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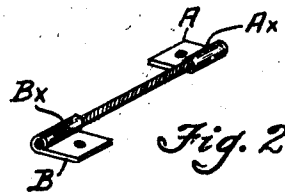
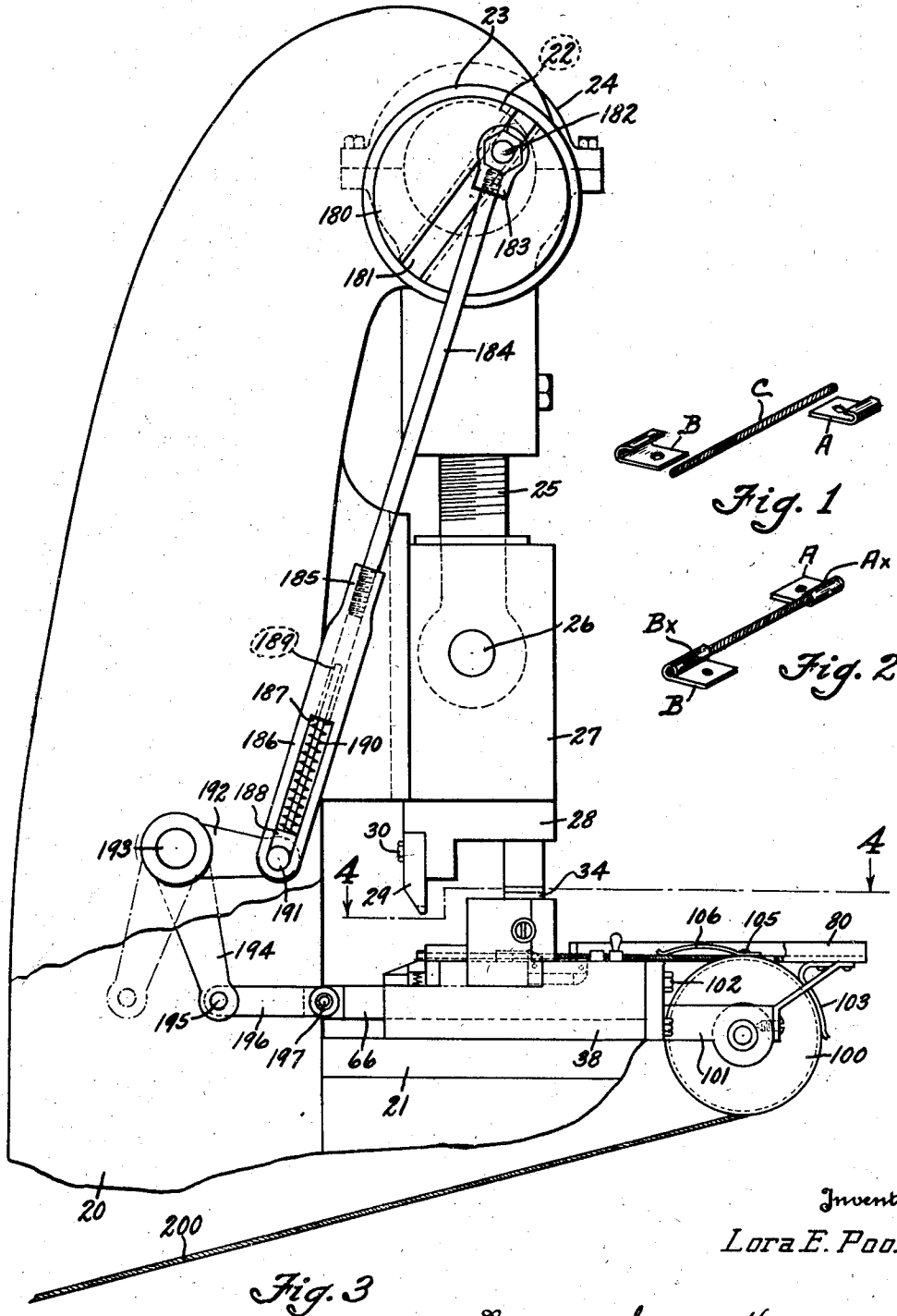
L. E. POOLE

