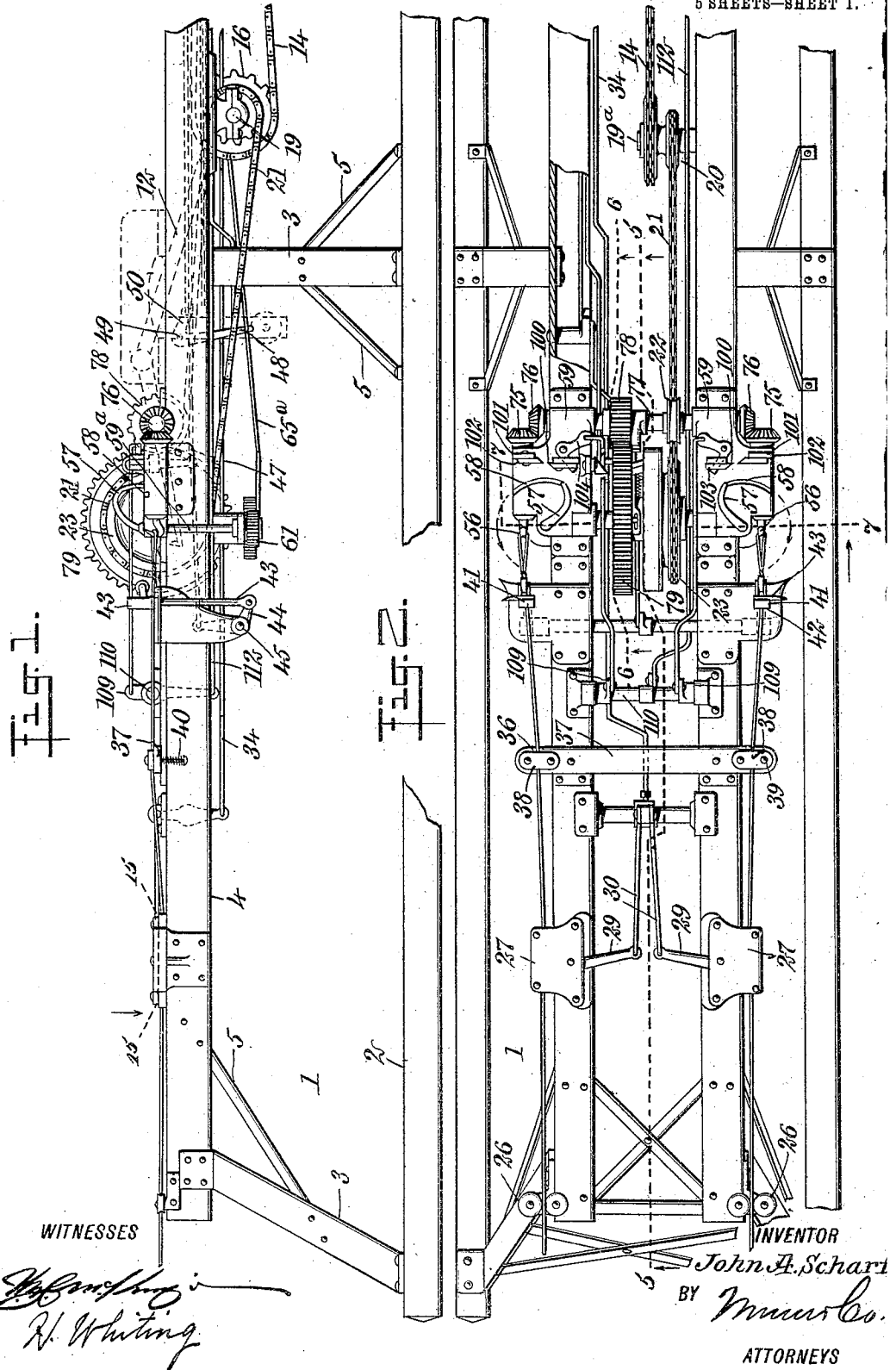


J. A. SCHARF.
 BALE TIE MACHINE.
 APPLICATION FILED APR. 6, 1909.

Patented Apr. 12, 1910.

955,000.

