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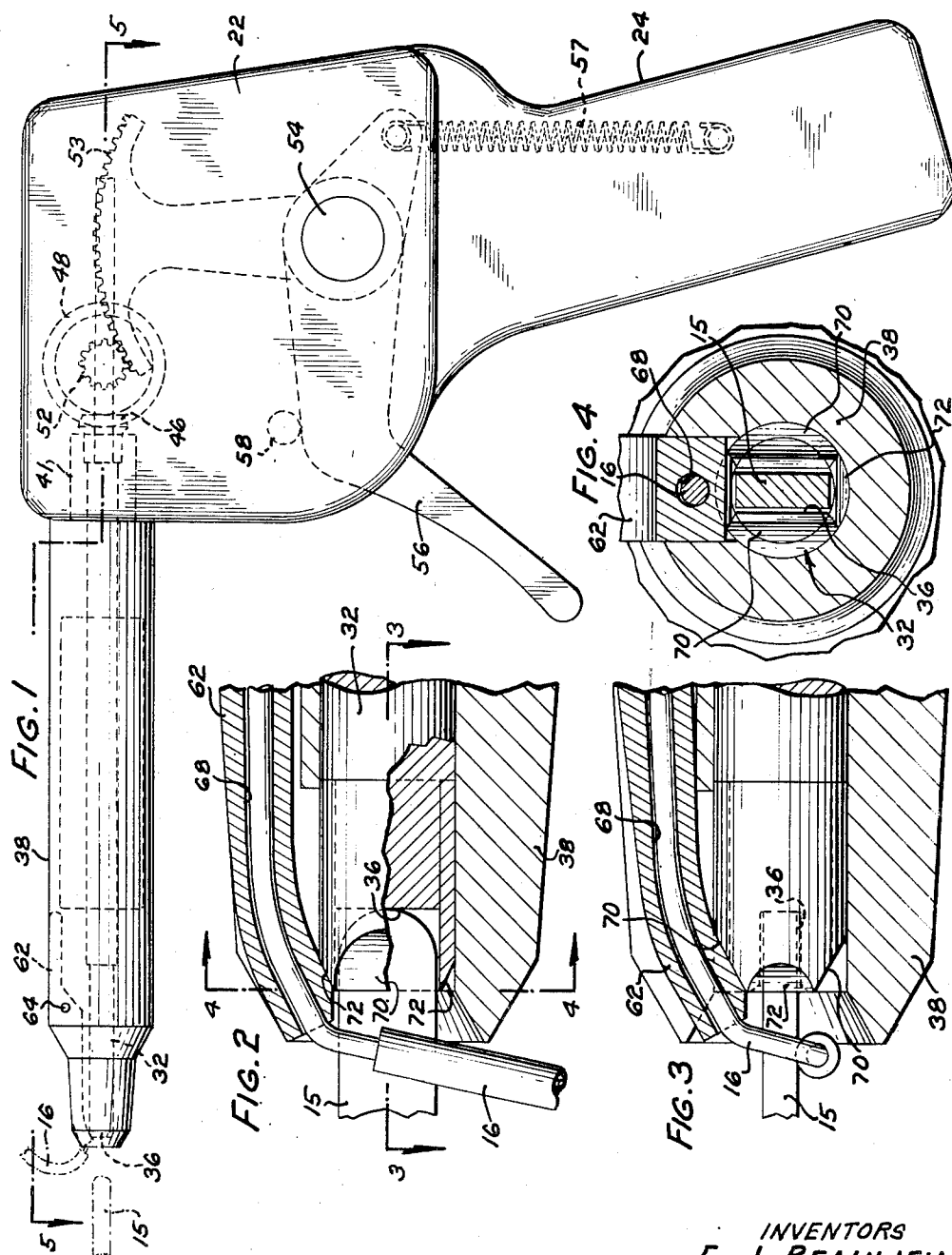
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DEVICE FOR WINDING WIRE ABOUT TERMINALS

