with a depending arm 85 adapted to engage a pin 86 when the lever 82 is moved to the left in a manner to be described. The shear blade 85 is normally maintained out of engagement with the shear blade 84 by the spring 87.

As a result of the construction just described, when the dog 24 is forced out of engagement with one of the notches 23, the lever 77 is moved upward by means of the bell crank 74 and link 76, the spring 80 permitting such lever 77 to slide sufficiently upon the pin 78 so that the left-hand end of the lever 77 passes by the projection 81, and, under the influence of the spring 80, rests on the top of such projection. When the dog 24 again comes into engagement with a notch 23, the spring 27 is sufficiently strong to move the lever 82 outward to the left on the pivot 83 by means of the link 64, bell crank 74, link 76, lever 77 and projection 81. This outward motion is continued until the shear blades 84 and 85 are below and above the material which extends from the wound reel to the source of supply, at which time the projection 86 comes in contact with the pin 86, and continued motion to the left of the lever 82 causes the shear blade 85 to rotate against the action of the spring 87 and cooperate with the shear blade 84 to sever the material. The lever 77 continues moving in a downward direction until its left-hand end passes beyond the projection 81, after which the spring 87 raises the upper shear blade 85, and restores both shear blades and the lever 82 carrying them to their normal position.

As shown in Fig. 2, the reels 19 used to receive the material to be wound are provided with bars extending from their cores, which bars are pointed and adapted to readily engage the material to be wound. It is to be understood that the rotation of the spindle-carrying frame 3, which results as described when a predetermined amount of material has been wound upon the reel, is over to the right, as viewed in Fig. 3, and that therefore the removal of the wound reel from its winding position draws the strip of material extending to the source of supply over the empty reel which is being brought into winding position, and that this same motion brings the strip of material between the shear blades in such a manner that the material is severed between the wound reel and the reel that is being brought into winding position. The severing of the material is accomplished as described at the instant when the empty reel has reached the winding position and immediately before rotation upon its own axis is imparted to such empty reel. As a result, the loose end of the material to be wound falls upon the core of the empty reel and is engaged by the bars projecting from such core, as a result of the rotation of the empty
reel which occurs immediately after the empty reel reaches the winding position.

A similar mechanism to that described for placing empty reels upon the hubs 18 carried by the spindles 7 is provided on the far side of the machine, as shown in Fig. 1, for placing covers upon the reels after they are wound. In this mechanism the receptacle 71 is adapted to receive the stock of covers in vertical position, instead of horizontal, as is the case in connection with the stock of reels in the receptacle 71. This is to facilitate the engagement and delivery of the covers from the receptacle 71 by the escapement dog 72 pivoted to the side of the receptacle 71a at 70°. The escapement dog 72 is connected to the pivotal end of the lever 69, the other end of this lever being connected by a link 68 to one end of a bell crank 66, the other end of which is adapted to cooperate with the horizontal portion of the member 50, which serves to receive and place upon the wound reels a cover in a manner identical with that already described for placing an empty reel upon one of the hubs 18. It is to be understood that the roller 48 engages the cam 45 on the far side of the machine, as shown in Fig. 1, in a manner identical with that already described for the roller 48, and that when the disk 44 is released, a sufficient delay interval is allowed before the rod 46 is moved to the left so that the wound reel may come into a position in line with the rod 46, after which such rod is moved to its extreme left-hand position by the action of the cam 45, and the cover contained in the carrier 51 is forced upon the wound reel.

In Fig. 4, the sprocket wheel 37 and chain 38 cooperating therewith are shown in face view, and clearly show the cooperation of the cam 39 carried by such chain and the lever 29, as a result of which the lever 29 is thrown to a position to engage one of the lugs 31. In Fig. 6, the conformity of the cam 40 is indicated, as a result of which the lever 29 is moved from its position just mentioned out of engagement with the lug 51.

In Fig. 5, the manner of supporting the lever 59 from the disk 44 is shown, as well as the arrangement of the spring 61 by which the lever 59 is retained in either of its positions already described. In Fig. 7, the conformity of the cam 65 is indicated, by engaging which the lever 59 is thrown out of engagement with the lug 58 carried by the collar 57.

While I have shown and described a modification of my machine in which four winding spindles are used, I do not limit myself to this construction, since other numbers of spindles might be used if desired. Furthermore, the reels employed in connection with my winding machine need not necessarily be of the conformation indicated, but may be of any form adapted to receive the material to be wound.

It is apparent that while the construction shown and described is adapted to automatically place covers upon the wound packages, this part of the mechanism need not be used unless desired, since for some purposes it is preferable that the packages shall not be covered in this manner.

While I have shown my invention in the particular embodiment herein described, I do not, however, limit myself to this construction, but desire to claim broadly any equivalent modifications that will suggest themselves to those skilled in the art.