5 SHEETS—SHEET 1.



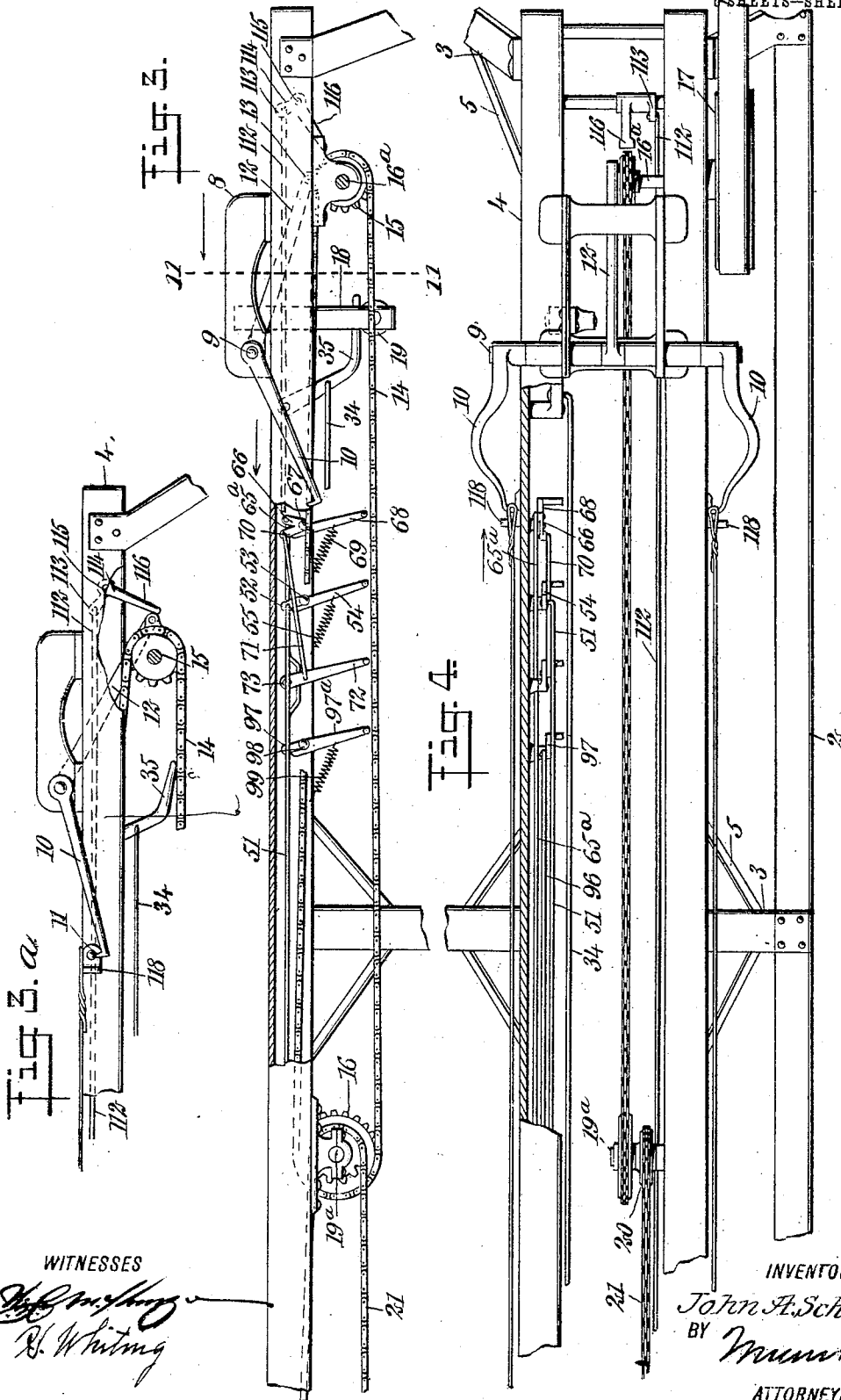
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Patented Apr. 12, 1910.

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6 SHEETS—SHEET 2.



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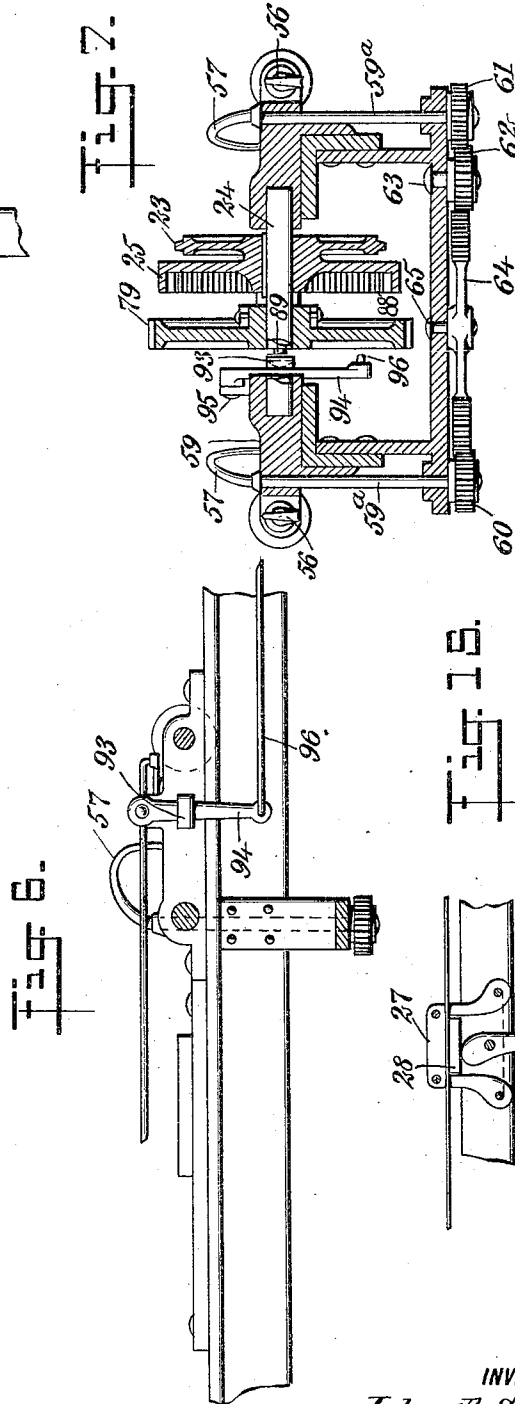
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6 SHEETS—SHEET 4.

Fig. 8.

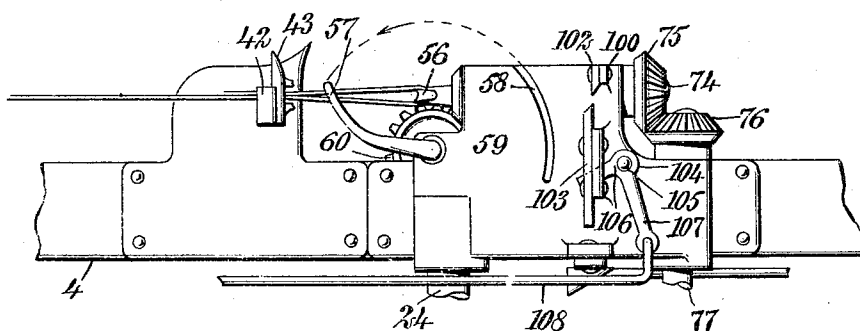


Fig. 9.

