June 8, 1926. 1,588,158

E. A. BOHLMAN ET AL

WINDING MACHINE

Filed Nov. 1, 1923 4 Sheets-Sheet 1

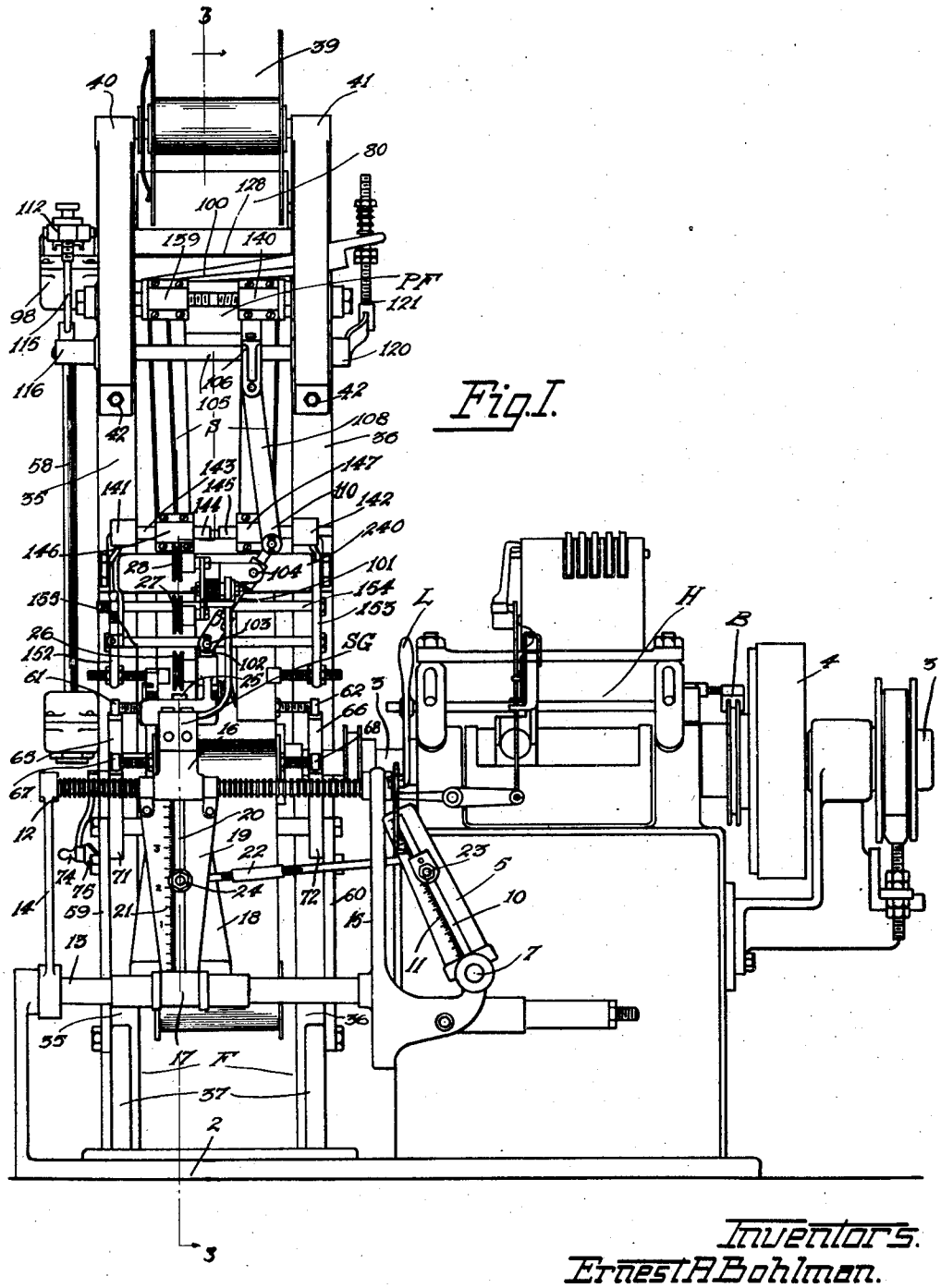

Fig. I.