What I claim is:

1. In an automatic winding machine, a spindle for holding a reel adapted to receive the material to be wound, means for driving the spindle, means for automatically interrupting the driving thereof when a predetermined amount of the material is wound upon the reel, and means for covering the wound reel.

2. In an automatic winding machine, a spindle for holding a reel adapted to receive the material to be wound, means for driving the spindle, means for automatically interrupting the driving thereof when a predetermined amount of the material is wound upon the reel, means for severing such material, and means for covering the wound reel.

3. In an automatic winding machine, a spindle for holding a reel adapted to receive the material to be wound, means for driving the spindle, means for automatically interrupting the driving thereof when a predetermined amount of the material is wound upon the reel, means for severing such material, means for covering the wound reel, and means for removing the wound reel from its spindle.

4. In an automatic winding machine, a spindle for holding a reel adapted to receive the material to be wound, means for driving the spindle, means for automatically interrupting the driving thereof when a predetermined amount of the material is wound upon the reel, means for severing such material, means for covering the wound reel, means for removing the wound reel from its spindle, and means for placing an empty reel upon such spindle.

5. In an automatic winding machine, a spindle for holding a reel adapted to receive the material to be wound, means for driving the spindle, means for automatically interrupting the driving thereof when a predetermined amount of the material is wound upon the reel, means for removing such spindle and reel from the winding position, means for severing such material, and means for covering the wound reel.
6. In an automatic winding machine, a spindle for holding a reel adapted to receive the material to be wound, means for driving the spindle, means for automatically interrupting the driving thereof when a predetermined amount of the material is wound upon the reel, means for removing such spindle and reel from the winding position, means for severing such material, means for covering the wound reel, and means for bringing a second spindle and reel into winding position.

7. In an automatic winding machine, a spindle for holding a reel adapted to receive the material to be wound, means for driving the spindle, means for automatically interrupting the driving thereof when a predetermined amount of the material is wound upon the reel, means for removing such spindle and reel from the winding position, means for severing such material, means for covering the wound reel, and means for removing the wound reel from its spindle.

8. In an automatic winding machine, a rotatable frame, spindles carried by the frame, means for normally preventing rotation of the frame, means for disengaging the frame when a predetermined amount of material is wound upon the spindle, means for removing such spindle and reel from the winding position, means for severing such material, means for covering the wound reel, and means for removing the wound reel from its spindle, and means for bringing a second spindle and reel into winding position.

9. In an automatic winding machine, a rotatable frame, spindles carried by the frame, means for normally preventing rotation of the frame, means for disengaging the frame when a predetermined amount of material is wound upon a reel, means for automatically moving the wound reel from its operative position and for bringing an empty reel into operative position, and means for removing a wound reel from a spindle.

10. In an automatic winding machine, a rotatable frame, spindles carried by the frame, means for normally preventing rotation of the frame, means for rotating the spindles, reels adapted to be supported and rotated by the spindles and to thereby receive the material to be wound, means for disengaging the frame when a predetermined amount of material is wound upon a reel, means for automatically moving the wound reel from its operative position and for bringing an empty reel into operative position, and means for placing an empty reel upon a spindle.

11. In an automatic winding machine, a rotatable frame, spindles carried by the frame, means for normally preventing rotation of the frame, means for rotating the spindles, reels adapted to be supported and rotated by the spindles and to thereby receive the material to be wound, means for disengaging the frame when a predetermined amount of material is wound upon a reel, means for automatically moving the wound reel from its operative position and for bringing an empty reel into operative position, means for removing a wound reel from a spindle, and means for placing an empty reel upon a spindle.

12. In an automatic winding machine, a rotatable frame, spindles carried by the frame, means for normally preventing rotation of the frame, means for rotating the spindles, reels adapted to be supported and rotated by the spindles and to thereby receive the material to be wound, means for disengaging the frame when a predetermined amount of material is wound upon a reel, and means for automatically moving the wound reel from its operative position and for bringing an empty reel into operative position, such disengagement serving to cause the operation of mechanism adapted to place an empty reel upon a spindle and remove a wound reel from another spindle.

13. In an automatic winding machine, a rotatable frame, spindles carried by the frame, means for normally preventing rotation of the frame, means for rotating the spindles, reels adapted to be supported and rotated by the spindles and to thereby receive the material to be wound, means for disengaging the frame when a predetermined amount of material is wound upon a reel, means for moving the wound reel from its operative position and for bringing an empty reel into operative position, and means for placing a cap on the wound reel.

14. In an automatic winding machine, a rotatable frame, spindles carried by the frame, means for normally preventing rotation of the frame, means for rotating the spindles, reels adapted to be supported and rotated by the spindles and to thereby receive the material to be wound, means for disengaging the frame when a predetermined amount of material is wound upon a reel, means for moving the wound reel from its operative position and for bringing an empty reel into operative position, and means for placing a cap on the wound reel.