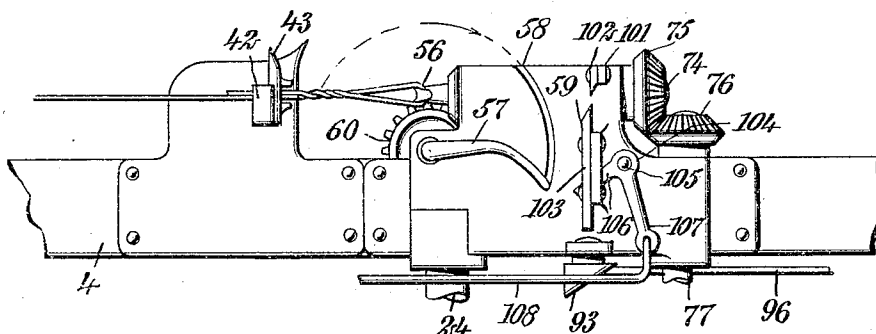
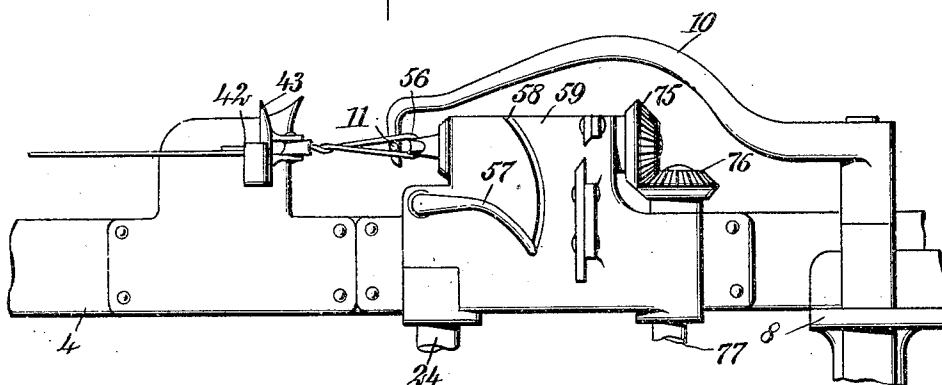


Fig. 10.



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Patented Apr. 12, 1910.

6 SHEETS—SHEET 5.

Fig. 11.

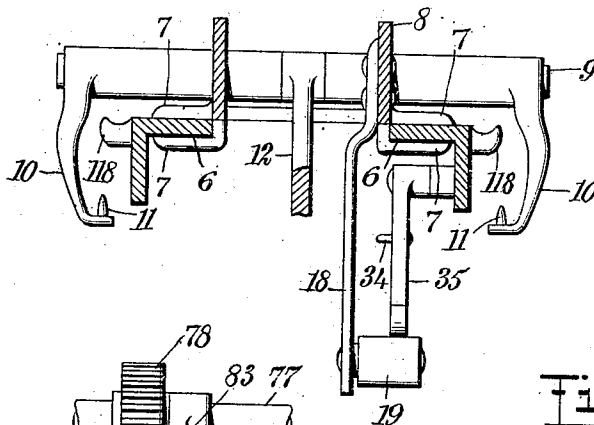


Fig. 12.

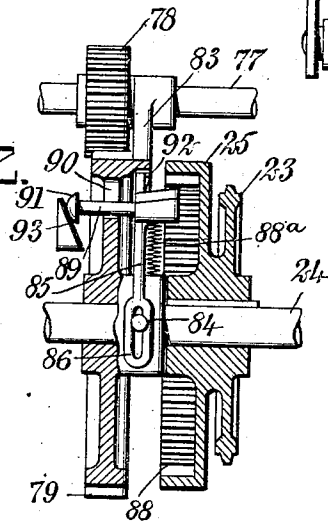


Fig. 12.b

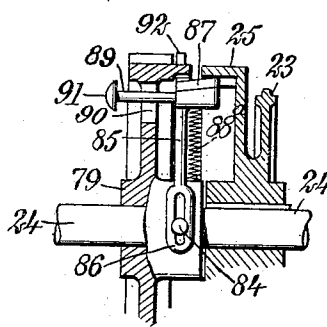


Fig. 14.

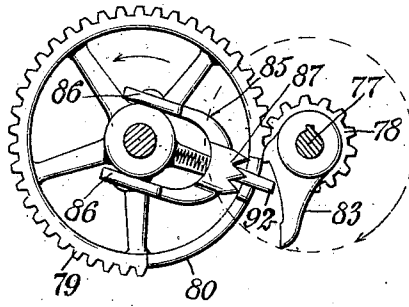
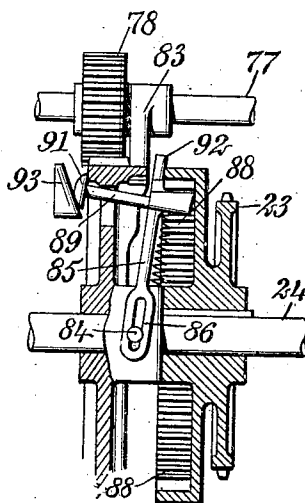
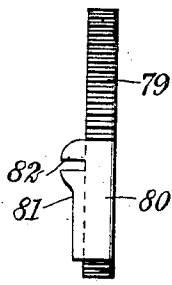


Fig. 13.

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Fig. 12.a.

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UNITED STATES PATENT OFFICE.

JOHN A. SCHARF, OF RICHWOOD, OHIO.

BALE-TIE MACHINE.

955,000.

Specification of Letters Patent. Patented Apr. 12, 1910.

Application filed April 6, 1909. Serial No. 488,197.

To all whom it may concern:

Be it known that I, JOHN A. SCHARF, a citizen of the United States, and a resident of Richwood, in the county of Union and State of Ohio, have invented a new and Improved Bale-Tie Machine, of which the following is a full, clear, and exact description.

This invention relates to bale-tie making machines of a type in which the wire is automatically drawn out, a loop twisted therein and tightly stretched and removed from the machine.