1,836,503

APPARATUS FOR MAKING ELECTRICAL CONNECTERS

Filed Oct. 9, 1929

5 Sheets-Sheet 1



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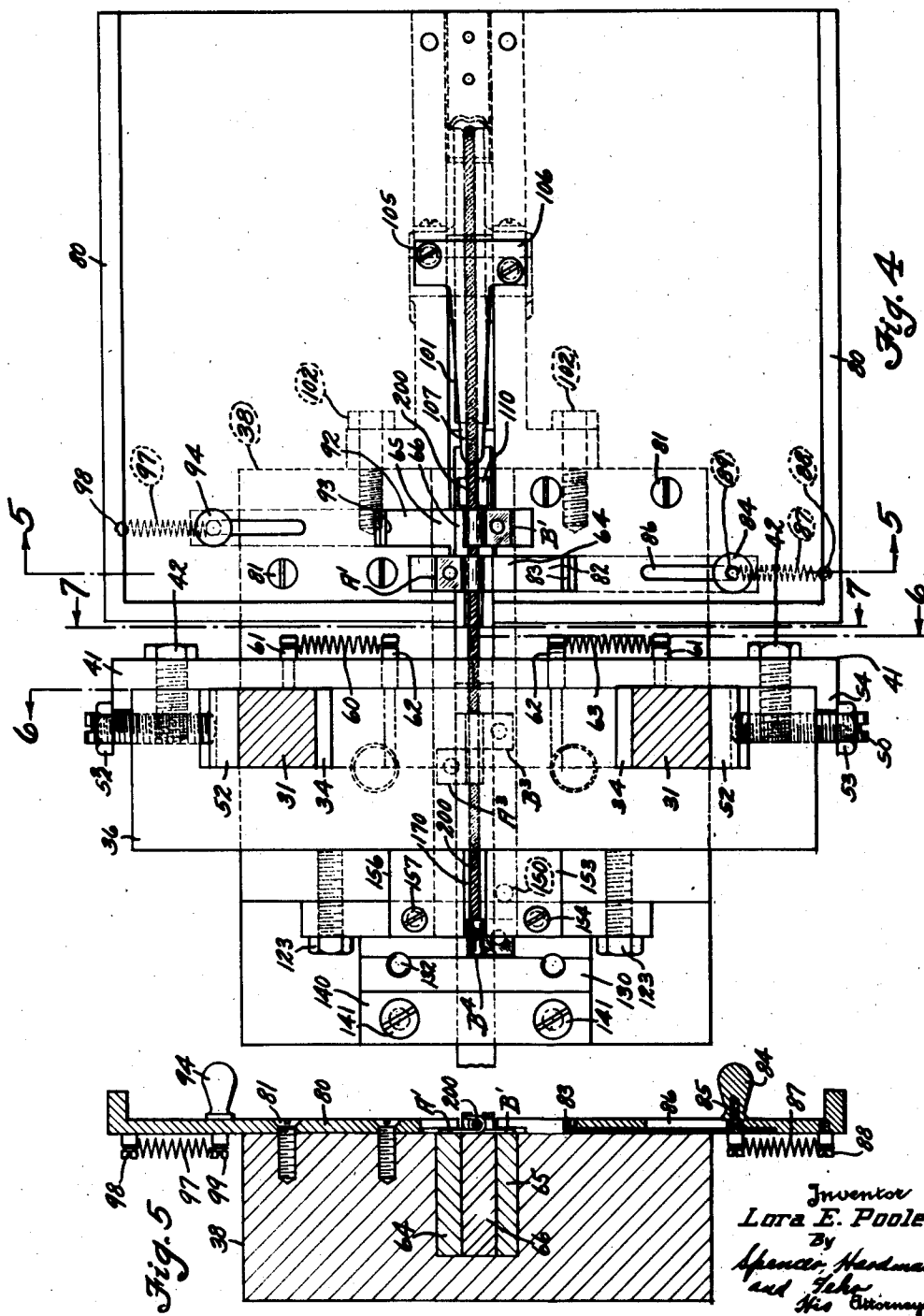
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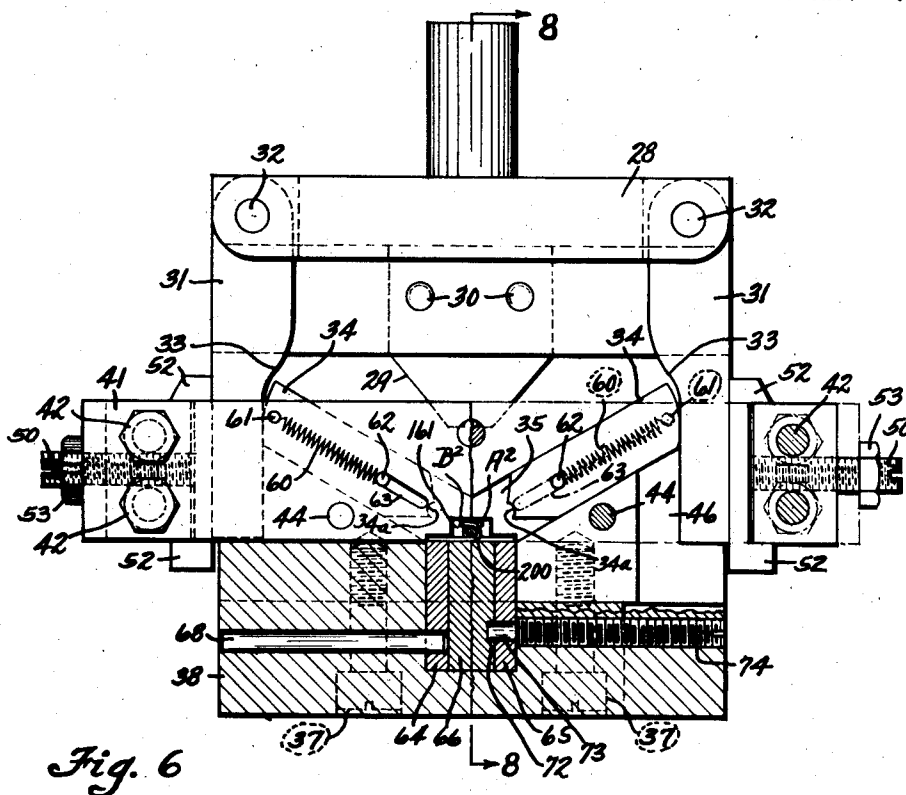