Filed May 6, 1949

4 Sheets-Sheet 1



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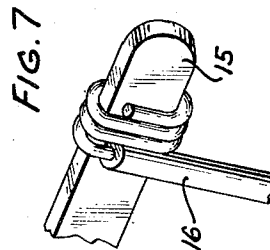
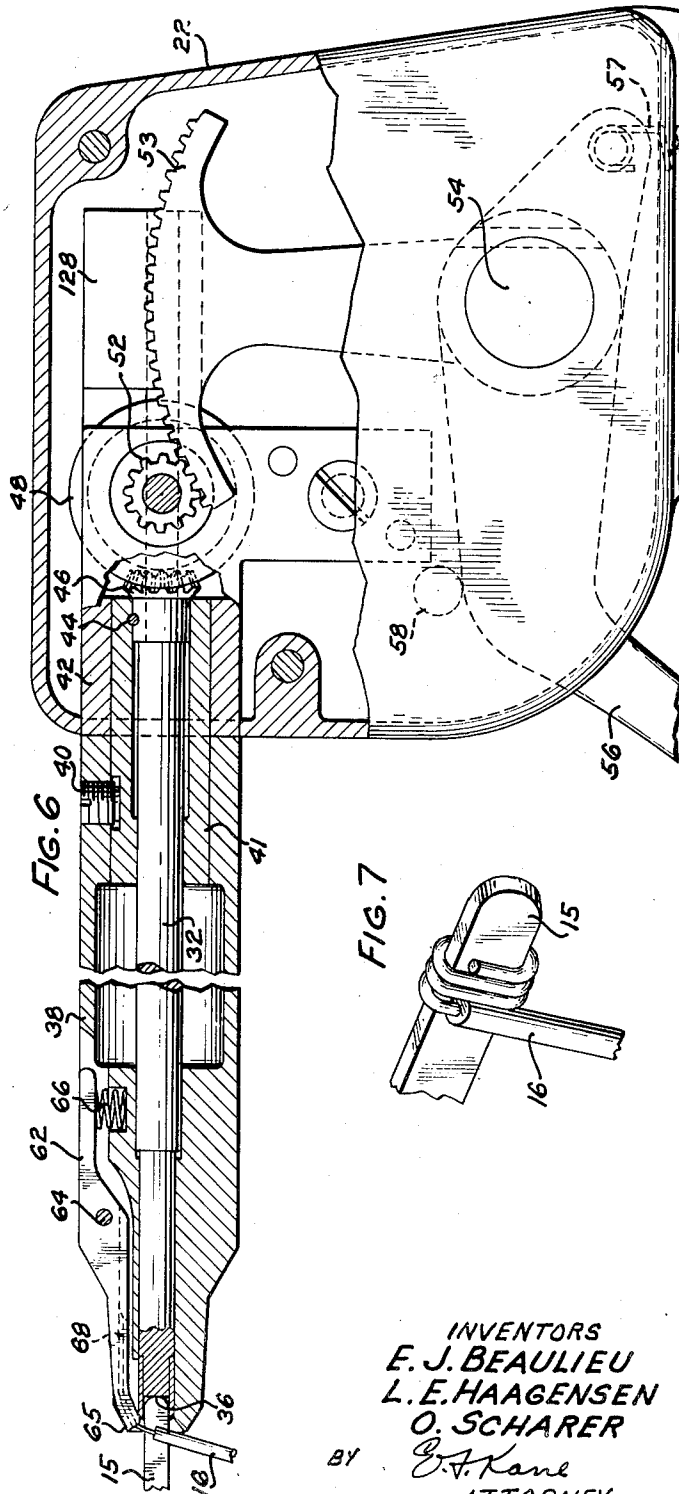
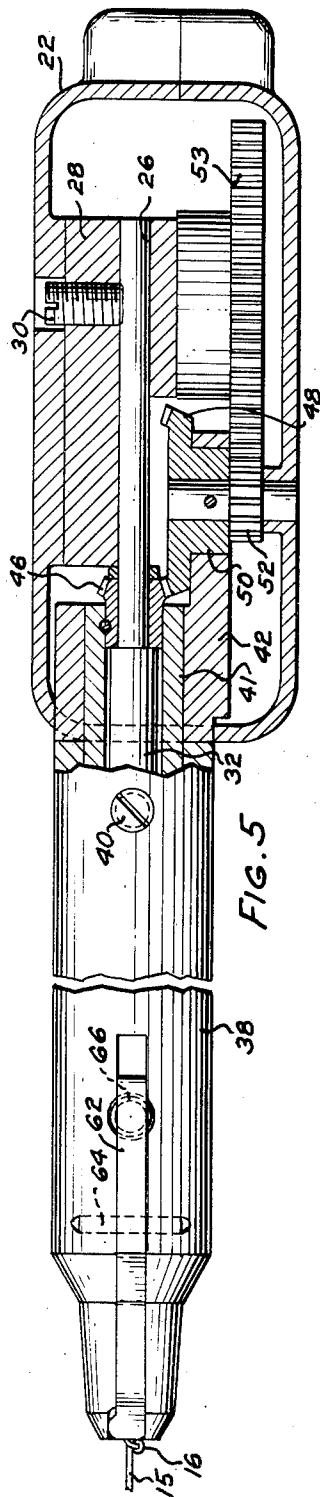
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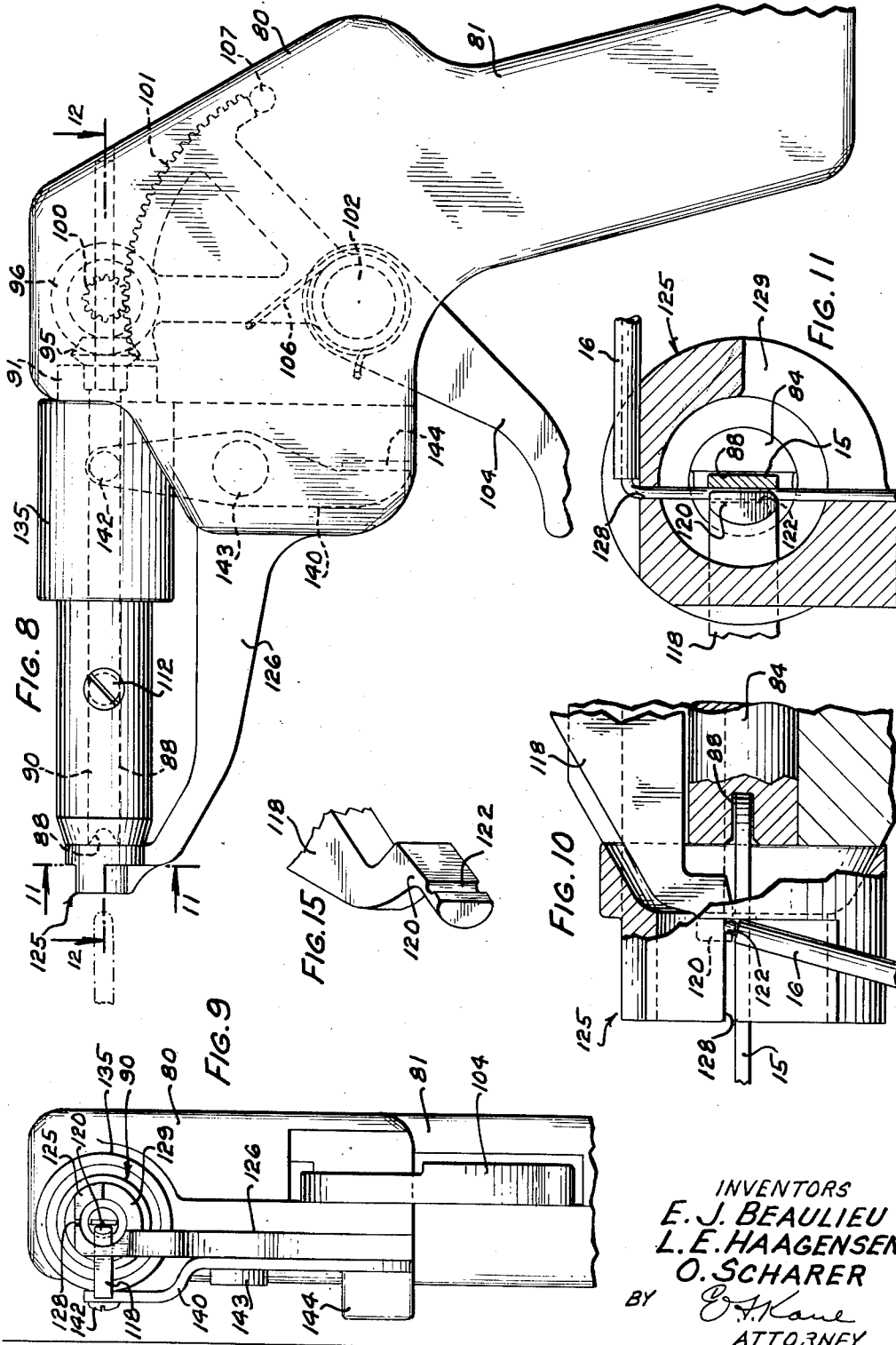
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DEVICE FOR WINDING WIRE ABOUT TERMINALS