An object of this invention is to form a simple and effective machine, which will perform the various operations of drawing out, bending, twisting, stretching, cutting and removing the bale-ties from the machine, with a small amount of power and with the least attention from the operator.

Another object is to form a plurality of bale-ties simultaneously.

In previous automatic machines the heavy loop forming mechanism has been made movable; a further object therefore, of this invention, is to provide a machine on which only the light wire drawing mechanism is to be carried.

These, and other objects, will be more fully described hereinafter, and particularly pointed out in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which like characters denote corresponding parts in all the figures, and in which—

Figure 1 is an elevation of the device showing a loop forming mechanism; Fig. 2 is a plan view of the same; Fig. 3 is an elevation partly in section, showing the trips operated by the wire drawing carriage; Fig. 3^a is a view in elevation showing the carriage in another position; Fig. 4 is a plan view of the same partly in section; Fig. 5 is a vertical longitudinal section on the line 5—5 in Fig. 2; Fig. 6 is an elevation partly in section on the line 6—6 in Fig. 2; Fig. 7 is a transverse section on the line 7—7 in Fig. 2; Fig. 8 is a plan view of a twisting mechanism showing the bending fingers at the end of the operation of bending; Fig. 9 is a similar view to Fig. 8 showing the bending fingers returned from bending and the wire loop twisted; Fig. 10 is a similar view to Fig. 8 showing an arm on the wire

drawing carriage about to remove the loop from the twister; Fig. 11 is a vertical cross section on the line 11—11 in Fig. 3; Fig. 12 is a horizontal section on the line 12—12 in Fig. 5; Fig. 12^a is a view similar to Fig. 12 showing the clutch in the act of being thrown into engagement; Fig. 12^b is a detail section of the same showing the clutch in engagement; Fig. 13 is a side view of the twister driving mechanism showing the clutch about to be thrown out; Fig. 14 is a top view of the twister driving gear, showing a portion of said gear stripped of its teeth, and Fig. 15 is a plan view of a wire clamp mechanism with the top removed, on the line 15—15 in Fig. 1.

Referring more particularly to the separate parts of the device, 1 is a frame composed of a base 2, supporting uprights 3 and a top 4, the whole being suitably braced by struts 5. The top 4 is composed of two longitudinally extending angle irons the flanges 6 of which extend inwardly toward each other, and engaging these flanges are flanges 7 on the wire drawing carriage 8. This carriage is adapted to slide back and forth on the top 4, utilizing the flanges 6 as ways. Pivottally secured in any suitable manner to the carriage 8 is a shaft 9, and pivoted to this shaft 9 and extending toward the front of the carriage are a pair of arms 10 which have, at the ends thereof, upwardly extending prongs 11. Secured to said arms 10 and pivoted to the shaft 9 and extending in the opposite direction is an arm 12. This arm is pivottally secured in any suitable manner to a box link 13 on an endless chain 14, this chain 14 being supported by sprocket wheels 15 and 16. The sprocket wheel 15 is driven by a shaft 16^a, which in turn is driven by any suitable motor, such as belt-driven pulley 17. The arm 12 may be made integral with the arms 10 and preferably extends at an angle to said arms, forming therewith a structure similar to a bell-crank lever. Suitably supported on the wire drawing carriage 8 is a trip support 18, which has supported thereon a tripping roller 19, which is adapted to engage various trips on the frame, which will be more fully described hereinafter. The sprocket wheel 16 drives a shaft 19^a, which in turn drives a sprocket wheel 20, which drives an endless chain 21. This chain on its upper side

passes under a suitable guide roller 22, and over another sprocket wheel 23. This sprocket wheel 23 is fastened to a shaft 24, which is suitably supported in the frame 4. This sprocket wheel has formed integral with it a clutch 25, and this clutch 25 is adapted to drive the twisting mechanism, which will be more fully described hereinafter.

At the opposite end of the frame from that on which the carriage is located, as shown in Figs. 1 and 2, the wires are adapted to be fed to the machine from any suitable means, such as reels, (not shown) over guides 26. These guides 26 may be of any suitable form, but are preferably oppositely disposed rollers suitably supported on the frame 4, the wires then extending from the guides to a pair of clamping devices. These clamping devices consist of frames 27 suitably supported on the frame 4, and clamping blocks 28, (see Fig. 15). Co-acting with said frames are cam levers 29, adapted to actuate the clamping blocks 28 to clamp the wires between the blocks and the frames. These cam levers 29 are operated by a pair of links 30 suitably secured to the top of a lever 31, which is secured to a shaft 32 pivotally mounted in the frame 4, (see Fig. 5). The lower end 33 of the lever 31 is connected to a link 34 which extends to the rear of the frame, and is connected to a trip 35, (see Fig. 3) pivotally supported in any suitable manner on the frame 4. This trip 35 is supported in such a position that it is adapted to be engaged by the trip 18 on the carriage 8 when said carriage has reached its extreme travel to the right, away from the twisting mechanism.

From the wire clamps 27 the wires pass through the wire tension devices 36, which are adapted to hold the wire under tension. These wire tension devices 36 are composed of a bar 37 which is fastened in any suitable manner to the frame 4, and has at each end thereof plates 38 movably connected to the bar by means of pins 39. These pins 39 yieldingly hold the plates 38 against the bar by means of the springs 40. The wires pass between the plates 38 and the bar 37 and are yieldingly held by the springs 40. From the wire tension device the wires pass to a pair of clamps 41 which are adapted to clamp the wires when properly operated. These wire clamps 41 consist of bed plates 42 and clamp rods 43 co-acting with said bed plates to grip the wire between them.