Fig. 6

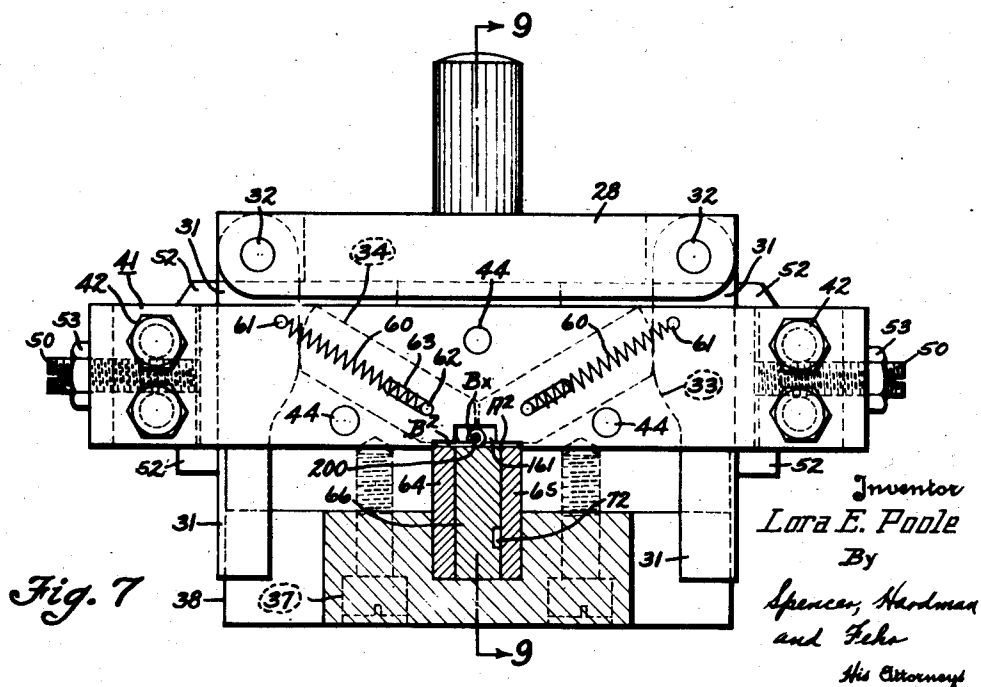


Fig. 7

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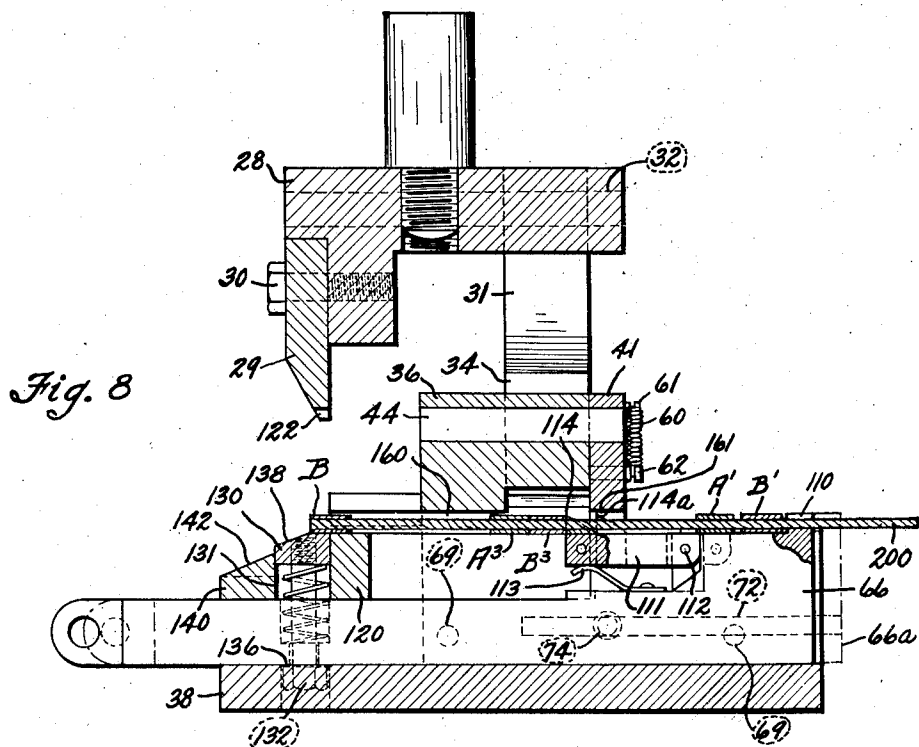