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WINDING MACHINE

Filed Nov. 1, 1923 4 Sheets-Sheet 2

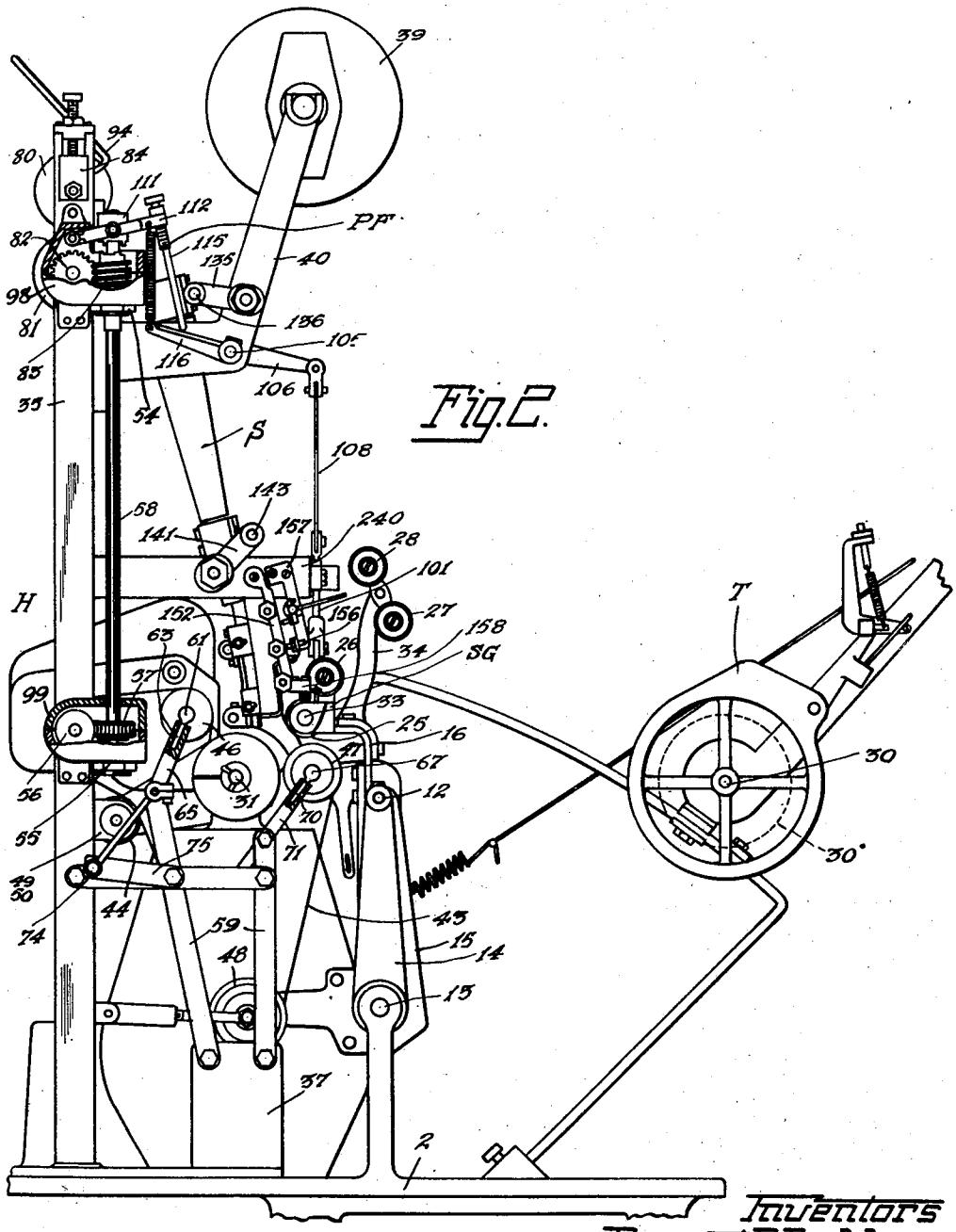

Fig. 2.

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WINDING MACHINE

Filed Nov. 1, 1923 4 Sheets-Sheet 3

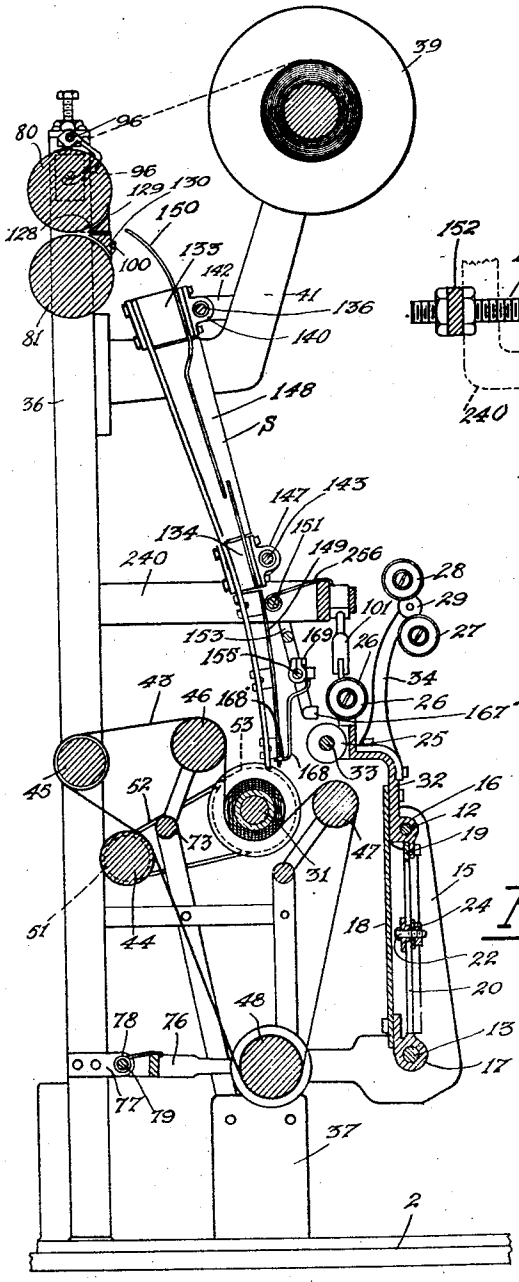

Fig. 3.

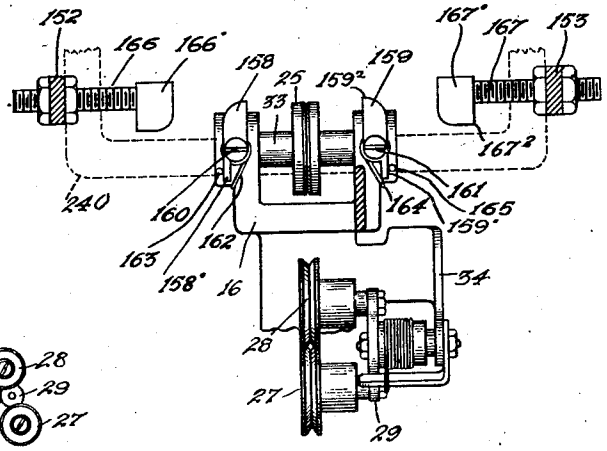

Fig. 6.

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WINDING MACHINE

Filed Nov. 1, 1923 4 Sheets-Sheet 4

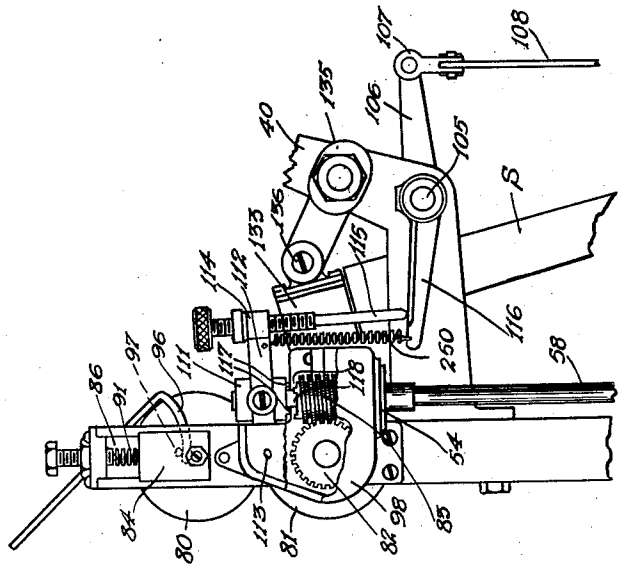

Fig. 5.