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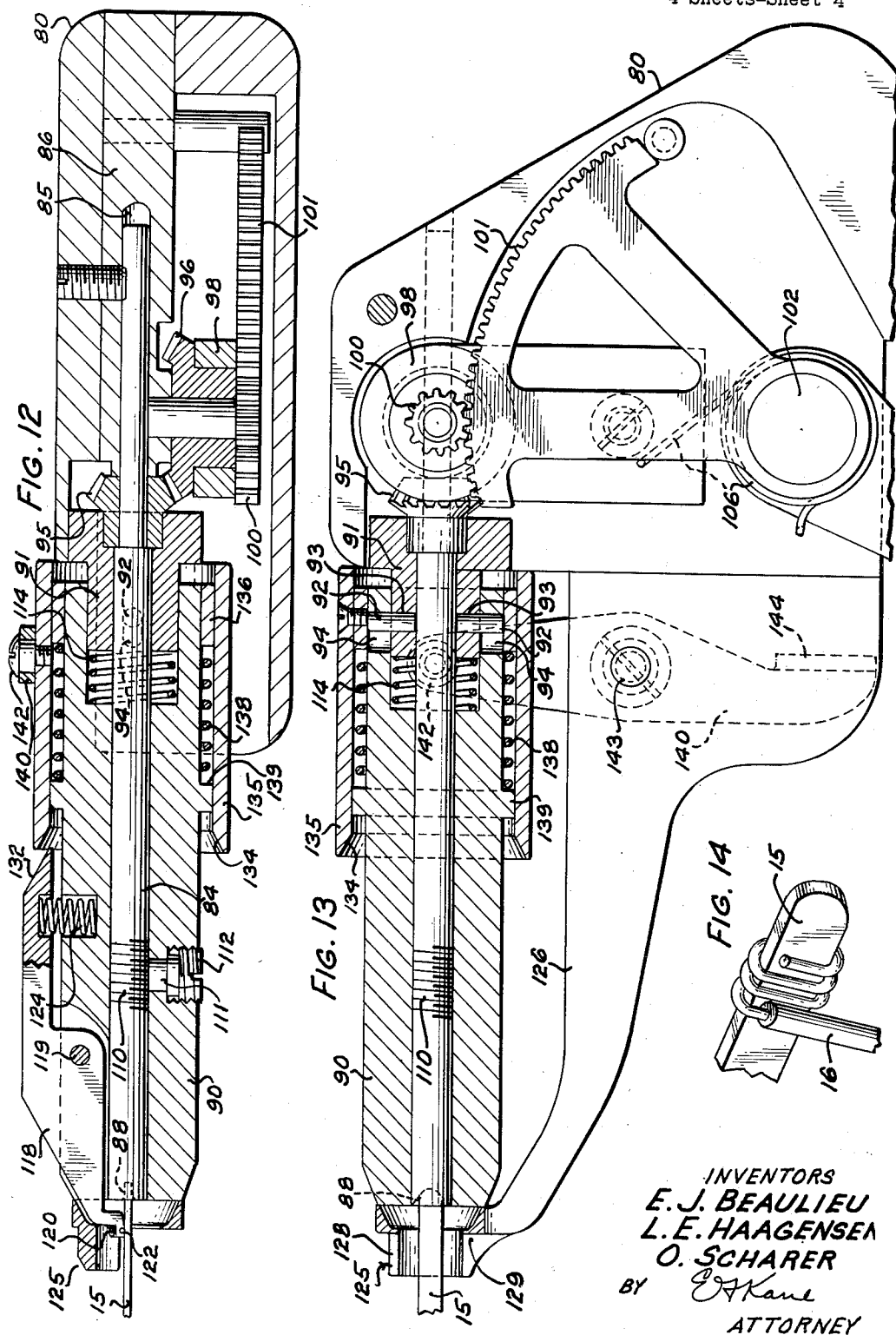
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DEVICE FOR WINDING WIRE ABOUT TERMINALS

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4 Sheets-Sheet 4



UNITED STATES PATENT OFFICE

2,648,356

DEVICE FOR WINDING WIRE ABOUT
TERMINALS

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13 Claims. (Cl. 140—122)

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This invention relates to wire winding devices and more particularly to a tool for twisting connector wires around flat type terminals.