Fig. 8

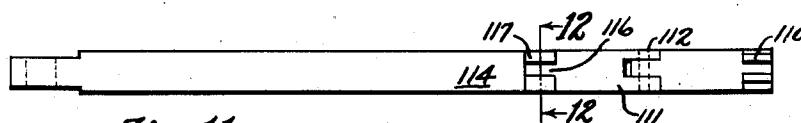


Fig. 11

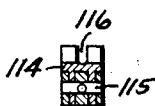


Fig. 12

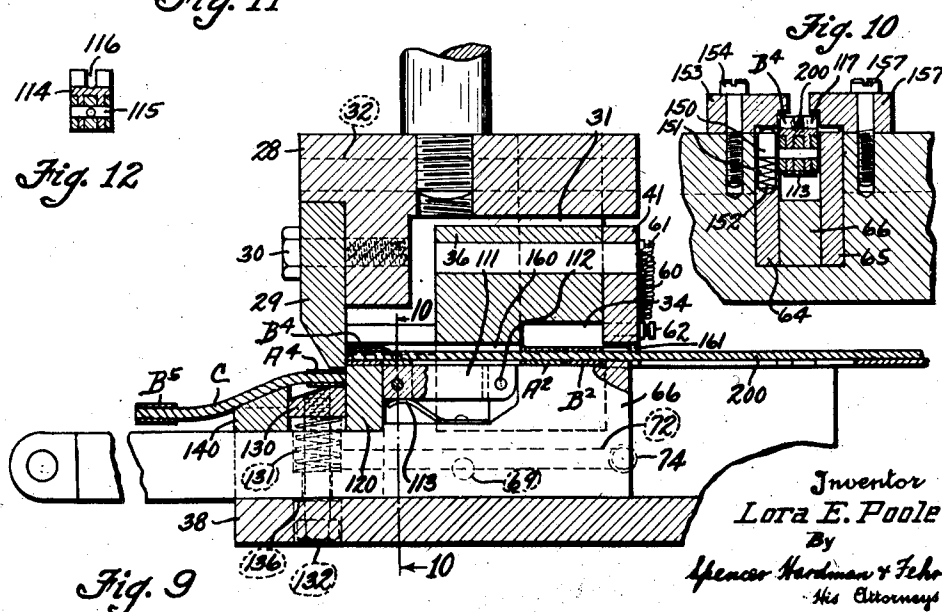


Fig. 9

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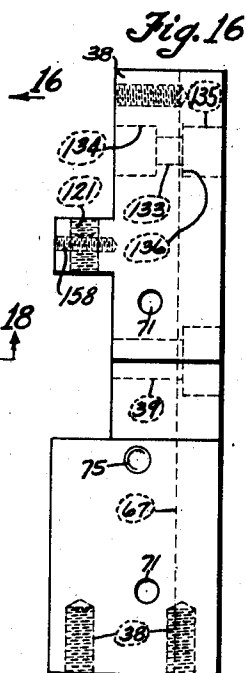
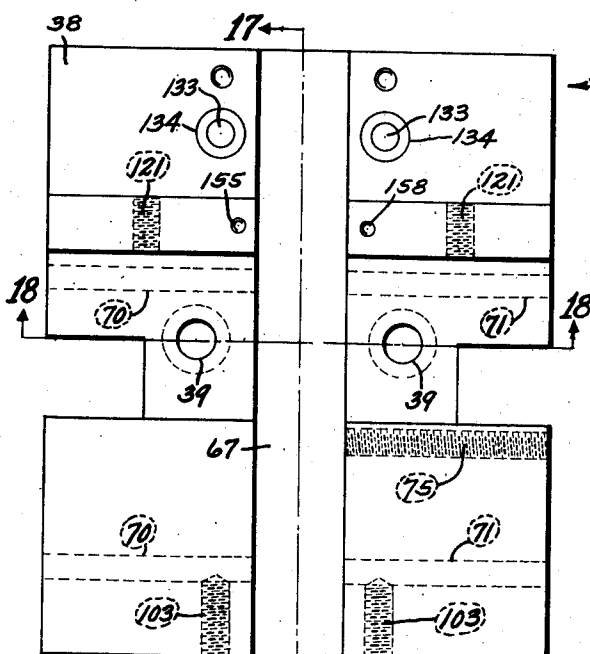
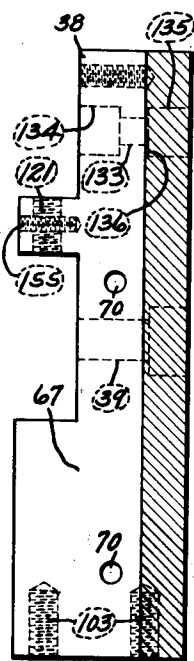
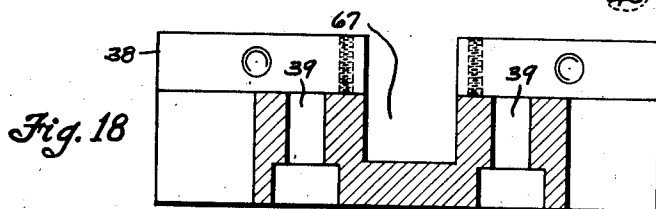
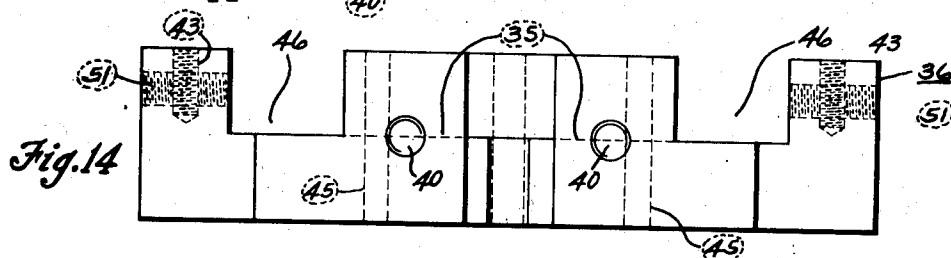
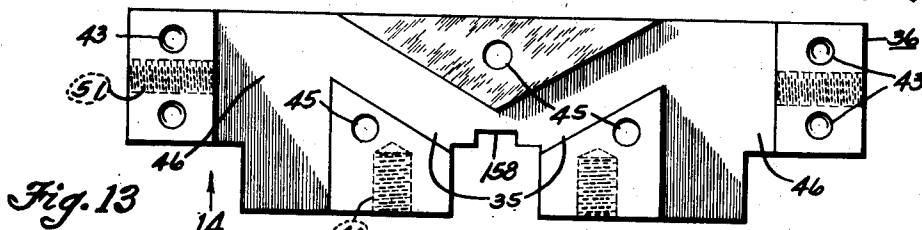
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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