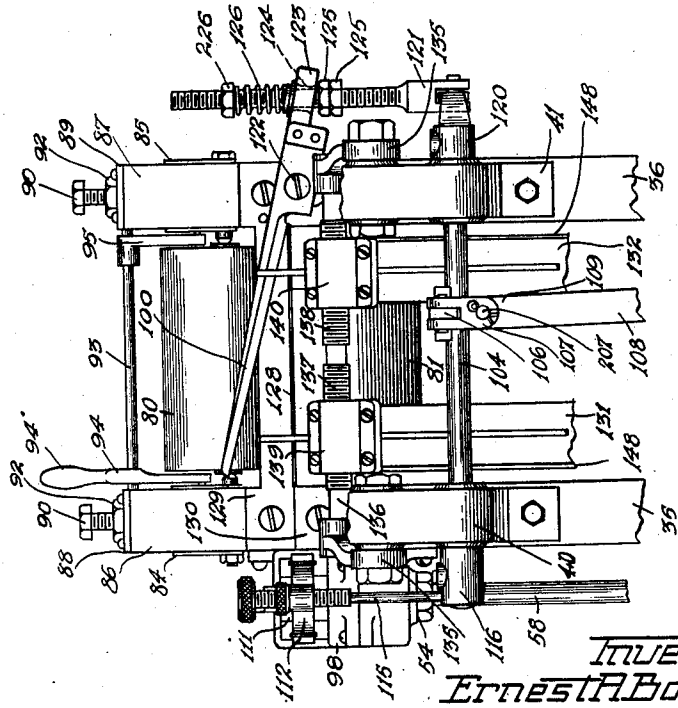

Fig. 4.

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Patented June 8, 1926. 1,588,158

UNITED STATES PATENT OFFICE.

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WINDING MACHINE.

Application filed November 1, 1923. Serial No. 672,035.

Our invention relates to machines for winding a strand of wire into a coil of a plurality of layers and for applying or introducing a sheet of material such as paper or the like between the layers of the coil for the purpose of separating or protecting the layers and an object of our invention is to construct a winding machine of the above type which is simple in construction and most efficient and positive in its operation of winding a coil and its introduction of the sheet material between the different layers of the coil.

In the winding machines of the above type various means have been devised for automatically superposing a layer of sheet material such as paper or the like between the layers of convolutions of the coil for protection or separating purposes. These various means for introducing the sheet material between the layers of the coil are more or less complicated and it is essential that the sheet material must be fed in straight and evenly to form a perfect coil. The paper feeds of prior machines are deficient in that the paper is not always fed straight and when this happens the coils constructed vary in diameter and shape, thus producing coils which are not uniform in size. To overcome these objectional features of a machine of the above type we have designed a simple and positive automatic paper feed mechanism and a feature of our invention is the provision of a paper feed which automatically severs the paper material into sheets of the required length and places it in position so that the instant a new layer of convolutions is started the paper is simultaneously dropped into position to permit it being placed upon the coil evenly and smoothly.

Another feature of our invention is a compensating device which as the diameter of the coil increases operates to increase the length of the sheet material to be fed to the coil that is being formed on the winding spindle of the machine.

Another feature of our invention is the provision of a novel control means for operating the cutting device for cutting the sheet material into desired lengths.

The above features as well as others will be more fully hereinafter described in the ensuing specification and for a more complete understanding of our 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 our invention;

Fig. 2 is a left side elevation of the winding machine;

Fig. 3 is a sectional view along the line 3—3 of Fig. 1 looking in the direction of the arrow;

Fig. 4 is a partial view of the winding machine illustrating the paper feed mechanism;

Fig. 5 is a left side view of Fig. 4 with parts broken away to more clearly illustrate the mechanism;

Fig. 6 is a view of the tripping mechanism of the paper feed which is controlled by the strand feeding carrier.

Referring now more in detail to our invention as illustrated in the accompanying drawings we provide a main frame comprising a flat top or supporting plate 2 upon which are mounted the various shafts, clutches, gearing etc., for transmitting and controlling the power as will now be described only in a general way. A main shaft 3 runs across the machine and carries at its one end a clutch pulley 4 through the agency of which the shaft 3 may be driven from a suitable source of power such as a motor and belt connection. The pulley 4 is of the usual clutch pulley type and a lever L which is a starting lever when moved to its starting position releases a suitable brake mechanism B from engagement with the shaft 3 to permit the clutch pulley 4 to operate and bring about the rotation of the shaft 3. Gearing mechanism enclosed by the housing H transmits motion to the rocker arm 5 which is pivoted at 7. The lower end of the rocker arm 5 is provided with a suitable connecting link which engages the groove of a traverse cam connected to the gearing mechanism and through the agency of suitable transmission gearing motion is transmitted to the traverse cam associated therewith to cause the arm 5 to rock to and fro and by means of the suitable link connections this motion is transmitted to the strand guiding mechanism SG to feed the wire strand to the coil a predetermined number of convolutions an inch. The de-

scription of the mechanism for transmitting motion to the strand guiding mechanism SG has only been general as this portion of the winding machine is of the type embodied in the well known universal winding machine and as this type of transmitting mechanism is well known a detailed description of the same is not thought necessary.