An object of the present invention is to provide an improved device for attaching a connector wire to a terminal.

In one embodiment of the invention the wire winding device is provided with a stationary shaft having a rectangular recess in one end thereof for receiving one end of the terminal and having a sleeve mounted for rotation on the shaft under control of the operator and slotted at its forward end for receiving a pivoted axially extending winding finger for rotation therewith. The winding finger apertured longitudinally from its forward end to receive the connector wire therein is positioned with its forward end adjacent the recess in the stationary shaft and is pivotally mounted in the rotatable sleeve and stressed for movement so as to urge the forward end of the winding finger and the connector wire therein into close proximity with the terminal member inserted in the recess of the device whereby as the sleeve is rotated the winding finger serves to wind the connector wire spirally about the terminal.

In another embodiment of the invention the wire winding device is provided with a stationary rod having a terminal receiving recess at its forward end having a sleeve mounted thereon for rotation under control of the operator. Pivotally mounted in a slot in the forward end of the sleeve is a winding finger which has a head at the forward end thereof extending beyond the recessed end of the stationary rod and having a transverse recess for receiving a connector wire therein. A slotted stationary guide at the forward end of the rotatable sleeve serves to support the connector wire in position adjacent the terminal, and a helical threaded connection is provided between the stationary rod on the rotatable sleeve to retract the sleeve on the rod during the rotation thereof so that during the rotation of the sleeve, the head of the spring-pressed winding finger yieldably urges the connector wire against the terminal and winds the free end thereof into a helix about the terminal and in tightly wrapped engagement therewith.

Other objects and advantages will be apparent by reference to the following detailed description of the invention and the accompanying drawings illustrating several embodiments thereof, in which

Fig. 1 is a side, elevational view of the preferred embodiment of the wire winding device showing,

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in dot and dash lines, a connector wire inserted in the winding finger thereof and a terminal to which the connector wire is to be secured;

Fig. 2 is an enlarged, fragmentary, vertical, sectional view of the forward portion of the winding device showing a portion of the terminal and the connector wire positioned therein and showing the winding finger with the connector wire inserted therein;

Fig. 3 is a fragmentary, horizontal, sectional view taken on the line 3—3 of Fig. 2 and showing the winding finger therein in a position advanced or rotated 90° with respect to the position shown in Fig. 2;

Fig. 4 is a detailed vertical cross-sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 is a plan, elevational, sectional view of the device taken on the line 5—5 of Fig. 1 with parts broken away;

Fig. 6 is a vertical, central, sectional view of a portion of the device with parts shown in elevation;

Fig. 7 is a perspective view of the terminal with the connector wire wound thereon;

Fig. 8 is a side, elevational view of a modified embodiment of the invention;

Fig. 9 is a fragmentary end elevational view of the device shown in Fig. 8;

Fig. 10 is an enlarged, plan view of the end portion of the winding device shown in Fig. 8 with parts thereof shown in section and showing the terminal and connector wire in position therein;

Fig. 11 is a fragmentary, vertical, sectional view taken on the line 11—11 of Fig. 8 and showing the terminal and the connector wire in position therein;

Fig. 12 is a plan, sectional view of the device taken on the line 12—12 of Fig. 8;

Fig. 13 is a vertical, central, longitudinal, sectional view through the device;

Fig. 14 is a perspective view of the terminal with the connector wire wound thereon; and

Fig. 15 is an enlarged view in perspective of the end of the winding finger.

In the manufacture of electrical apparatus such as is used, for example, in the telephone and radio art, a flat type of terminal 15, as illustrated in Figs. 7 and 14, is frequently used and in order to make an electrical connection therewith, a connector wire 16 is wound in spiral fashion tightly around the terminal for several convolutions, and the junction is enclosed in solder to provide an effective and protected electrical connection. The winding of the connector wire 16 about the

terminal 15, which heretofore has mainly been a manual operation, may be greatly facilitated by the use of portable wire winding devices of the type herein disclosed.

Referring now to the embodiment of the invention disclosed in Figs. 1 to 6, the device is disclosed as a pistol type of winding tool comprising a housing 22 having a hand grip 24 extending downwardly therefrom. Secured in an aperture 26 (Fig. 5) in a stationary boss 28 within the housing 22, as by means of a set screw 30, is one end of a stationary rod or shaft 32. The rod 32 extends outwardly through an aperture in the housing and is provided at its forward end with a rectangular recess 36 for receiving the end of the terminal 15 therein. A sleeve member 38 rotatably mounted on the stationary rod 32 is secured by means of a set screw 40 at its rear end in telescoping relation to a bushing 41, which, in turn, is mounted for rotation on the rod 32 and within a bearing member 42 secured to the housing 22.

At its rear end, the bushing 40 is secured by means of a pin 44 to a bevel gear 46, which is freely rotatable on the rod 32 and meshes with a bevel gear 48 having a cylindrical hub 50, which is rotatably mounted in a bearing aperture in the bearing member 42. A pinion gear 52, secured to the bevel gear 48 for rotation therewith, meshes with a gear sector 53 mounted for movement about a pivot pin 54 and having an operating or trigger lever 56 extending therefrom through an aperture in the housing 22. The sector 53 is stressed for rotation in a clockwise direction about its pivot 54, as viewed in Fig. 1, by a spring 57, the rotary movement of the sector in this direction being limited by a stop pin 58 engageable with the arm 56. It will be apparent, from the description thus far, that, upon engagement and actuation of the lever 56 in a counter-clockwise direction, the sleeve 38 will be caused to rotate through a predetermined number of revolutions, and, upon disengagement of the lever 56, the spring 57 will serve to rotate the sleeve 38 in the opposite direction and restore it to its normal position, as indicated in Figs. 5 and 6 of the drawings.