The rods 43 extend substantially vertically downward to engage a pair of arms 44 of a bell crank lever, which arms are secured on a shaft 45, rotatably secured in any well known manner on the frame 4. Extending at an angle to the short arms 44 and secured to the shaft 45, is another arm 46 of said bell crank lever. This arm 46 is engaged in

any suitable manner by the connecting link 47, which in turn engages an arm 50 of another bell crank lever. This latter bell crank lever is suitably pivoted to the frame 4 at 49. A long arm 48 of this bell crank lever is engaged by a long connecting link 51. The long arm 48 of the last mentioned bell crank lever also forms a trip whose operation is to be more fully described hereinafter. The connecting link 51 extends along the under side of the frame 4, and is suitably connected to an arm 52, which is pivoted to the frame at 53. This arm 52 is adapted to be thrown over beyond its pivot 53 by means of a trip 54. This trip 54 is held in the position shown in Fig. 3 by means of a spring 55. This trip is adapted to be operated by the tripper 18 on the carriage 8 in order to operate the clamping device to clamp the wire. This operation will be more fully described hereinafter.

The ends of the wires having been passed through the wire clamps 41 extend just beyond the twisting hooks 56, around which they are adapted to be bent by the bending fingers 57. These bending fingers 57 curve inwardly and downwardly and are guided in slots 58 in the frames 59, which are fastened in any suitable manner to the top of the frame 4. Integral with the bending fingers 57 and pivotally supported by the frame 4 in any suitable manner are the vertical shafts 59^a. These shafts 59^a have on the lower extremities gears 60 and 61, which are fastened thereto and adapted to operate the same. The gear 61 meshes with an idle gear 62, which is supported in any suitable manner, as by means of a stub shaft 63 on the frame. The gear 62 and gear 60 mesh with a double sector gear 64. This double sector gear 64 is pivoted to the frame in any suitable manner, as by a stub shaft 65, and is adapted to operate the gears 60 and 61 to turn the shafts 59^a, and thus operate the bending fingers 57 to bend the wire about the twistors 56. The ends of the wires being bent about the twistors 56 pass between the clamping plates on the wire clamps 41, which are adapted to be clamped down on the ends to hold the ends and the main body of the wire from moving during the twisting operation.

The sector gear 64 is operated by a connecting link 65^a, which extends along the frame 4 to one arm 66 of a bell-crank lever pivotally secured at 67 to the frame 4. This bell-crank lever is adapted to be drawn over beyond its pivotal center 67 by means of a trip 68, which is also pivoted at 67. This trip 68 is held in the position shown in Fig. 3 by a spring 69, and is adapted to be operated by the trip 18 on the carriage 8 in a manner to be described more fully hereinafter. Another arm 70 of the bell-crank lever of which 66 forms a part, is

connected in any suitable manner, as by means of a connecting link 71, to a trip 72 and adapted to be operated thereby. This trip 72 is pivoted to the frame 4 at 73, and is adapted to be operated by the tripper 18 on the carriage 8 so that it will throw the arms 66 and 70 of the bell-crank lever over into their original position and draw back the link 65^a, and thus return the sector gear 64 to its original position. When the wires in their bent position form a loop around the twistors 56 and are clamped by the clamps 41, they are then adapted to be twisted. The twisting hooks 56 are integral with shafts 74, which are suitably supported in the frames 59. These shafts 74 are adapted to be rotated by the beveled pinions 75, which pinions mesh with pinions 76 fastened on the ends of a shaft 77. This shaft 77 is adapted to be rotated by a pinion 78, which is also fastened to the shaft 77. The pinion 78 meshes with a gear 79, which is loosely mounted on the shaft 24. This gear 79 has teeth on only part of its circumference, the remainder of the circumference being bare, as shown in Fig. 14. Corresponding to the bare portion 80 of the gear 79 is a flange 81, which extends outwardly from the side of the gear and toward the sprocket wheel 23 and the clutch 25. This flange 81 has a slot 82 therein, the ends of which are extended somewhat beyond the top of the main flange and curved up to the edge of the slot. Fastened to the shaft 77 alongside of the pinion 78 is a cam shoe 83. (See Figs. 12 and 13^a.) This cam shoe is adapted to rotate between the gear 79 and the clutch 25, during the interval when the flange 81 is on the opposite side of the shaft 24. The number of teeth on the gear 79 and on the pinion 78, are so designed that the pinion 78 will revolve several times, preferably three, while the gear 79 revolves once; and also so that the cam shoe 83 will co-act with the flange 81 and slot 82.

On the hub of the gear 79, as seen in Figs. 12, 12^a, 12^b and 13, and secured by means of the pins 84 is the clutch 85. This clutch 85 has a U shaped frame, with slotted extending arms 86. These slots in the arms 86 slidably engage pivot pins 84. The outer surface of the U shaped frame has serrations or teeth 87 formed thereon, which are adapted to engage the internal serrations or teeth 88 on the clutch 25. The clutch 85 is pressed away from the hub by means of a spring 88^a, which operates on the under side of the U shaped frame. Extending at right angles from the clutch is a pin 89, which passes through a slot 90 in the gear 79, and has a cam head 91 on the outer extremity thereof. This pin 89 assists in holding the clutch 85 to the gear 79, and also is adapted to throw the clutch into engagement with the teeth 88 on the clutch 25. Extending outwardly from

the top of the U shaped frame to the clutch 85 is a lug 92. This lug 92 is adapted to extend through the slot 82, and is also adapted to co-act with the cam shoe 83 on the shaft 77. The pin 89 which throws the clutch 85 into engagement with the clutch 25 is adapted to co-act by means of its outer surface 91 with a cam surface 93 on the lever 94. This lever 94 is suitably pivoted to the frame 59, as at 95 shown in Fig. 7. At the lower extremity of this lever 94 is connected a link 96, which extends along the frame 4 to a trip 97. This trip 97 is pivotally secured in any suitable manner to the frame 4, as at 98, and is held in the position as shown in Fig. 3 by means of a spring 99. This trip is adapted to coöperate with the trip 18 on the carriage 8 in a manner to be described hereinafter.