The rocker arm 5 is in the form of a plate which is provided with a slot 10, the face of the plate being provided with a graduated scale 11 for purposes as will be presently described. The strand guiding mechanism SG is slidably supported on shafts 12 and 13 which are suitably supported by hanger arms 14 and 15 which are fastened to the frame of the machine. The strand guiding mechanism SG comprises a pair of slidable members 16 and 17 connected by means of a plate 18 secured to the members 16 and 17 by means of suitable screws. A plate 19 is also secured to the members 16 and 17 and is provided with a slot 20 the face of the said plate 19 being provided with a graduated scale 21. A connecting link 22 connects the rocker arm 5 and the strand guiding mechanism SG, one end of the link 22 being slidably secured in the slot 10 of the rocker arm 5 by means of a suitable bolt and nut 23 and the other end of the link 22 being slidably supported in the slot 20 of the plate 19 by means of a suitable bolt and nut 24. By means of this arrangement the movement of the strand guiding mechanism SG in its travel from left to right and vice versa is regulated by means of this link connection and by moving the ends of the link 22 up or down in the slots 10 and 20 in the arm 5 and plate 19 as the case may be, different widths of coils may be wound. The member 16 slidably supported on the shaft 12 carries the guide wheels 25, 26, 27 and 28 which guide the strand of wire from the source of supply 30' which is suitably supported on the spindle 30 which is associated with a suitable tension device T and as this supply spindle 31 and tension device T are also well known mechanism and used on machines of the type as named above a detailed description of this portion of the mechanism is not thought necessary as it is well known in the art. The member 16 is provided with an angular extension 32 which is provided with a bifurcated portion, and the arms of this bifurcated portion support a shaft 33 fixed therein. The guide wheel 25 is rotatably supported on this shaft 33 in proximity to the winding spindle for purposes as will presently be described. Another guide wheel 26 is rotatably secured to the member 16, and a pair of guide wheels 27 and 28 are rotatably secured to an arm 29 which is pivotally secured to a bracket 34 suitably secured to the member 16. The guide wheels 25 and 26, and arm 29 and its supported guide wheels 27 and 28 are all as a whole supported on the member 16 and serve as guides for the wire strand leading to the winding spindle 31 which is an extension of the main shaft 3 and is adapted to receive a suitable arbor upon which the coil is wound.

A suitable frame comprising a pair of upright members 35 and 36 is secured to projecting studs 37 on the base 2 by means of suitable bolts and serve as supports for the paper feed mechanism PF and its associated parts as will now be described in detail. The source of paper supply is in the form of a suitable spool 39 upon which the roll of paper is supported, the said spool 39 being rotatably supported by a pair of brackets 40 and 41 secured to the upright members 35 and 36 by means of suitable bolts 42. A plurality of rollers 44, 45, 46, 47 and 48 are associated with the winding spindle 31, and a belt 43 which traverses the spindle 31 and the rollers 44, 45, 46, 47 and 48 transmits motion to the paper feed mechanism PF through the agency of suitable gearing mechanism which will be more fully hereinafter described. The roller 44 is suitably supported in a pair of bearings 49 and 50 which are suitably secured to the upright members 35 and 36 and has secured to its one end a pulley 51 which is connected to the main shaft 3 by means of a belt 52 which is connected to a pulley 53 secured to the shaft 3 and through the agency of the belt 52 motion is transmitted to the roller 44. The roller 45 is also rotatably supported between the upright members 35 and 36 in suitable bearings set in the said members 35 and 36 and a worm gear 56 secured to one end of the roller shaft meshes with the gear 57 secured to a vertical shaft 58 for purposes as will presently be described. A pair of suitable brackets 59 and 60 are secured to the base 2 and upright members 35 and 36 and form supporting means for the rollers 46 and 47. The roller 46 is rotatably supported in bearings 61 and 62 which are provided with integrally formed members 63 which rest in suitable orifices in arms 65 and 66 secured to the brackets 59 and 60. The roller 46 and its bearings 61 and 62 are as a whole slidably supported in the arms 65 and 66 to permit the roller to move in a horizontal direction and this roller 46 may be termed a floating roller the purpose of which being more fully hereinafter described. The roller 47 is also supported in bearings 67 and 68 which are provided with integrally formed pin members 70 which rest in suitable orifices in arms 71 and 72. The arms 65 and 66 are connected

by means of a suitable rod 73 and are pivotally secured to the brackets 59 and 60 by means of the rod 73 and a lever 74 secured to the rod 73 which connects the arms 65 and 66 when moved causes the arms 65 and 66 and its supported floating roller 46 to be swung about its pivot rod 73 a limited distance. A leaf spring 75 secured to the bracket 59 is engaged by the lever 74 when the roller 46 is in its operative position to hold the same in that position. The roller 48 is rotatably supported by means of a U-shaped member 76 which U-shaped member 76 is in turn pivotally secured to the upright members 35 and 36 by means of the plates 77 which are secured to the said upright members 35 and 36. A spiral spring 78 around a rod 79 on which the U-shaped member 76 is pivoted has one end secured to the U-shaped member 76 and its other end secured to the rod 79 and the tension of the spring 78 is such as to force the U-shaped member 76 and its supported roller 48 downward. The roller 44 is connected to the main shaft 3 through the agency of the pulleys 51 and 53 and belt 52, and as the shaft 3 rotates, rotary motion is transmitted to the roller 44 by means of this belt and pulley connection. The belt 43, as before described, traverses the roller 44 and the rotation of the roller 44 transmits motion to the belt 43 and this belt 43 serves as an auxiliary drive for purposes as will presently be described. The belt 43 also cooperates with the winding spindle 31 and engages the face of the coil being formed on the winding spindle 31 and the rotation of the winding spindle transmits motion to the belt 43 which rides over the rollers 44, 45, 46, 47 and 48 and causes rotation of the said rollers. The rollers 46, 47 and 48 are idlers over which the belt 43 travels and the roller 48 rotatably supported by U-shaped member 76 over which the belt also travels serves as a tension for the belt due to the spring connection 78 as before described to keep the belt taut. The roller 45 is also rotated by the belt 43 over which it travels and transmits motion to the vertical shaft 58 through the agency of the worm 56 secured to the roller shaft and the gear secured to the said shaft 57 for purposes as will presently be described.