At its forward end the sleeve 38 is provided with a longitudinal and radially extending slot for receiving a winding finger 62. The winding finger 62 is pivotally mounted intermediate its ends on a pin 64 and has its forward end 65 positioned slightly beyond the end of the rod 32. A spring 66 engaging the rearwardly extending portion of the winding finger 62 stresses the finger for rotation about the pin 64 to urge the forward end 65 into engagement with the end of the rod 32. Extending longitudinally of the winding finger 62 from the forward end 65 thereof is a recess or aperture 68 for receiving the connector wire 16 therein. The bore 68 is formed in the winding finger as by drilling while the forward portion of the winding finger is straight, and after the bore 68 has been formed, the forward end 65 may be bent radially inwardly as shown in the drawings.

To enable the end 65 of the winding finger 62 to move into close proximity to a terminal member 15 positioned in the recess 36 of the rod 32, portions of the forward end of the rod 32 are cut away forming pairs of oppositely disposed inclined surfaces 70—70 and 72—72 arranged in rectangular formation about the rectangular recess 36. The inclined surfaces 70—70 and 72—72, in addition to providing clearance for

the movement radially inwardly of the end 65 of the winding finger 62, form a cam track to guide the forward end 65 radially in and out, as the sleeve 38 and the winding finger 62 are rotated, to follow a rectangular path corresponding generally to the rectangular cross-section of the terminal 15.

In using this device the operator while holding the device in one hand inserts with the other hand the bared end of the connector wire 16 into the aperture 68 of the winding finger 62 as indicated in Fig. 1 and then moves the winding tool or device relative to the terminal to cause the end of the terminal to be positioned within the recess 36 of the stationary rod 32. The conductor wire 16 may then be bent downwardly, as indicated in Fig. 6, and held there while the operator engages and moves the lever 56 to actuate the driving mechanism and rotate the sleeve 38 and the winding finger 62 through a predetermined number of revolutions, approximately three and one-half. As the winding finger 62 is revolved about the rod 32, the forward end 65 thereof will guide the bared end of the connector wire 16 about the terminal and, as successive convolutions are laid or wound on the terminal 15, they act to push the preceding convolutions longitudinally thereon so that, on completion of the winding operation, the end of the connector wire 16 will be wound in a spiral form in tight engagement with the terminal and with the convolutions thereof in tight engagement with each other as shown in Fig. 7.

In the embodiment of the invention illustrated in Figs. 8 to 13, the wire winding device is shown as being of the manually operated pistol type tool comprising a housing 80 having a handle or pistol grip 81. A rod or shaft 84, secured in a recess 85 in a member 86 (Fig. 12) formed as a part of the housing 80, extends outwardly from the housing and, at its forward end, is provided with a recess 88 for receiving one end of the terminal member 15, as illustrated in Figs. 10—13. A barrel or sleeve 90 is rotatably mounted on the shaft 84 and is provided, at one end, with an enlarged aperture for telescopically receiving therein a bushing 91. Pins 92—92, fitting in apertures 93, and longitudinally extending slots 94 in the bushing 91 and the sleeve 90, respectively, operatively connect the sleeve 90 for rotary movement with and for axial movement relative to the bushing 91. The bushing 91 has fixed thereto, as by being pressed therein, a bevel gear 95, which meshes with a bevel gear 96 mounted for rotation in a bearing member 98. Fixed to the bevel gear 96 for rotation therewith is a gear 100, which meshes with a gear sector 101 mounted for oscillating movement about a pivot pin 102. The sector 101 has an operating arm 104 extending outwardly from the housing 80 and is stressed for rotation in a clockwise direction, as viewed in Fig. 8, by a torsion spring 106, and a stop pin 107 serves to limit the rotation of the gear sector in this direction.

Screw threads 110 formed in the shaft 84 are engaged by the threaded end of a plug 111 (Fig. 12) secured to the sleeve 90 by a threaded member 112 and serves to form a threaded connection between the rotatable sleeve 90 and the non-rotatable shaft 84. Upon actuation of the operating arm 104, the drive is actuated to impart movement to the sleeve 90, causing it simultaneously to rotate through a predetermined number of revolutions and to move rearwardly on the shaft in a helical path. Upon release of the operating

arm 104, the torsion spring 106 acts, through the drive, to restore the sleeve to its normal position. A coil spring 114, interposed between the end of the bushing 91 and shoulder in the sleeve 90, serves to urge the sleeve longitudinally away from the bushing 92 and maintains the sleeve in its normal position, as indicated in Figs. 12 and 13.

At its forward end, the sleeve 90 is provided with a radially and longitudinally extending slot for receiving a winding finger 118 therein for rotation with the sleeve 90 and for pivotal movement about a pin 119 carried by the sleeve. A head 120, formed on the forward end of the winding finger 118, is positioned axially beyond the end of the stationary shaft 84 and extends radially inwardly toward the axis of the shaft 84 into close relation with a terminal positioned in the recess 88 of the stationary shaft. A transversely extending groove 122 is formed in the head 120 for receiving the bared end of the connector wire 16 therein and for guiding the connector wire 16 about the terminal 15. A spring 124, engaging the rearwardly extending portion of the winding finger 118, stresses the winding finger for rotation in a counter-clockwise direction about the pivot pin 119 to urge the head 120 thereof into engagement with the terminal member 15.