Just beyond the twisting hooks 56 are wire cutters 100. These wire cutters consist in stationary frames 101, to which are suitably secured stationary knives 102. These knives 102 are adapted to coöperate with movable knives 103, which are slidably supported by the frames 59, in any suitable manner. These movable knives 103 are adapted to be operated by bell-crank levers 104, which are pivotally secured to the frame 59 as at 105. One arm 106 of the bell-crank levers 104 engages slots in the knives 103, and is adapted to reciprocate said knives. The other ends of the bell-crank levers 104 have arms 107 which are engaged by links 108 extending forward of the frame 4 to a pair of arms 109, fastened to a shaft 110, which is pivotally supported in any suitable manner on the frame 4. Extending downwardly, and fixed to the shaft 110 is an arm 111, which is connected to a link 112. This link 112 extends to the other end of the frame 4 where it engages an arm 113 on a bell-crank lever 114. This bell-crank lever 114 is pivotally secured to the frame as at 115 in any suitable manner, and has another arm 116 extending at an angle to the arm 113. This arm 116 is adapted to coöperate with the box link 13 on the chain 14 to which the arm 12 on the carriage 8 is pivoted. This box link 13 is adapted to operate the lever 114, and through the link 112 operate the wire cutters 100. On the sides of the frame 4, suitably supported thereon are the lugs 118, which form a rest for the wires after they are drawn out by the wire drawing carriage 8.

In following the operation of the device we will assume the carriage 8 starting from its extreme right hand position with the arm 12 traveling on the upper side of the chain 14 in the direction of the arrows shown in Fig. 3. We will also assume that the wires have been passed through the guides 26, the clamps 27, the tensioners 36

and the clamps 41, and the ends extended alongside of the twister hooks 56, ready for the first operation of bending. The chain 14 draws the carriage 8 in the direction of the arrows in Fig. 3. The tripper roller 19 first comes in contact with the trip 68. This throws the trip 68 against the action of the spring 69 and forces the bell-crank lever 66 over beyond its pivot 67 and draws on the connecting link 65^a, which in turn revolves the gear sector 64 through a part of a revolution. This gear sector 64 operates the pinions 61 and 60 to revolve the shafts 59^a, and these turn the bending fingers 57 to the position shown in Fig. 8. This operation bends the ends of the wire about the twisting hooks 56, forming a loop, the ends of which are between the clamping members of the clamps 41. The trip on the carriage 18 next comes in contact with the trip 54, and throws this trip against the action of the spring 55 so that the link 51 is drawn toward the right. This link 51 turns the arm 50 of the bell crank lever pivoted at 49, which in turn throws, through the connecting link 47, the lever arm 46, which operates the shaft 45, drawing down the arms 44, which in turn operate the clamping members 43. The clamping members 43 contact with the bed 42 to clamp the wires and the ends thereof together, holding the loop fast to prevent its pulling out during the twisting operation. The tripper roller 19 next comes in contact with the trip 72. By throwing this trip 72 it draws on the connecting links 71 and pulls the bell-crank lever 66 back into its original position, and by means of the connecting link 65^a, and the sector gear 64, revolves the shafts 59^a so that the bending fingers 57 are returned to their original position, as shown in Fig. 9. On further motion of the carriage the tripper roller 19 comes in contact with the trip 97 and throws the arm 97^a, over into a position beyond its pivoted pin. This arm 97^a draws the link 96 which throws the lever 94.

The cam surface 93 on the lever 94 co-operates with the cam end 91 of the pin 89 to throw the clutch 85 over into the position shown in Fig. 12^a. This brings the clutch 85 into engagement with the clutch teeth 88 on the clutch 25 so that the gear 79 revolves with the shaft 24, and thus with the sprocket wheel 23. When the gear 79 is revolved sufficiently for the pin 89 to come out of contact with the cam surface 93 the spring 88^a forces the clutch back into the position shown in Fig. 12^b, so that it is still in engagement with the clutch teeth 88 and the lug 92 extends through the slot 82 in the flange 81 on the gear 79. The gear 79 now revolves through one revolution, at the same time rotating the pinion 78 through a number of revolutions, preferably three. This

in turn drives the beveled gears 76, which mesh with the gears 75 and turn the twisting shafts 74 through a number of revolutions. The hooks 56 are thus revolved so that they twist the loops of the wire, as shown in Fig. 10. While the gear 79 is revolving, the cam shoe 83 is also revolving with the shaft 77, and is in such a position that it passes between the gears 79 and clutch 25. At the end of the revolution of the gear 79 the cam shoe 83 comes into co-action with the stripped surface 80 and forces the lug 92 back through the slot 82 into the position shown in Fig. 12. The gear 79 is thus thrown out of connection with the sprocket 23 and ceases to revolve. Thus the twisting motion of the hooks 56 also stops. The wire drawing carriage 8 now travels to its extreme left hand position, as shown in Fig. 1, where the tripping roller 19 comes in contact with the trip arm 48 on the bell-crank lever having the short arm 50, and throws it over in such position that it operates the bell-crank lever arm 46 to throw up the clamping members 43 and release the wires from beneath clamping members 43. When the chain 14 draws the box link 13 down under the sprocket wheel 16 the arm 12 is tilted down. This operation serves to elevate the arms 10 so that the prongs 11 engage the loops of the wires and remove said loops from the twisting hooks 56, the clamps having been released as previously stated. The carriage 8 now travels to the right, drawing the wires with it until it reaches its right hand position, as shown in Fig. 3, when the trip roller 19 comes in contact with the trip 35 drawing it into such a position that it draws on the link 34. This link 34 throws the arm 33 of the lever on the shaft 32, which in turn operates the links 30 to throw the cam levers 29. These cam levers 29 force the clamping blocks 28 outwardly, so that they clamp the wires between their surface and the surfaces of the frames 27. The wires are thus held firmly during the next operation, which is the stretching operation. The carriage 8 travels a short distance after coming in contact with the trip 35, and still holds the clamps in operation by reason of the length of the trip 35, until the arm 12 has traveled beyond the sprocket 15 and up to the top of the same. This operation serves to draw out or stretch the wires; and at the same time when the box link 13 comes to the top of the sprocket wheel 15 the arm 12 is elevated and the arms 10 depressed, so that the prongs 11 are removed from the loops of the wires. Meantime the box link 13 has come in contact with the arm 116 on the bell-crank lever 114 pivoted at 115 and has thrown the same over into such position that the other arm 113 draws on the link 112. This link 112 revolves the shaft 110 so that it turns the