A pair of rollers 80 and 81 are associated with the paper feed mechanism PF and are supported by the upright members 35 and 36. The roller 81 is rotatably supported in a pair of suitable bearings in the upright members 35 and 36 and has secured to one end of its supporting shaft a pinion 82 which meshes with a worm 83 loosely supported on the end of the vertical shaft 58 which when rotating transmits rotary motion to the roller 81 at predetermined times through the agency of the pinion 82 and worm 83 for purposes as will presently be described. The vertical shaft 58 is rotatably supported in bearings 54 and 55 which bearings are secured to the gear covers 98 and 99 while gear covers 98 and 99 are secured to the upright frame member 35 by means of suitable screws. The roller 80 directly above the roller 81 is slidably supported by means of a pair of members 84 and 85 which rest in the bifurcated ends 86 and 87 of the upright members 35 and 36. A pair of plates 88 and 89 is secured to the ends of the upright members 35 and 36 by means of suitable screws and adjustment screws 90 which pass through suitable tapped orifices in the plates 88 and 89 engage spiral springs 91 which rest against the members 84 and 85 and the tension of the springs 91 is such as to force the roller which is rotatably supported by the said members 84 and 85 into contact with the roller 81. The adjusting screws 90 are for the purpose of regulating the tension of the springs 91 and lock nuts 92 for the screws 90 secure the screws 90 in their adjusted positions. A rod 93 rotatably supported in plates 88 and 89 has secured thereto arms 94 and 95 which are provided with arcuate shaped extensions 96 integrally formed therewith and these arcuate shaped extensions 96 engage respectively pins 97 in the members 84 and 85. The arm 94 is provided with a lever extension 94′ which when moved to the right with reference to Fig. 5 causes the rod 93 to be rotated and as the arms 94 and 95 are secured to the rod 93, the said arms 94 and 95 are moved, causing their arcuate shaped extensions 96 to engage the pins 97 in the slidable members 84 and 85 and move the said members 84 and 85 upward against the tension of the springs 91, and as the roller 80 is rotatably supported by these members 84 and 85, it is also moved from engagement with the roller 81. This provision for moving the roller 80 is for the purpose of inserting the paper from the paper supply for purposes as will presently be described. To release the roller 80 from its raised position, the lever 94′ is moved to its position illustrated in the drawing, permitting the members to be forced down to their normal position by means of the spring 91.

We provide a suitable paper feed mechanism PF and a suitable knife 100 for cutting the paper into desired lengths as it is fed by the paper feed mechanism to the coil being wound, and the movement of the paper feed PF and its associated knife 100 will now be described. A link 101 is provided which is pivotally secured at its one end to the lug 102 on the member 16 by means of a suitable pin 103, and intermediate of its ends the link 101

is pivoted by means of a suitable pivot pin 104 to U-shaped bracket 240 which is secured to the upright members 35 and 36 by means of suitable bolts this pivot pin 104 serving as a fulcrum for the link 101 about which the said link rocks. A rod 105 rotatably supported by the bracket arms 40 and 41 which support the spool of paper 39 has secured to it an arm 106. A member 107 is pivotally secured to the arm 106 by means of a pin 207 and a connecting link 108 having its one end 109 pivoted to the member 107 and its other end 110 pivoted to the link 101 connects the link 101 and the arm 106 secured to the rotatable rod 105.

The upper end of the vertical shaft 58 slidably supports a collar 111 which collar 111 is keyed to the shaft 58 to permit the collar to be moved up or down on the shaft 58 a limited distance but due to its being keyed to the shaft 58, it is rotated with the shaft 58. A yoke member 112 suitably pivoted at its one end at 113 spans the collar 111 and is provided with suitable pins which rest in an annular slot in the collar 111. The end 114 of the yoke member 112 is provided with a threaded orifice which is adapted to receive a threaded pin 115 which when in position is engaged by an arm 116 secured to the rod 105, and this arm 116 through the agency of the pin 115 brings about the limited up and down movement of the collar 111 keyed to the shaft 58. The pin 115 is adjustable to regulate the movement of the collar 111 and a lock nut secured to the pin 115 holds the same in its adjusted position. The collar 111 is provided with teeth 117 on its bottom peripheral face, which are adapted to engage suitable notches 118 in the peripheral face of the worm 82 loosely supported on the shaft 58 for purposes as will presently be described. The other end of the rod 105 has secured to it an arm 120 which extends rearwardly and pivotally secured to it is a threaded member 121. The knife 100 for cutting the paper into desired lengths is pivotally secured to the upright member 36 by means of the screw 122 and its end 123 is provided with a suitable orifice 124 through which member 121 extends, and by means of a suitable adjustable nut 125 threaded on the member 121 the instant at which the movement of the knife is brought about may be regulated by this nut 125 and a lock nut 125' holds the nut 125 in its adjusted position, and a spring 126 around the member 121 rests against the end 123 of the knife 100 and is held under tension by means of a nut 226 which is threaded upon the member 121 to hold the knife end 123 against the nut 125. A suitable slot 128 through which the paper is fed is formed by the plates 129 and 130 which are secured to the upright members 35 and 36.

A chute S for guiding the length of paper cut by the knife 100 to the winding spindle 31 upon which the coil is being wound comprises a pair of suitably formed strips 131 and 132 each of which is secured respectively to a pair of U-shaped brackets 133 and 134. A pair of arms 135 secured to the brackets 40 and 41 support a rod 136 which is provided with left and right hand threaded portions 137 and 138. A pair of lugs 139 and 140 having threaded engagement respectively with the threaded portions 137 and 138 of the rod 136 have secured to them respectively the U-shaped brackets 133 and 134 which have secured to them the strips 131 and 132. A pair of arms 141 and 142 secured to the bracket 240 supports a rod 143 which is provided with left and right hand threaded portions 144 and 145. A pair of lugs 146 and 147 having threaded engagement respectively with the threaded portions 144 and 145 of the rod 143 have secured to them respectively a U-shaped bracket 133 and 134 to which are secured the strips 131 and 132. A side extension 148 is suitably secured to each strip 131 and 132 to form the walls for the upper portion of the chute S and its lower portion is provided with a suitable cover portion 149 also secured to the strips 131 and 132. The strips 131 and 132 and their respective brackets 133 and 134 being thus secured to the lugs 139, 140, 146 and 147 on the respective rods 136 and 143 suspend the chute S in position so that its receiving end is in place near the outlet 128 of the paper feed and its delivery end is in position just above the winding spindle 31 for the delivery of the paper to the coil being wound at proper intervals. The rods 136 and 143 which support the chute S as a whole have slotted ends which are adapted to receive a screw driver or suitable instrument and may be turned to the right or left causing the lugs 139, 140, 146 and 147 which support the strips 131 and 132 and their supported parts to move away or toward each other as the case may be to either increase or decrease the width of the chute S so that varying widths of paper may be used to wind different widths of coils and suitable set screws are provided which lock the rods in their adjusted positions. Suitable wire guides 150 are provided which are secured to the chute and serve as guides in permitting free passage of the paper in its downward travel in the chute S.