In order to align the connector wire 16 with the groove 122 in the winding finger 118 and to support it during rotation of the winding finger, a stationary support and guide member 125 is positioned at the forward end of the shaft 84 and the sleeve 90. The guide member 125 is formed on the forward end of the bracket 126 secured to a portion of the housing member 80, as illustrated in Figs. 8 and 9. The guide member 125 has an axially disposed central aperture to provide clearance for rotation and radial outward movement of the head 122 of the winding finger 118. In the upper wall of the member 125, a longitudinally extending slot 129 is formed having an end wall engageable with the bared end of the connector wire 16 to locate the wire 16 in a predetermined position relative to the head 120 of the winding finger 118 and to a terminal 15 positioned in the recess 88. In the lower right-hand portion of the guide 125, as viewed from the front (Fig. 11) a relatively wide recess 129 is formed to provide clearance for the reception of the free end of the connector wire 16. When located in the end of the slot 128, as indicated in Figs. 10 and 11, the connector wire 16 is positioned adjacent the terminal 15 about which the connector wire is to be wound and in alignment with the groove 122 in the head 120 of the winding finger 118.

The other end of the winding finger 118 is inclined to form a cam surface 132, which cooperates with an annular conical cam surface 134 formed on a sleeve 135 mounted for reciprocable movement on the sleeve 90. A ring 136 secured to the inner portion of the barrel 135 forms a shoulder for receiving the thrust of a coiled spring 138 which reacts against the shoulder 139 on the sleeve 90 and serves to urge the sleeve 135 rearwardly to its normal position where it engages a portion of the housing 80, as shown in Fig. 13. A lever 140, pivoted at its upper end 142 to the sleeve 135 and fulcrumed intermediate its ends at 143 to the bracket 126, has a finger piece 144, by means of which the lever may be actuated to impart forward axial movement to the sleeve 135 and cause the rocking of the winding finger 118 to a position permitting the application or insertion of the connector wire 116.

In using this embodiment of winding apparatus, the operator grasps the device by the handle grip 81 and moves the device relative to the terminal 15 so as to position the end of the terminal in the recess 88 of the non-rotatable shaft 84 as illustrated in Figs. 12 and 13. With the index finger, the operator may then rock the actuating lever 140 to advance the sleeve 135 and rock the winding finger 118 to its open or inoperative position, with the head 120 thereof spaced from the terminal 15, after which the bared end of the connector wire 16 may be placed in front of the guide 129, aligned with the slot 128 therein and moved axially into engagement with the end thereof, after which the actuating lever 140 may be released to permit the retraction of the sleeve 135 and the movement of the winding finger 118 to its normal position. As the head 120 of the winding finger 118 moves radially inwardly, it engages the connector wire 16 in the groove 122 thereof and urges it into firm engagement with the terminal 15. The upper portion of the connector wire 16 may be bent transversely and manually held in a fixed position on the supporting guide member 125, as indicated in Figs. 10 and 11. The operator may then engage and actuate the lever 104 which through the gear drive imparts rotation to the sleeve 90 through approximately three and one-half revolutions and simultaneously therewith causes an axial movement rearwardly of the sleeve relative to the stationary shaft and the terminal 15. During this rotary and axial movement of the sleeve, the winding finger 118 moving therewith serves to wrap the free end of the connector wire 16 spirally and tightly about the terminal 15 and with the convolutions thereof in spaced relation to each other as indicated in Fig. 14. Since the downwardly extending free end of the connector wire 16, a portion of which is shown in Fig. 11, is longer than the radius of the central axial aperture through the guide member 120, the connector wire 16 is bent into a loop by the head 120 of the winding finger 118 as the winding finger 118 rotates to wind the wire 16 about the terminal 15, and the free end of the loop gets progressively shorter as the wire 16 passes through the groove 122 as it is progressively wound onto the terminal. On completion of the winding operation, the winding device may be withdrawn axially from the terminal 15 and the connection formed thereon by the connector wire 16.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. A device for winding a connector wire about a flat type terminal comprising a non-rotatable element having a recess in one end thereof for receiving one end of a flat type terminal to position the terminal in predetermined relation longitudinally and transversely with respect to said element, a rotatable member mounted for rotation about said element, a winding finger pivotally mounted on said rotatable member for rotation therewith and having an end portion thereof adjacent the recess of said element, a recess in said end of the winding finger for receiving one end of a connector wire therein, means for rotating said rotary member whereby said winding finger is caused to rotate and wind

the connector wire positioned in the recess of said winding finger around the terminal positioned in the recess of said element, and means on the non-rotatable element operable in response to the rotation of said member for moving said end of the winding finger radially to maintain it in close proximity to the surfaces of the flat type terminal about which the connector wire is being wound.

2. A device for winding a connector wire about a terminal comprising a rod having a recess at one end thereof for receiving one end of a flat type terminal therein to position the terminal in predetermined relation to said rod, a sleeve mounted for rotation on said rod, a longitudinally extending winding finger pivotally mounted intermediate its ends on said sleeve for rotation therewith and having an end portion thereof adjacent the recess of said rod, cam surfaces on the end of said rod forming a cam track conforming generally to the cross-section of said terminal, spring means on said sleeve stressing said winding finger to urge said one end thereof into engagement with said cam track, a longitudinally disposed recess in said winding finger extending inwardly from said one end, means for supporting said rod, and drive means mounted on said supporting means for rotating said sleeve whereby said winding finger is caused to rotate and wind an end portion of a connector wire positioned in the recess of said winding finger around a terminal positioned in the recess of said rod.

3. A winding tool for winding a connector wire about a terminal comprising the combination of a non-rotatable element having a recess in one end thereof for receiving one end of a terminal therein for holding the terminal against lateral movement, said element having means engageable with the end of the terminal to limit the movement of said terminal longitudinally of said element to a predetermined position, a winding member having an end thereof disposed adjacent the recess in said non-rotatable element and a terminal positioned therein and having a recess for slidably receiving a portion of a connector wire therein and supporting said connector wire in engagement with said terminal, rotatable means mounted on said non-rotatable element for supporting said winding member for rotation about said non-rotatable element and for transverse movement relative thereto, means on said rotatable means for stressing said winding member for movement to cause the end thereof to move inwardly toward the axis of rotation to maintain the connector wire in engagement with the terminal, and drive means operatively connected to said winding member for imparting rotation thereto to wind a connector wire positioned in the recess in said winding member about a terminal positioned in the recess in said element.