levers 109 which draw on the links 108, which links operate the wire cutters 103, and the wires are thus severed at the end of the stretching operation. The travel of the box link 13 from the end to the upper side of the sprocket wheel 15, has elevated the arm 12 and depressed the arms 10, so that the prongs 11 are removed from the loops of the wires, the wires being supported by the lugs 118 on the sides of the frames 4. A complete bale tie thus formed drops into a suitable receptacle below the machine. The wire drawing carriage now travels forward in the direction of the arrows shown in Fig. 3, to perform another complete operation.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a device of the class described, the combination with a loop frame, of a movable wire drawer, and means actuated by said wire drawer adapted to loop the wire.

2. In a device of the class described, the combination with a loop frame, of a movable wire drawer, and means actuated by said wire drawer adapted to bend and twist wire.

3. In a device of the class described, the combination with a loop frame, of a movable wire drawer, and means actuated by said wire drawer adapted to bend, twist and stretch wire.

4. In a device of the class described, the combination with a loop frame, of a movable wire drawer, and means actuated by said wire drawer adapted to bend, twist, stretch and cut wire.

5. In a device of the class described, the combination with a loop frame, of a movable wire drawer, means on said loop frame adapted to bend and twist wire, and means on said wire drawer adapted to actuate said aforementioned means.

6. In a device of the class described, the combination with a frame, of a wire bender on said frame, a wire drawer adapted to slide on said frame, a trip on said frame adapted to actuate said wire bender, and a tripper on said wire drawer adapted to actuate said trip.

7. In a device of the class described, the combination with a frame, of a wire drawer adapted to slide on said frame, a tripper on said wire drawer, a trip on said frame adapted to be actuated by said tripper, bending fingers on said frame, and operating means connecting said bending fingers with said trip.

8. In a device of the class described, the combination with a frame, of a wire drawer adapted to slide on said frame, a tripper on said wire drawer, a trip on said frame adapted to be actuated by said tripper, a link connected to said trip, a gear sector operated by said link, gears meshing with said

gear sector, shafts adapted to be rotated by said gears, and bending fingers adapted to be operated by said shafts.

9. In a device of the class described, the combination with a frame, of a wire drawer adapted to slide on said frame, a tripper on said wire drawer, a trip on said frame adapted to be actuated by said tripper, a link connecting said trip, a double gear sector adapted to be operated by said link, and bending fingers adapted to be rotated by said gear sector, said bending fingers being guided in slotted pieces on said frame.

10. In a device of the class described, the combination with a frame, of a wire drawer adapted to slide on said frame, a trip on said frame, a wire holding clamp on said frame, a feed on said frame, a tripper on said wire drawer adapted to operate said trip, and operating means connecting said wire clamp to said trip.

11. In a device of the class described, the combination with a frame, of a wire drawing carriage on said frame, a tripper on said carriage, a trip on said frame adapted to be operated by said tripper, a link connected to said trip, a bell-crank lever adapted to be operated by said link, a clamping rod adapted to be operated by said bell-crank lever, and a clamping bed co-acting with said clamping rod.

12. In a device of the class described, the combination with a frame, of a wire drawer adapted to slide on said frame, a trip on said frame, a tripper on said carriage adapted to coöperate with said trip, a link connected with said trip, a bell-crank lever on said frame adapted to be operated by said link, said bell-crank lever forming a trip, a link connected to said bell-crank lever, another bell-crank lever connected with said link, a clamping rod adapted to be operated by said last mentioned bell-crank lever, and a clamping bed adapted to co-act with said clamping rod to clamp wire between them.

13. In a device of the class described, the combination with a frame, of a wire drawer adapted to slide on said frame, a wire twister on said frame, a trip on said frame, a tripper on said wire drawer adapted to actuate said trip, and operating means connecting said twister to said trip.

14. In a device of the class described, the combination with a frame, of a wire drawer adapted to slide on said frame, a tripper on said wire drawer, a trip on said frame adapted to be actuated by said tripper, a link connected to said trip, driving means on said frame, a twister adapted to be rotated by said driving means, and means connected to said link adapted to throw in said driving means.

15. In a device of the class described, the combination with a frame, of twisting hooks supported on said frame, a shaft supported

on said frame, a sprocket on said shaft, a clutch on said sprocket, a gear on said shaft adapted to rotate said twisting hooks, clutch means on said gear, a trip on said frame, a wire drawer adapted to slide on said frame, a tripper on said wire drawer adapted to operate said trip, and means connected to said trip adapted to throw said clutch on said gear into driving connection with said clutch on said sprocket.

16. In a device of the class described, the combination with a frame, of twisting hooks rotatably supported on said frame, driving means on said frame, driving connections between said driving means and said twisting hooks, a wire drawing carriage on said frame, a trip on said frame, a tripper on said wire drawing carriage adapted to operate said trip, means connecting said trip with said driving connections, adapted to bring said driving connection into driving relation with said driving means, and means adapted to throw said driving connections out of operation automatically.

17. In a device of the class described, the combination with a frame, of twisting hooks supported on said frame, driving means supported on said frame, a clutch on said driving means, a clutch adapted to engage said clutch on said driving means to rotate the twisting hooks, means adapted to throw said clutches into engagement, and means for automatically throwing said clutches out of engagement.