A rod 151 pivotally supported by the U-shaped bracket 240 has secured at each end arms 152 and 153 which are connected by means of suitable rods 154 and 155. A spiral spring 256 having one end secured to the rod 151 and its other end secured to the bracket 240 holds the arms 152 and 153 which are connected by the said rods 154 and 155 against an adjustable stop 156 which is secured to an arm 157 which arm

157 is secured to the bracket 240 for purposes as will presently be described. The slidable member 16 carries a pair of pivoted dogs 158 and 159 which are pivotally supported by means of the pivot screws 160 and 161. A spring 162 around the pivot pin 160 has its one end secured to the dog 158 and its other end secured to the member 16 and the tension of the spring 162 is such as to hold stop extension 158' of the dog 158 against stop 163 which is secured to the member 16. A spring 164 around the pivot screw 161 has its one end secured to the dog 159 and its other end secured to the member 16 and the tension of the spring 164 is such as to hold the stop extension 159' of the dog 159 against its stop 165 which is secured to the member 16. An adjustable threaded member 166 is secured to the arm 152 and is provided with a cam shaped member 166' which is engaged by the dog 158 when the member 16 is traveling to the left to move the arms 152 and 153 away from its stop 156. An adjustable threaded member 167 is secured to the arm 153 and is provided with a cam shaped member 167' which is engaged by the dog 159 when the member 16 is traveling to the right to move the arms 152 and 153 away from its stop 156. A Y-shaped member 168 secured to an adjustable block 169 on the rod 155 cooperates with the paper that is dropped down the chute S so that the paper is released at the right instant so that it may be fed to the coil all of which will be described in detail when describing the operation of the machine.

Having described in general the mechanism which comprises the machine of our invention, we will now describe in detail the operation of the same which is as follows: Assuming that a strand of wire from the supply spool 30' on the spindle 30 is led over the guide wheel of the tension device T, and over the guide wheel 28, under the guide wheel 27, under the guide wheel 26, and over the guide wheel 28, and attached to the winding spindle 31. When the strand is thus threaded over the guide wheels and attached to the core of the coil to be wound, the machine is now started by operating the starting lever to release the brake mechanism B and operate the clutch pulley 4. Assuming that the carriage 16 is in the position illustrated in Fig. 1, when the starting lever is actuated, rotary motion will be transmitted to the main shaft 3 causing the winding spindle 31 integrally formed therewith to rotate, and through the agency of the train of gearing in the housing H, motion is transmitted to the traverse cam, and through the agency of the pin connection between the rocker arm 5 that is pivoted to the pivot 7 and the traverse cam the rocker arm 5 will rock about its pivot 7 and move to the right, and due to the link connection 22 between the rocker arm 5 and the slidable carriage members 16 and 17 supported on the shafts 12 and 13. The strand guiding mechanism SG as a whole is moved to the right to feed the wire strand from the supply spool 30' to the winding spindle 31 at a predetermined number of convolutions per inch. As the carriage 16 moves to the right, the free end of the link 101 which is pivotally secured to the carriage 16 by the pivot pin 103 and fulcrumed by the pivot pin 104 to the bracket 240 swings to the left. The link 108 pivotally secured to the free end of the link 101 pivotally secured to the arm 106 secured to the rod 105 now starts to move in an upward direction as the link 101 is rotated about its fulcrum 104, and as the arm 106 is secured to the rod 105 and connected to the link 108, the said arm 106 is also raised, causing the rod 105 to rock in its bearing supports in the members 40 and 41. The arm 116 which is secured to the rod 105 is in the position as illustrated in Fig. 2 when the machine starts its travel from left to right, and when the rod 105 is rocked for the reason just described, its free end which engages the pin 115 starts moving in a downward direction. The arm 120 which is secured to the other end of the rod 105 also starts moving in a downward direction and this arm 120 causes the knife 100 which is pivotally secured to the upright 36 by the pivot screw 122 to swing about its pivot 122, to raise the knife 100 upward by means of the member 123 and its supported parts. As the shaft 3 rotates, rotary motion is also transmitted to the roller 44, through the agency of the belt 52 and pulley wheels 51 and 53, and due to the rotation of the winding spindle 31 the belt 43 starts its travel over the rollers. The rotation of the roller 44 through the agency of the pulleys 51 and 53 and belt 52 serves as an auxiliary means for the travel of the belt 43. The vertical shaft 58 is rotated through the agency of the worm 56 secured to the roller shaft of the roller 45, and the worm shaft 58 at this time does not affect the rotation of worm 83 secured to the shaft 58. Due to the fact that the arm 116 is in its raised position, its free end engages the end of the pin 15 which is adjustably secured to the yoke 112 which spans the collar 111. From the previous description it will be remembered that the yoke is slidably secured to the upper end of the shaft 58, and with the arm 116 in its raised position it is apparent that the collar will also be in its raised position with its teeth 117 out of mesh with the notches 118 in the worm 83 loosely supported on the shaft 58. Thus, with the members 116 and 11 in this position no motion is transmitted