4. A tool for winding a connector wire about a terminal comprising a non-rotatable element having a recess for receiving one end of a terminal therein to position the terminal in predetermined relation to said element, a rotatable member mounted for rotation about said element, means interconnecting said rotatable member and said element for effecting a relative axial movement therebetween in response to rotation of said rotatable member, a winding finger having an end thereof positioned adjacent the recess, means mounting said winding finger for rotary and axial movement with said rotatable

member and for transverse movement relative thereto, spring means on said rotatable member and cooperating with said winding finger urging said end thereof radially inwardly toward the axis of rotation and a terminal positioned in said recess, a guide recess in the end of said winding finger for receiving an end portion of a connector wire therein to guide the connector wire around the terminal, and drive means for rotating said rotatable member whereby said winding finger is caused to move in a helical path and wind a portion of the connector wire positioned in the guide recess of said winding finger around the terminal positioned in the recess of said element.

5. A device for winding a connector wire about a terminal comprising a non-rotatable rod having a recess in one end thereof for receiving one end of the terminal to position the terminal in predetermined relation to said rod, means for supporting said rod, a sleeve mounted for rotation about said rod, a longitudinally extending winding finger pivotally mounted on said sleeve for rotation therewith and having an end portion thereof positioned beyond the end of said rod and extending inwardly toward the axis of rotation of said sleeve, said end having a transverse recess therein for receiving a connector wire, spring means on said sleeve stressing said winding finger to urge said end thereof toward the axis of rotation of said sleeve for holding a wire positioned in the groove of said end transversely against a terminal positioned in the recess in said rod, a member mounted on said supporting means and positioned adjacent said one end of the winding finger for supporting a portion of the connector wire during the winding operation, and drive means on said supporting means for rotating said sleeve whereby said winding finger is caused to rotate and wind a connector wire positioned in the recess of said winding finger around a terminal positioned in the recess of said rod.

6. A winding tool for winding a connector wire about a flat type terminal comprising a non-rotatable rod having a recess at one end thereof for receiving one end of a terminal therein to position the terminal in predetermined relation to said rod, supporting means including a handle for supporting said rod, a sleeve mounted for rotation about said rod, a longitudinally extending winding finger pivotally mounted intermediate its ends on said sleeve for rotation therewith and having an end portion thereof extending beyond the end of said rod and inwardly toward the axis of rotation of said sleeve, spring means on said sleeve stressing said winding finger to urge said one end toward the axis of rotation of said sleeve, said one end of the winding finger having a transverse recess for receiving a connector wire therein to position the connector wire transversely against a terminal positioned in the recess of said rod, a guide member mounted on said supporting means and positioned adjacent said one end of the winding finger to guide a connector wire into position to be engaged by said end of the winding finger and for holding a portion of said connector wire against movement during the winding operation, an annular member mounted for sliding movement on said sleeve and having a cam surface engageable with the other end of said winding finger to rock said winding finger against said spring means in response to an axial movement of said annular member, means mounted on said supporting

means operable to impart axial movement to said annular member, and drive means on said supporting means for rotating said sleeve whereby said winding finger is caused to rotate and wind a connector wire positioned in the recess of said winding finger around a terminal positioned in the recess of said rod.

7. A winding tool for winding a connector wire about a terminal comprising a non-rotatable rod having a recess in one end thereof for receiving one end of a terminal therein to position the terminal in predetermined relation to said rod, means for supporting said rod, a sleeve mounted for rotation on said rod, threaded means interconnecting said rod and said sleeve for imparting axial movement to said sleeve in response to rotation thereof, a longitudinally extending winding finger pivotally mounted on said sleeve for rotary movement therewith and having one end thereof extending beyond the end of said rod and inwardly toward the axis of rotation of said sleeve, said one end of the winding finger having a transversely extending recess for receiving a connector wire therein, spring means on said sleeve stressing said winding finger to urge said one end thereof toward the axis of rotation of said sleeve for holding a wire positioned in the transverse groove of said one end against a terminal positioned in the recess of said rod, a guide member mounted on said supporting means and positioned adjacent said one end of the winding finger for guiding a connector wire into position to be engaged by said one end of the winding member and for holding a portion of said connector wire against rotation during the winding operation, and drive means mounted on said supporting means for rotating said sleeve through a predetermined number of revolutions whereby said winding finger is caused to rotate and wind a connector wire positioned in the recess of said winding finger around a terminal positioned in the recess of said rod.

8. A winding tool for winding a connector wire about a terminal comprising a non-rotatable rod having a recess in one end thereof for receiving one end of a terminal therein to position the terminal in predetermined relation to said rod, supporting means for supporting said rod, a sleeve mounted for rotation on said rod, threaded means interconnecting said rod and said sleeve for imparting axial movement to said sleeve in response to rotation thereof, means limiting the axial movement of said sleeve, spring means urging said sleeve for axial movement in one direction, a longitudinally extending winding finger pivotally mounted on said sleeve for rotary movement therewith and having one end thereof extending beyond the end of said rod and inwardly toward the axis of rotation of said sleeve, said one end of the winding finger having a transversely extending recess for receiving a connector wire therein, spring means on said sleeve stressing said winding finger to urge said one end thereof toward the axis of rotation of said sleeve for holding a wire positioned in the transverse groove of said one end against a terminal positioned in the recess of said rod, a guide member mounted on said supporting means and positioned adjacent said one end of the winding finger for guiding a connector wire into position to be engaged by said one end of the winding member and for holding a portion of said connector wire against rotation during the winding operation, and drive means mounted on said supporting means for rotating said sleeve through a predetermined

number of revolutions whereby said winding finger is caused to rotate and wind a connector wire positioned in the recess of said winding finger around a terminal positioned in the recess of said rod.