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APPARATUS FOR MAKING ELECTRICAL CONNECTERS

Application filed October 9, 1929. Serial No. 398,524.

This invention relates to apparatus for making electrical connectors and more especially, the type of connector which comprises a piece of flexible wire attached to one or more terminal clips.

One of the objects of the present invention is to provide a machine of simple and durable construction for making the kind of electrical connectors referred to. In the present invention this object is accomplished by providing means for feeding the terminal clip against a piece of flexible wire, means for fastening the clip to the wire, and means for cutting off a piece of the wire with clip attached. Preferably, the machine includes means for feeding the wire with attached clip from the fastening means to the cutting means and for moving adjacent the fastening means the unattached clip which had been fed to a position against the wire. The present machine provides for making electrical connectors having a terminal clip attached at one end only to a piece of wire or having a terminal clip attached at each end of the wire. When a connector of the latter type is required two terminal clips are attached in contiguous relation to the wire and are fed relative to the cutting means so that the wire will be cut between contiguous clips.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of one form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a disassembled perspective view of parts 30 of the electrical connector which are operated upon a machine constructed in accordance with the present invention.

Fig. 2 is a perspective view of the connector made by the present machine.

Fig. 3 is a fragmentary side view of a machine embodying the present invention.

Fig. 4 is a sectional view on line 4—4 of Fig. 3 and is drawn to a larger scale than Fig. 3.

Fig. 5 is a sectional view on the line 5—5 of Fig. 4.

Fig. 6 is a sectional view on the line 6—6

of Fig. 4 and shows the clip attaching members in retracted position.

Fig. 7 is a sectional view on the line 7—7 of Fig. 4 and shows the clip attaching means fully advanced toward the work.

Fig. 8 is a fragmentary sectional view on the line 8—8 of Fig. 6.

Fig. 9 is a fragmentary sectional view on the line 9—9 of Fig. 7.

Fig. 10 is a fragmentary view on the line 10—10 of Fig. 9.

Fig. 11 is a plan view of a reciprocating member included in the feeding mechanism.

Fig. 12 is a sectional view taken on the line 12—12 of Fig. 11.

Fig. 13 is a front elevation of a guide block for supporting movable parts of the means for attaching the terminal clips to the wire.

Fig. 14 is a view looking in the direction of arrow 14 in Fig. 13.

Fig. 15 is a plan view of the base block of the apparatus.

Fig. 16 is a side elevation looking in the direction of arrow 16 in Fig. 15.

Figs. 17 and 18 are sectional views taken respectively on the lines 17—17 and 18—18 of Fig. 15.

Means for attaching clips to wire

The present machine comprises mechanisms adapted to be operated by a punch press such as shown in Fig. 3. The press comprises a frame 20 supporting a platform 21 and a main shaft 22 which carries an eccentric 23 connected by a strap 24 with a connecting rod 25 hingedly connected at 26 with a vertically reciprocating punch press cross head 27. The head 27 carries a block 28 to which a shear blade 29 is secured by screws 30. Two cam bars 31 are pivotally attached to the block 28 by pins 32 and are provided with curved camming surfaces 33 which engage forming bars 34 and cause them to move in downwardly converging direction through inclined guiding channels 35 (see Figs. 13 and 14) provided in a guide block member 36 which is attached by screws 37 to a base block 38 which is secured in any suitable manner to the platform 21. The screws 37 pass through plane holes 39 (see

Figs. 15 to 18) in base block 38 and are screwed into tap holes 40 in the guide block 36. The forming bars 34 are retained in their guiding channels 35 by plate 41 attached by screws 42 to the guide block 36, said screws being threaded into tap holes 43 in block 36. The plate 41 is accurately located with respect to the block 36 by dowel pins 44 which pass through holes 45 in block 36. The plate 41 retains also the cam bars 31 within the guide channels 46 provided for them by the block 36. In order to adjust or vary the limit to which the bars 34 move when approaching the work, the cam bars 31 are adjustable about their pivot pins 32 by the turning of screws 50 which pass through tap holes 51 in the guide block 36 and bear upon wear pieces 52 which in turn engages the cam bars 31. The screws 50 are locked in adjusted position by nuts 53 which bear against the intumed ends 54 of the plate 41 which embrace the ends of the block 36. The forming bars 34 are normally maintained in upper position shown in Fig. 6 by spring 60 having their upper ends attached to studs 61 carried by the plate 41 and their lower ends attached to studs 62 which pass through slot 63 in plate 41 and which are attached to the forming bars 34.