to the roller 81 at this time. As the carriage 16 continues its travel from left to right, the free end of the link 101 continues its travel to the left rocking about its fulcrum point 104, and due to the connecting link 108 and the rod 105, arms 116 and 120 continue their downward movement, the arm 116 permitting the yoke 112 to rock about its pivot 113 and the spring 250 which has one end secured to the arm 116 and its other end secured to the yoke 112 draws the yoke 112 down, and the arm 120 in its downward movement causes the knife 100 to rotate about its pivot 122 and move upward due to the downward pressure exerted on the end 123 of the knife 100 by the nut 226 and spring 126. The yoke 112 in its downward movement also carries the collar 111 in a downward direction due to the pin connection of the yoke and the annular groove in the collar 111. Now when the teeth 117 engage the notches 118 in the worm 83, motion is transmitted to the worm 83 due to the fact that the collar 111 is keyed to the shaft 58, and through the agency of the worm 83 and the worm gear 82 on the roller shaft or roller 81, the roller starts rotating and feeds the paper from the supply spool 39 through the slot 128 formed by the plates 129 and 130. The roller 80 which cooperates with the roller 81 is also rotated as before described. The free end of the link 101 continues in its travel to the left, causing the arm 116 to continue in its downward movement, permitting the collar 111 to remain in mesh with the worm 83. Now, when the free end of the link 101 passes the apex of its swing from the right to left, the link 108 which connects the arm 106 secured to the rod 105 is now started in a downward direction as is readily apparent causing the rod 105 to rotate in a direction opposite that which it was rotated during the swing of the free end of the link 101, until it reached the apex of its swing from right to left. This rotation of the rod 105 in the opposite direction, due to the link 118 moving in a downward direction, causes the free end of the arm 116 to move in an upward direction, and again engages the pin 115 of the yoke 112. The collar 111 is again started to move in an upward direction, and when the collar 111 is raised high enough to cause the disengagement of its teeth 117 with the notches 118 in the worm 83, further rotation of the roller 81 is stopped, as the worm 83 is loose upon the shaft 58. The arm 120 which controls the movement of the knife 100 also moves upward and the instant that the clutch collar 111 disengages the worm 83, the knife starts its downward travel to cut off the paper that was fed through the slot 128. As the carriage 16 continues its travel to the right, the dog 159 will engage the cam face of the cam 167 adjustably secured to the arm 153 and force the arms 152 and 153 against the normal tension of the spring 256 around the rod 151. As the carriage 16 is traveling in a left to right direction the dog 159 engages the cam 167 and as the said dog 159 is held in the position illustrated in Fig. 6 by the stop 165, the arms 152 and 153 are moved inward. The Y-shaped member 168 which is secured to the rod 115, that connects arms 152 and 153 is also moved and its angular ends 168′ are placed in position so that when the paper is cut off by the knife 100, and drops down the chute S by gravity it will engage these ends 168′ and rest against them. Now when the nose 159^2 of the dog 159 passes the nose 167^2 of the cam 167, the spring 256 which was placed under tension when the arms 152 and 153 were moved again permits the arms 152 and 153 to move back to their normal position against the stop 156. This tripping of the arms 152 and 153 takes place the instant the carriage 15 reaches the end of its left to right travel so that the instant the travel of the carriage 16 is started in the reverse direction, the ends 168′ are withdrawn from the chute S and release the strip of paper so that it may drop between the face of the coil being wound, and the belt 43 and be carried by the strand of wire and placed around the coil to insulate the layer just wound, from the next one to be started when the carriage 16 starts its travel back in a right to left direction. This reversal of direction of the carriage 16 is brought about by the traverse cam and the connecting link 22 between the rocker arm 5 and the connecting plate 19. As the carriage 16 starts its travel from right to left, the free end of the link 101 will start to swing to the right and bring about the operation of the paper feed mechanism PF, and the knife 100 in the same sequence as above described. As the carriage 16 starts its reverse travel, the dog 159 will engage the cam 167 and as the carriage 16 continues in its travel, the dog 159 will be rotated about its pivot 161, against the tension of its spring 164 permitting the dog 159 to pass the cam 167, and when it has disengaged the cam 167, it again restores with its stop extension 159′ again engaging the stop 165, it being restored by the spring 164.

Travel of the belt 43 is brought about by the said belt 43 engaging the face of the coil being wound on the spindle 31. The roller 44 which is driven from the main shaft 3 through the medium of the belt 52 and pulleys 51 and 53 serves as an auxiliary drive and aids in the travel of the belt 43 so that the belt 43 is always supplied with ample power to drive the paper feed mechanism. As the size of the coil increases the speed of travel of the belt 43 is increased as is readily apparent due to its being driven by the wind-

ing spindle 31 and this increased travel of the belt 43 increases the speed of rotation of the roller 45 over which it travels, causing the shaft 58 to be rotated at increased speed and through the agency of the worm wheel 82 and worm 83, the speed of rotation of the roller 81 is increased, causing the roller to feed longer strips of paper during the time that collar 111 is in mesh with the notches 118 of worm 85, and it may therefore be seen that the same number of layers of paper are placed on the coil between each layer of convolutions of wire by this automatic increasing of the speed of the shaft 58 as the coil increases in diameter.

While we have described a preferred embodiment of our invention it is to be understood that changes and modifications will readily suggest themselves by those skilled in the art and therefore aim to cover all such changes and modifications as come within the spirit and scope of the appended claims.

What we claim as new and desire to secure by United States Letters Patent, is:—

1. In a winding machine of the character described comprising a winding spindle, a reciprocating carriage including guiding means for laying the strand in successive layers, driving means for rotating said winding spindle, paper feed mechanism for delivering sheets of paper to said winding spindle, a shaft, clutch mechanism associated with said shaft, means for transmitting motion to said shaft and means under the control of said reciprocating carriage for operating said clutch mechanism to engage said shaft to operate said paper feed mechanism at predetermined intervals.

2. In a winding machine of the character described comprising a winding spindle, a reciprocating carriage including a guide means for laying the strand in successive layers on said spindle, driving means for rotating said winding spindle, paper feed mechanism for feeding sheets of paper to the winding spindle, a shaft, clutch mechanism associated with said shaft, means for rotating said shaft, a link connection under the control of said reciprocating carriage for actuating said clutch mechanism to engage said shaft to operate said paper feed mechanism at predetermined intervals.

3. In a winding machine of the character described comprising a winding spindle, a reciprocating carriage including a guide means for laying a strand of material in successive layers on said spindle, driving means for rotating said winding spindle, paper feed mechanism for feeding sheets of paper to said winding spindle, from a paper supply, a shaft, clutch mechanism associated with said shaft, means for rotating said shaft, said means under the control of said winding spindle, a link connection under the control of the reciprocating carriage for actuating said clutch mechanism to engage said rotating shaft to operate said feed mechanism at predetermined intervals.