9. A hand tool for winding a connector wire about a flat type terminal comprising a handle member, a non-rotatable element supported by said handle member and having a rectangular recess in one end thereof for receiving one end of a terminal therein to position the terminal longitudinally and laterally in a predetermined relation relative to said element, a rotary member mounted for rotation on said element, a winding finger pivotally connected on said rotary member for rotation therewith and for rocking movement relative thereto and transversely thereof, said finger having its forward end extending forwardly beyond the end of said element and having a bore extending longitudinally thereof from the front end for receiving a predetermined length of the end portion of a connector wire, said finger having its forward end directed inwardly toward the axis to lay the wire as it leaves the finger onto the terminal, resilient means on said rotary member for stressing said finger for movement in one direction to urge the forward end thereof inwardly toward the axis of rotation and the terminal in said recess, and cam surfaces on said element conforming substantially to the rectangular cross-section of said terminal for limiting the inward movement of said winding finger to a predetermined position of close proximity to said terminal.

10. A hand tool for winding a connector wire about a flat type terminal comprising a handle member, a non-rotatable shaft supported by said handle member and having a rectangular recess at one end thereof for receiving one end of a terminal therein to position the terminal longitudinally and laterally in a predetermined relation with respect to said shaft, a tubular member mounted for rotation on said shaft and having its forward end extending beyond the end of said shaft and having conical surfaces for guiding a terminal toward the recess in the end of said shaft, a winding finger pivotally connected intermediate its ends on said tubular member for rotation therewith and for oscillatable movement transversely thereof, said finger having its forward end extending forwardly beyond the end of said shaft and having a bore extending longitudinally thereof from the front end for receiving a predetermined length of the end portion of a connector wire, said finger having its forward end directed inwardly toward the axis to lay the wire as it leaves the finger onto the terminal, spring means on said tubular member stressing said finger for movement to urge the forward end thereof inwardly toward the axis of rotation and the terminal in said recess, and cam surfaces on said element conforming substantially to the rectangular cross-section of said terminal for limiting the inward movement of said winding finger to a predetermined position of close proximity to said terminal.

11. A device for winding a connector wire about a terminal comprising a non-rotatable element having a recess in one end thereof for receiving one end of a terminal therein to hold the terminal against lateral movement, means on said element engageable with the end of the terminal to limit the movement thereof longitudinally of said element to a predetermined position, a member mounted for rotation about said element, a wind-

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ing finger pivotally mounted on said rotatable member for rotation therewith and having an end portion thereof adjacent the recess of said element, said winding finger having a recess in the end thereof for receiving a connector wire, means mounted on said device to stress said winding finger to urge said end thereof toward the element and to urge the connector wire in the recess thereof into engagement with a terminal positioned in the recess of said element, and means for rotating said rotary member whereby said winding finger is caused to rotate and wind the connector wire positioned in the recess of said winding finger around the terminal positioned in the recess of said element and to thereby effect relative movement longitudinally between the terminal and the non-rotatable element as said connector wire is wound around said terminal.

12. A device for winding a connector wire about a flat-type terminal comprising a non-rotatable rod having a recess in one end thereof for receiving one end of a terminal therein for supporting the terminal against lateral movement, said rod having means engageable with the end of the terminal to limit the movement thereof longitudinally of said rod to a predetermined position, a sleeve mounted for rotation on said rod, a longitudinally extending winding finger pivotally mounted on said sleeve for rotation therewith and having an end portion adjacent the recess of said rod, said one end of the winding finger having a longitudinally extending recess therein for receiving a connector wire, means mounted on said sleeve stressing said winding finger to urge said one end thereof toward the rod to urge the connector wire in the recess thereof into engagement with a terminal positioned in the recess of said rod, and means for rotating said sleeve whereby said winding finger is caused to rotate and wind a connector wire positioned in the recess of said winding finger around a terminal positioned in the recess of said rod and to thereby effect relative movement longitudinally between the terminal and the rod as said wire is wound around said terminal.

13. A device for winding a connector wire about a terminal comprising a non-rotatable element

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having a recess in one end thereof for receiving one end of the terminal therein for holding the terminal against lateral movement, said element having means engageable with the end of the terminal to limit the movement thereof longitudinally of said element to a predetermined position, a member mounted for rotation about said element, a winding finger having an end thereof positioned adjacent the recess, means mounting said winding finger on said rotatable member for rotation therewith and for transverse movement relative to said rotatable member, means on said rotatable member cooperating with said winding finger to urge said end thereof radially inwardly toward the axis of rotation and toward a terminal positioned in said recess to press the connector wire against the terminal, a recess in the end of said winding finger for receiving an end portion of a connector wire therein to guide the connector wire around the terminal, and drive means for rotating said rotatable member whereby said winding finger is caused to rotate and wind a portion of the connector wire positioned in the recess of said winding finger around the terminal positioned in the recess of said element.

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1,144,217	McCarter	June 22, 1915
1,238,445	Scholl	Aug. 28, 1917
1,249,898	Bush	Dec. 11, 1917
1,514,852	Grondahl	Nov. 11, 1924
1,583,321	Smith	May 4, 1926
1,585,135	Waite	May 18, 1926
1,607,242	De Bold	Nov. 16, 1926
1,672,939	Hoene	June 12, 1928
1,891,664	Brenizer	Dec. 20, 1932
2,139,011	Furness	Dec. 6, 1938
2,199,113	Peirce	Apr. 30, 1940
2,375,861	Martin	May 15, 1945