The work operated upon by the forming bars 34 is shown more particularly in Figs. 1 and 2 and comprises a wire C and two similar J-shaped terminal clip pieces A and B which are first placed against the ends of the wire as shown at A¹ and B¹ in Fig. 4 and are fastened to the wire by squeezing the loop of the terminal clip around the wire as indicated at A² and B² in Fig. 2. By mechanism to be described, the clips are located at A² and B², respectively, in the path of movement of the forming bars 34 while resting upon stationary blocks 64 and 65 between which is located a horizontally reciprocating block 66. The blocks 64 and 65 are retained within a channel 67 provided by the base block 38 by dowel pins 68 and 69 respectively, which pass through holes 70 and 71 respectively, provided in the base block 38 as shown in Figs. 16 and 17. The block 65 is provided with a groove 72 for receiving the reduced end 73 of a screw 74 threaded through a tap hole 75 in the base block 38 as shown in Figs. 16 and 17. When the punch press head 27 moves downwardly, the cam bars 31 carried thereby cause the forming bars 34 to move from the position shown in Fig. 6 to that shown in Fig. 7 in order to cause their concavo-cylindrical forming surfaces 34a to engage the loops of the terminal clips A and B and move them from the position shown in Fig. 6 and bend them around the wire 200 as shown in Fig. 7.

Means for feeding clips against the wire

Before the clips A and B are moved with

the wire into the position A² and B² for operation upon them by the attaching mechanism previously described, the clips are first fed by hand into positions A¹ and B¹ against the wire as shown in Fig. 4. A table 80 which is attached to the base block 38 by screws 81 is provided with an opening 82 for receiving the terminal clip A which rests upon the upper surface of the base block 38. The clip A is placed within the opening 82 so that the loop of the clip will face the wire 200. The clip is moved into the position A¹ by a slide 83 actuated by handle 84 attached to the slide by means including a screw 85 which passes through a slot 86 in the table 80. The slide 83 is normally maintained in retracted position shown in Figs. 4 and 5 by a spring 87 attached at one end to a stud 88 threadedly connected with the table 80 and at the other end with a stud 89 integral with the screw 85. Similarly, the clip B is placed in an opening 92 in the table 80, and while resting upon the base block 38 it is moved manually by a feed slide 93 into position B¹ with its loop embracing the wire 200 while it rests upon the reciprocating block 66. The slide 93 is actuated by a knob 94 and is retained in retracted position by a spring 97 attached at one end to a stud 98 connected with the table 80 and at the other end to a stud 99 which forms the head of a screw which connects the slide 93 with the knob 94.

The wire 200 from which the pieces C are cut is unwound from a supply reel (not shown) and passes around a grooved pulley 100 mounted upon a bracket 101 attached by screws 102 to the base block 38, said screws being threaded into tap holes in the block 38 shown in Figs. 15, 16 and 17. The pulley 100 is engaged by a resilient spring member 103 which puts a friction drag on the pulley to prevent overtravel thereof when the wire is fed into the machine. Screws 105 attach to the table 80 a resilient leaf spring member 106, the free end 107 of which engages the wire 200 to maintain it in engagement with the upper surface of the feed block 66.

Means for feeding the unattached clips located against the wire to the clip attaching mechanism

The clips are moved from unattached positions A¹ and B¹, shown in Fig. 4 to positions A² and B² directly under the forming bars 34 as shown in Fig. 9 by mechanism including the feed block 66. The block 66 has a notched lug 110 which receives the wire 200 and which engages the clips at A¹ and B¹ in Fig. 8 when the block is moved from the position shown in Fig. 8 toward the left into the position shown in Fig. 9 in order to move the clips into the positions A² and B² shown in Fig. 9. This movement of the clips from positions A¹ and B¹ to positions A² and B² takes place before the forming slides 34 en-

gage the clip so that after the clips have arrived in the positions A² and B² they may be operated upon by the forming slides as shown in Fig. 7.

5 *Means for feeding the wire and clips attached thereto to the wire cutting device*

After the clips have been attached to the wire 200 while they are in the positions A² and B² the wire and clips are caused to move toward the left by a part connected with the feed block 66. This part comprises a finger 111 pivotally connected with the block 66 by a pin 112 and maintained normally in the position shown in Figs. 8 and 9 by a leaf spring member 113 attached to the block 66. The finger 111 carries a hard metal tip or wear piece 114 secured by a pin 115 to the finger 111. The tip 114 has a groove 116 for receiving the wire 200. During the return of the punch press head 27 to upper position in which the press is caused to stop automatically by the use of a conventional type throw-out clutch (not shown), the feed block 66 moves from the position shown in Fig. 9 toward the right first into the position 66a shown in Fig. 8 in dot and dash lines and then toward the left a short distance into the full line position 66 shown in Fig. 8. During the movement of the block 66 toward the right the beveled edges 117 of the tip 114 are engaged by the clips A and B successively which cause the finger 111 to move downwardly so that the tip 114 may ride along the under sides of the clips and then finally spring into the position 114a due to the action of the spring 113 upon the finger 111. During the movement of the block 66 from the dot and dash line position 66a to the full line position shown in Fig. 8 the tip 114 will move from the position 114a toward the left and will engage the clip B and will move the clips A and B from the positions A² and B² shown in Fig. 9 to the positions A³ and B³ shown in Fig. 8. As stated before the machine comes to rest automatically with the parts as shown in Fig. 8. Before starting the machine other clips are placed in the positions A¹ and B¹ on the left hand side of the lug 110 as shown in Fig. 8. By the time the cross head 27 has moved part way downwardly in a succeeding cycle of operation, the feed block 66 will have been moved from the position shown in Fig. 8 to the position shown in Fig. 9 in order to carry clips which were previously in positions A¹ and B¹ into the positions A² and B², and clips which were in the positions A³ and B³ into the positions such that the wire 200 may be severed between the clips A and B.