4. In a winding machine of the character described comprising a winding spindle, a reciprocating carriage including a guiding means for laying a strand of material in successive layers on said winding spindle, driving means for rotating said spindle, paper feed mechanism for feeding sheets of paper to said winding spindle from a paper supply, a shaft and clutch mechanism associated with said shaft for said paper feed, means for rotating said shaft, said means under the control of said winding spindle, a link connection connecting said carriage and said clutch under the control of said carriage for actuating said clutch mechanism to engage said shaft to cause said paper feed mechanism to function at predetermined intervals.

5. In a winding machine, the combination of a winding spindle, driving means for rotating said spindle, a reciprocating carriage including guiding means for laying successive layers of material on said winding spindle, paper feed mechanism for feeding sheets of paper to said winding spindle from a paper supply, a shaft and clutch mechanism associated with said paper feed, a knife, means for rotating said shaft, said means under the control of said winding spindle, a link connection under the control of said carriage for actuating said clutch mechanism to engage said shaft to cause said paper feed mechanism to function at predetermined intervals, the said link connection also operating said knife to sever said paper in desired lengths.

6. In a winding machine, the combination of a winding spindle, driving means for said winding spindle, means for feeding sheets of paper to said winding spindle, a reciprocating carriage including guiding means for laying successive layers of material on said winding spindle, a knife for severing the paper in desired lengths, said means for feeding said sheet of paper and said knife for severing said paper in desired lengths under the control of said reciprocating carriage and means including a link connection for associating said means for feeding said paper and knife with said carriage.

7. A winding machine including a source of supply and a winding spindle, driving means for said winding spindle, a reciprocating carriage supporting means for laying successive layers of material from said source on said winding spindle, a shaft, means associated with said shaft and spindle for driving said shaft, clutch mechanism associated with said shaft, a link connection for associating said carriage with said clutch mechanism, said reciprocating movement of said carriage causing said link connection to

actuate said clutch mechanism to engage said driven shaft at predetermined intervals.

8. A winding machine including a source of supply and a winding spindle, driving means for said winding spindle, a reciprocating carriage supporting guiding means for laying successive layers of material from said source on said winding spindle, paper feed mechanism for delivering sheets of paper to said winding spindle, a shaft, means associated with said shaft and spindle for driving said shaft, clutch mechanism associated with said shaft, and a link connection for associating said carriage with said clutch mechanism, the said movement of said reciprocating carriage causing said link connection to actuate said clutch mechanism to engage said driven shaft to operate said paper feed mechanism at predetermined intervals.

9. A winding machine including a source of supply and a winding spindle, driving means for said winding spindle, a carriage having reciprocating movement and including guiding means for a strand from said supply source to said winding spindle, paper feed mechanism for delivering sheets of paper to said winding spindle, a driven shaft, clutch mechanism associated with said shaft, driving means between said spindle and said shaft, auxiliary driving means for said shaft associated with the coil being wound on said spindle, clutch mechanism for said shaft, and a link connection between said carriage and said clutch mechanism, the said link causing movement of said clutch to engage said shaft to operate said paper mechanism at predetermined intervals due to the reciprocating movement of said carriage.

10. A winding machine including a source of supply and a rotatable winding spindle, a reciprocating carriage supporting guiding means for laying successive layers of material from said source over said guiding means on said winding spindle to form a coil, a shaft, means associated with shaft and spindle for driving said shaft, a plurality of rollers, an auxiliary drive for said shaft including said rollers, paper feed mechanism for delivering sheets of paper to said winding spindle, clutch mechanism associated with said shaft, and a link connection for associating said carriage with said clutch mechanism, the reciprocating movement of said carriage causing said link connection to actuate said clutch mechanism to engage said shaft, to operate said paper feed mechanism at predetermined intervals.

11. A winding machine including a source of supply and a rotatable winding spindle, a reciprocating carriage supporting guiding means for laying successive layers of material from said source on said winding spindle to form a coil, a shaft, means associated with said shaft and said spindle for driving said shaft, a plurality of rollers, an auxiliary drive for said shaft including said rollers, paper feed mechanism including a paper supply for delivering sheets of paper to said winding spindle, clutch mechanism associated with said shaft, a link connection for associating said carriage with said clutch mechanism, the reciprocating movement of said carriage causing said link connection to actuate said clutch mechanism to engage said shaft to operate said paper feed mechanism at predetermined intervals, and means for severing said sheets of paper in desired lengths.

12. In a winding machine including a winding spindle and a source of supply, driving means for said winding spindle, a reciprocating carriage including guiding means for laying successive layers of material on said spindle to form a coil, feeding means for feeding sheets of paper to said winding spindle from a paper supply, driving means for said feeding means normally disconnected, means under the control of said reciprocating carriage for connecting said driving means with said feeding means to operate said feeding means at intervals to feed said sheet of paper, said feeding means operating at increasing speeds through the agency of said driving means to deliver varying lengths of paper as the size of said coil on said winding spindle increases, and severing means for severing said sheets of paper in desired lengths to be fed to said coil.

13. A winding machine including a winding spindle and a source of supply, driving means for said winding spindle, a reciprocating carriage including guiding means for laying successive layers of material on said spindle to form a coil, feeding means for feeding sheets of paper to said winding spindle from a paper supply, driving means for said feeding means normally disconnected, means under the control of said reciprocating carriage for connecting said driving means with said feeding means to operate said feeding means at intervals to feed said sheets of paper in desired lengths to be fed to said coil, and severing means for severing said sheets of paper in desired lengths to be fed to said coil, said driving means associated with said paper feed and said coil being formed for operating said feeding means to increase the lengths of the sheets as the diameter of the coil increases.

14. A winding machine of the character described including a winding spindle, a core for connection thereto, a reciprocating device and means for placing layers of material on said core to form a coil, driving means for said paper feed mechanism normally disconnected therefrom, paper feed mechanism for supplying paper to said core, means associated with said reciprocating de-

vice for automatically connecting said driving means with said paper feed mechanism to operate said paper feed mechanism to supply said paper to said core, said paper feed mechanism operating at increasing speeds through the agency of said driving means, to deliver varying lengths of paper as the size of said coil on said winding spindle increases.

Signed by us at Chicago, in the county of Cook and State of Illinois, this 30th day of October, 1923.

ERNEST A. BOHLMAN.
EMIL J. NIELSEN.