15. In an automatic winding machine, a rotatable frame, spindles carried by the frame, means for normally preventing rotation of the frame, means for rotating the spindles, reels adapted to be supported and rotated by the spindles and to thereby receive the material to be wound, means for disengaging the frame when a predetermined amount of material is wound upon a reel, and means for severing the material before such empty reel reaches its operative position, means for placing a cap on the wound reel, and means for removing a wound reel from a spindle.
receive the material to be wound, means for disengaging the frame when a predetermined amount of material is wound upon a reel, means for moving the wound reel from its operative position and for bringing an empty reel into operative position, means for severing the material before such empty reel reaches its operative position, means for placing a cap on the wound reel, means for removing a wound reel from a spindle, and means for placing an empty reel upon a spindle.

18. In an automatic winding machine, a rotatable frame, spindles carried by the frame, means for normally preventing rotation of the frame, means for engaging the frame when a predetermined amount of material is wound upon a reel, means for moving the wound reel from its operative position and for bringing an empty reel into operative position, means for severing the material before such empty reel reaches its operative position, and means for placing a cap on the wound reel, such disengagement serving to cause the operation of mechanism adapted to place an empty reel upon a spindle and remove a wound reel from another spindle.

19. In an automatic winding machine, a rotatable frame, rotatable spindles carried by the frame, reels adapted to be supported and rotated by the spindles and to thereby receive the material to be wound, a driving shaft, gearing connected therewith for imparting through frictional driving mechanism rotation to the spindles, a dog adapted to normally engage the frame to prevent rotation thereof, a lever carried by the gearing and adapted to engage the frame and cause disengagement of the dog and rotation of the frame after a predetermined number of rotations of the spindle, such rotation of the frame serving to remove a wound reel from the winding position and to advance an empty reel to the winding position, and such dog adapted to reengage the frame when the empty reel reaches the winding position, a cam adapted to withdraw such lever from engagement as the empty reel reaches the winding position, and shearing members operated as such dog reengages the frame to sever the material.

20. In an automatic winding machine, a rotatable frame, rotatable spindles carried by the frame, reels adapted to be supported and rotated by the spindles and to thereby receive the material to be wound, a driving shaft, gearing connected therewith for imparting through frictional driving mechanism rotation to the spindles, a first dog adapted to normally engage the frame to prevent rotation thereof, a first lever carried by the gearing and adapted to engage the frame and cause disengagement of the dog and rotation of the frame after a predetermined number of rotations of the spindle, such rotation of the frame serving to remove a wound reel from the winding position and to advance an empty reel to the winding position, such first dog adapted to reengage the frame when the empty reel reaches the winding position, a first cam adapted to withdraw such first lever from engagement as the empty reel reaches the winding position, shearing members operated as such first dog reengages the frame to sever the material, a circular cam adapted to be operated by such driving shaft, a second dog for normally engaging such circular cam and thereby preventing rotation thereof, a second lever carried by the circular cam and adapted to engage the driving shaft and cause disengagement of such second dog and rotation of the circular cam when such first dog is disengaged from such frame, a carrier operated by the circular cam to place an empty reel on a spindle, and means operated by such carrier for feeding empty reels one at a time from a supply of such reels to such carrier.

21. In an automatic winding machine, a rotatable frame, rotatable spindles carried by the frame, reels adapted to be supported
and rotated by the spindles and to thereby receive the material to be wound, a driving shaft, gearing connected therewith for imparting through frictional driving mechanism rotation to the spindles, a first dog adapted to normally engage the frame to prevent rotation thereof, a first lever carried by the gearing and adapted to engage the frame and cause disengagement of the dog and rotation of the frame after a predetermined number of rotations of the spindles, such rotation of the frame serving to remove a wound reel from the winding position and to advance an empty reel to the winding position, such first dog adapted to reengage the frame when the empty reel reaches the winding position, a first cam adapted to withdraw such first lever from engagement as the empty reel reaches the winding position, shearing members operated as such first dog reengages the frame to sever the material, a circular cam adapted to be operated by such driving shaft, a second dog for normally engaging such circular cam and thereby preventing rotation thereof, a second lever carried by the circular cam and adapted to engage the driving shaft and cause disengagement of such second dog and rotation of the circular cam when such first dog is disengaged from such frame, a first carrier operated by the circular cam to place an empty reel upon a spindle, means operated by such first carrier for feeding empty reels one at a time from a supply of such reels to such first carrier, a second carrier operated by the circular cam to place a cover on a wound reel, means operated by such second carrier for feeding covers one at a time from a supply of such covers to such second carrier, and a second cam adapted to disengage such second lever from the driving shaft after the carriers have been operated, such second dog adapted to reengage the circular cam as it is released from the driving shaft.