10 *Means for severing the wire between contiguous clips*

The wire 200 is severed between contiguous clips A and B by operating shear blades in-

cluding the blade 29 and a hard metal blade 120 attached by suitable screws threaded into tap holes 121 in the block 38 as shown in Figs. 15, 16 and 17. By the time that the forming bars 34 have attached clips located at A² and B² to the wire 200 the clip A located beneath the blade 29 will have been moved by it into the position A⁴ while the clip B remains upon the shear blade 120 in the position B⁴ as shown in Fig. 9. During the movement of the clip A into the position A⁴ by the downward movement of the shear blade 29 which is provided with a notch 122 embracing the coiled portion of the clip A, the wire is severed between the clips A and B so as to provide a piece of wire C having one end attached to a clip A and the other to a clip B shown in the position B⁵ in Fig. 9, the clip B having been moved from the position B⁴ which it previously occupied to the position B⁵ during the preceding feeding operation just described.

During downward movement of the shear blade 29 the clip at A⁴ is pressed by the blade against a pressure pad 130 urged upwardly by springs 131 which surround screws 132 which are attached to the block 130. The block 38 is provided with holes 133 for receiving the screws 132 with recesses 134 for receiving the springs 131 and with recesses 135 for receiving the heads of the screws 132. The screw heads engage shoulders 136 which limit upward movement of the pad 130 into the position shown in Fig. 8. The pad 130 slides between the shear block 120 and a guide block 140 attached by screws 141 to the base block 38 and is provided with an inclined surface 142 which is located slightly below the inclined surface 138 of the pad 130. When, after a shearing operation, the blade 29 recedes from the work, the springs 131 are quickly released to move the pad 130 from the position shown in Fig. 9 to that shown in Fig. 8 whereupon the completed connector is given a quick upward movement causing it to slide easily down the inclined surface 142 into a suitable receptacle.

In order that the work will not move toward the right from the position shown in Fig. 9 while the feed block 66 is moving toward the right, a spring pressed plunger 150 is located in a recess 151 provided by the block 64 and is urged by a spring 152 into a position just to the right of the clip in the position B⁴. This plunger or button 150 will yield sufficiently to permit the clip to pass over it so that it may occupy the position B⁴ just to the left of the button. But the resistance offered by the spring 152 is sufficient to hold the button 150 in a position for preventing movement of the clip B⁴ toward the right. In order that the button 150 may be effective, it is necessary that the clip B⁴ be held down upon the block 120. This is accomplished by a guide block 153 secured by

a screw 154 threaded into a hole 155 provided in the base block 38 as shown in Figs. 15 and 17. The block 153 serves another purpose, namely that of guiding the clips as they move from the clip attaching means to the wire shearing means. Opposite the block 153 is located a similar block 156 attached by a screw 157 threaded into a hole 158 tapped into the base block 38 as shown in Figs. 15 and 16. These blocks 153 and 156 are provided with notches corresponding in contour with notches 160 and 161 provided respectively in the block 36 as shown in Figs. 13 and 14 and in the retainer plate 41 as shown in Figs. 6 and 7. The notches in these parts provide clearance for free movement of the work in a horizontal direction while tending to confine the work upon the base block 38 or upon the feed block 66. So far as guiding and retaining the work is concerned the blocks 153 and 156 might have been joined together but it has been found convenient to leave the space 170 between them in order to provide for the application of a tool which might be used to dislodge the work in case of clogging.

As previously explained, it is necessary that the work be fed into position for operation by the clip attaching means and the wire shearing means a substantially long period of time before the press head 27 reaches its lowermost position. Therefore, the operating mechanism between the main shaft 22 of the press and the feed block 66 includes a lost motion connection and also a resilient connection which permits of locating the feed finger 111 against the shear block 120 shown in Fig. 9 with yielding pressure. The main shaft 22 carries a crank disc 180 having a cross slot 181 for receiving the head of a crank pin 182 which may be connected by conventional means (not shown) in the desired adjusted position with the crank disc. The pin 182 is pivotally connected with a block 183 threadedly connected with a rod 184 in turn threadedly connected with the tubular end 185 of a bar 186 which is provided with a slot 187 for receiving a block 188 attached to a stem 189 extending into the tubular member 185. A spring 190 coiled around the stem 189 yieldingly urges the block 188 against a pin 191 also received by the slot 187. The pin 191 is connected with a lever 192 attached to a shaft 193 which is attached to a lever 194 which is pivotally connected at 195 with a link 196 which is pivotally connected at 197 with the feed block 66. The feed block operating mechanism is so constructed and arranged that during about 90 degrees of rotation of the main shaft in a clockwise direction from normal position the feed block will be moved from the position 66 in full lines in Fig. 8 to the position shown in Fig. 9. Further movement of the shaft 22 will cause the cross head

27 to complete its downward movement while the work is maintained in the correct position by the feed block 66.