23. In an automatic winding machine, a rotatable frame, rotatable spindles carried by the frame, reels adapted to be supported and rotated by the spindles and to thereby receive the material to be wound, a driving shaft, gearing connected therewith for imparting through frictional driving mechanism rotation to the spindles, a first dog adapted to normally engage the frame to prevent rotation thereof, a first lever carried by the gearing and adapted to engage the frame and cause disengagement of the dog and rotation of the frame after a predetermined number of rotations of the spindles, such rotation of the frame serving to remove a wound reel from the winding position and to advance an empty reel to the winding position, such first dog adapted to reengage the frame when the empty reel reaches the winding position, shearing members operated as such first dog reengages the frame to sever the material, a circular cam adapted to be operated by such driving shaft, a second dog for normally engaging such circular cam and thereby preventing rotation thereof, a second lever carried by the circular cam and adapted to engage the driving shaft and cause disengagement of such second dog and rotation of the circular cam when such first dog is disengaged from such frame, a first carrier operated by the circular cam to place an empty reel upon a spindle, means operated by such first carrier for feeding empty reels one at a time from a supply of such reels to such first carrier, a second carrier operated by the circular cam to place a cover on a wound reel, means operated by such second carrier for feeding covers one at a time from a supply of such covers to such second carrier, and a second cam adapted to disengage such second lever from the driving shaft after the carriers have been operated, such second dog adapted to reengage the circular cam as it is released from the driving shaft.
covers to such second carrier, a second cam adapted to disengage such second lever from the driving shaft after the carriers have been operated, such second dog adapted to reengage the circular cam as it is released from the driving shaft, and a third cam adapted to remove the wound and covered reel from its spindle.

24. In an automatic winding machine, a spindle for holding a reel adapted to receive the material to be wound, means for driving the spindle, means for automatically interrupting the driving thereof when a predetermined amount of material is wound upon the reel, a second spindle adapted to receive a winding reel, means for removing the first spindle and reel from the winding position and for bringing the second spindle and reel into winding position, means for severing the material, means for covering the wound reel, and means for removing the wound reel from its spindle.

25. In an automatic winding machine, a spindle for holding a reel adapted to receive the material to be wound, means for driving the spindle and thus winding the material upon the reel, and means for placing a formed cover on the wound reel.

26. In an automatic winding machine, a spindle for holding a reel adapted to receive the material to be wound, means for driving the spindle, means for severing such material when a predetermined amount is wound upon the reel, and means for covering the wound reel.

27. In an automatic winding machine, a spindle for holding a reel adapted to receive the material to be wound, means for driving the spindle, means for severing such material when a predetermined amount is wound upon the reel, means for covering the wound reel, and means for removing the wound reel from its spindle.

28. In an automatic winding machine, a spindle for holding a reel adapted to receive the material to be wound, means for driving the spindle, means for severing such material when a predetermined amount is wound upon the reel, means for covering the wound reel, means for removing the wound reel from its spindle, and means for placing an empty reel upon such spindle.

29. In an automatic winding machine, a spindle for holding a reel adapted to receive the material to be wound, means for driving the spindle, means for removing such spindle and reel from the winding position, means for severing such material, and means for covering the wound reel.

30. In an automatic winding machine, a spindle for holding a reel adapted to receive the material to be wound, means for removing the spindle and reel from the winding position and for bringing a second spindle and reel into winding position, means for severing the material, and means for covering the wound reel.

31. In an automatic winding machine, a spindle for holding a reel adapted to receive the material to be wound, means for driving the spindle, means for removing such spindle and reel from the winding position, means for severing such material, means for covering the wound reel, and means for removing the wound reel from its spindle.

32. In an automatic winding machine, a spindle for holding a reel adapted to receive the material to be wound, means for driving the spindle, means for removing the spindle and reel from the winding position and for bringing a second spindle and reel into winding position, means for severing the material, and means for covering the wound reel.

33. In an automatic winding machine, a spindle for holding a reel adapted to receive the material to be wound, means for driving the spindle, means for removing the spindle and reel from winding position and for bringing a second spindle and reel into winding position, means for severing the material, means for covering the wound reel, means for removing the wound reel from the spindle, and means for placing an empty reel upon the spindle.

34. In an automatic winding machine, means for winding material upon a reel, means for severing the material when a predetermined amount is thus wound, and means for covering the wound reel.

35. In an automatic winding machine, means for winding material upon a reel, and means for placing a formed cover on the wound reel.

In witness whereof, I hereunto subscribe my name this 22nd day of January A. D. 1909.

DAVID E. GRAY.

Witnesses:
ALBERT C. BELL.
LEONARD W. NOVANDER.