While the form of embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. Apparatus for making electrical connectors comprising in combination, means for feeding a clip against a flexible wire, means for fastening the clip to the wire, and means for cutting off a piece of the wire with the clip attached. 75

2. Apparatus for making electrical connectors comprising in combination, means for feeding a wire, means for feeding a terminal clip against the wire, means for fastening the clip to the wire, and means for cutting off a piece of the wire with the clip attached. 80

3. Apparatus for making electrical connectors comprising in combination, means for feeding a terminal clip against a wire, means for supporting said clip in that position, means spaced from the supporting means for fastening a clip to the wire, means spaced from the fastening means for cutting off a piece of wire with a clip attached, and means for feeding the wire and attached clip to the cutting means and for feeding the unattached clip to the fastening means. 85

4. Apparatus for making electrical connectors comprising in combination, means for feeding a terminal clip against a wire, means for supporting said clip in that position, means spaced from the supporting means for fastening a clip to the wire, means spaced from the fastening means for cutting off a piece of wire with a clip attached, and means for feeding the wire and attached clip to the cutting means and for feeding the unattached clip to the fastening means, said feeding means including a member engageable with a clip attached to the wire. 90

5. Apparatus for making electrical connectors comprising in combination, means for supporting a terminal clip when placed loosely against a wire, means spaced from the supporting means for fastening a clip to the wire, means spaced from the fastening means for cutting off a piece of wire with a clip attached, and an oscillating member carrying a part engageable with a clip attached to the wire and carrying a part engageable with a clip placed loosely against the wire, said member being movable toward the cutting means for the purpose of feeding the wire with the attached clip to the cutting means and for moving the unattached clip to the fastening means. 100

6. Apparatus for making electrical connectors comprising in combination, means for fastening a terminal clip to the wire and com- 105

prising a forming member movable transversely with respect to the wire, a cam for actuating the forming member, means for cutting off a piece of the wire with the clip attached and including a shear blade, a common reciprocating member for supporting the shear blade and cam, and means for feeding the wire and clip attached to the cutting means.

7. Apparatus for making electrical connectors comprising in combination, means for fastening a terminal clip to the wire and comprising a forming member movable transversely with respect to the wire, a cam for actuating the forming member, means for cutting off a piece of the wire with the clip attached and including a shear blade, a vertically movable reciprocating member for supporting the shear blade and cam, and a horizontally movable member having a part for engaging a clip attached to the wire in order to feed the wire with a clip attached to the cutting means.

8. Apparatus for making electrical connectors comprising in combination, means for supporting a terminal clip when placed loosely against a wire, means spaced from the supporting means for fastening a clip to the wire and comprising a forming member movable transversely with respect to the wire, a cam for actuating the forming member, means spaced from the fastening means for cutting off a piece of wire with a clip attached and including a shear blade, a common reciprocating member for supporting the shear blade and cam, and means for feeding the wire and attached clip to the cutting means and for feeding the unattached clip to the fastening means.

9. Apparatus for making electrical connectors comprising in combination, means for supporting a terminal clip when placed loosely against a wire, means spaced from the supporting means for fastening a clip to the wire and comprising a forming member movable transversely with respect to the wire, a cam for actuating the forming member, means spaced from the fastening means for cutting off a piece of wire with a clip attached and including a shear blade, a vertically movable reciprocating member for supporting the shear blade and cam, and a horizontally movable member having a part for engaging a clip attached to the wire in order to feed the wire with a clip attached to the cutting means, and having a part engageable with an unattached clip placed adjacent the wire for feeding said unattached clip to the fastening means.

10. Apparatus for making electrical connectors comprising in combination, means for feeding two clips against the wire, means for fastening the clips to the wire in contiguous relation, means for feeding the wire with clips attached relative to a cutting means,

and means for cutting the wire between contiguous clips.

11. Apparatus for making electrical connectors comprising in combination, means for fastening two clips to a wire in contiguous relation, means for feeding the wire with clips attached relative to a cutting means, and means for cutting the wire between contiguous clips.

12. Apparatus for making electrical connectors comprising in combination, means for feeding two clips against the wire in contiguous relation, means for fastening the clips to the wire, and means for cutting the wire between contiguous clips.

13. Apparatus for making electrical connectors comprising in combination, means for supporting two terminal clips in contiguous relation against a wire, means spaced from the supporting means for fastening the clips to the wire, means spaced from the fastening means for cutting the wire between contiguous clips, and means for feeding the wire and attached clips to the cutting means and for feeding the unattached clips to the fastening means.

14. Apparatus according to claim 13 in which the feeding means includes a member engageable with a clip attached to the wire.

15. Apparatus according to claim 13 in which the feeding means includes an oscillating member carrying a part engageable with a clip attached to the wire, and carrying a part engageable with that unattached clip remotest from the fastening means, said oscillating member being movable toward the cutting means for the purpose of feeding the wire with clips attached relative thereto and for moving the unattached clips to the fastening means.

In testimony whereof I hereto affix my signature.

LORA A. POOLE.