18. In a device of the class described, the combination with a frame, of a wire drawing carriage adapted to slide on said frame, a tripper on said wire drawing carriage, a trip on said frame adapted to be actuated by said tripper, a link connected to said trip, a cam lever operated by said link, a pin adapted to engage the said cam lever, a clutch operated by said pin, a driving gear supported on said frame, a clutch on said driving gear adapted to engage said first mentioned clutch, a gear driven by said first mentioned clutch, a pinion driven by said gear, a shaft driven by said pinion, bevel gears on said shaft, and twisting hooks adapted to be revolved by said bevel gears.

19. In a device of the class described, the combination with a frame, of a wire drawing carriage adapted to slide on said frame, a tripper on said carriage, a trip on said frame adapted to be operated by said tripper, a link connected to said trip, a lever operated by said link, a link operated by said lever, a cam lever operated by said link, and a clamping block operated by said cam lever.

20. In a device of the class described, the combination with a frame, of a wire drawer adapted to slide on said frame, a tripper on said wire drawer, a trip on said frame adapted to be operated by said tripper, a

link connected with said trip, a lever adapted to be operated by said link, a pair of links adapted to be operated by said lever, a pair of cam levers adapted to be operated by said links, and a pair of clamping blocks adapted to be operated by said cam levers.

21. In a device of the class described, the combination with a frame, of a wire cutter on said frame, a wire drawer adapted to slide on said frame, a tripper on said wire drawer, a trip on said frame adapted to be operated by said tripper, and operating means connecting said wire cutter with said trip.

22. In a device of the class described, the combination with a frame, of a wire drawer adapted to slide on said frame, a tripper on said wire drawer, a trip on said frame adapted to be operated by said tripper, a link connected to said trip, a lever adapted to be operated by said link, a shaft adapted to be rotated by said link, a pair of levers operated by said shaft, a pair of links operated by said levers, and a pair of wire cutters operated by said links.

23. In a device of the class described, the combination with a frame, of a wire drawer adapted to slide on said frame, a wire bender on said frame, a trip on said frame adapted to operate said wire bender, a holding clamp on said frame, a trip on said frame adapted to operate said holding clamp, and a tripper on said wire drawer adapted to operate said trips.

24. In a device of the class described, the combination with a frame, of a wire drawer adapted to slide on said frame, a tripper on said wire drawer, a trip on said frame adapted to be operated by said tripper, a link connected to said trip, a sector gear adapted to be operated by said link, bending fingers on said frame adapted to be operated by said sector gear, a trip on said frame adapted to be operated by said tripper, a link connected with said trip, a bell-crank lever adapted to be operated by said link, a clamping member adapted to be operated by said bell-crank lever, and a clamping plate adapted to coact with said clamping member.

25. In a device of the class described, the combination with a frame, of a wire drawer adapted to slide on said frame, a tripper on said wire drawer, a trip on said frame adapted to be operated by said tripper, a link connected with said trip, a double sector gear adapted to be rotated by said link, gears meshing with said gear sectors, bending fingers adapted to be revolved by said gears, a trip on said frame adapted to be operated by said tripper, a link connecting said trip, a bell-crank lever one arm of which forms a trip adapted to be operated by said link, a link connected to said bell-crank lever, a bell-crank lever adapted to be operated by

said last mentioned link, a clamping member adapted to be operated by said bell-crank lever, and a clamping plate adapted to be coöperated with said clamping member.

26. In a device of the class described, the combination with a frame, of a wire bender on said frame, a trip on said frame adapted to operate said wire bender, a holding clamp on said frame, a trip on said frame adapted to operate said holding clamp, a wire twister on said frame, a trip on said frame adapted to operate said wire twister, a wire drawer adapted to slide on said frame, and a tripper on said wire drawer adapted to operate said trips.

27. In a device of the class described, the combination with a frame, of a wire drawer adapted to slide on said frame, a tripper on said wire drawer, a trip on said frame adapted to be operated by said tripper, a link connected to said trip, a sector gear adapted to be operated by said link, bending fingers adapted to be operated by said sector gear, a trip on said frame adapted to be operated by said tripper, a link connected to said trip, a bell-crank lever connected to said link, a wire clamp adapted to be operated by said bell-crank lever, a trip on said frame adapted to be operated by said tripper on said wire drawer, a link connecting said trip, a wire twister on said frame, means adapted to drive said twister, and means on said last mentioned link adapted to bring said driving means to operation.

28. In a device of the class described, the combination with a frame, of a wire drawer adapted to slide on said frame, a tripper on said wire drawer, a trip on said frame adapted to be operated by said tripper, a link connected to said tripper, a double sector gear adapted to be operated by said link, gears meshing with said sector gears, bending fingers adapted to be rotated by said gears, a trip on said frame adapted to be operated by said tripper on said wire drawer, a link connected to said trip, a bell-crank lever one of whose arms forms a trip adapted to be operated by said link, a link adapted to be operated by said bell-crank lever, a bell-crank lever adapted to be operated by said last mentioned link, a clamping member adapted to be operated by said bell-crank lever, a clamping plate adapted to coact with said clamping member, a trip on said frame adapted to be operated by said tripper on said wire drawer, a link connected to said latter trip, a cam lever adapted to be operated by said link, a clutch adapted to be thrown into operation by said cam lever, a gear connected to said clutch, a clutch adapted to mesh with said aforementioned clutch, pinions adapted to mesh with said clutch gear, and twisting hooks adapted to be rotated by said clutch gear.

29. In a device of the class described, the combination with a frame, of a wire bender on said frame, a trip adapted to operate said wire bender, a holding clamp on said frame, a trip adapted to operate said holding clamp, a wire twister on said frame, a trip adapted to operate said wire twister, a releasing trip for said holding clamp, a wire drawer adapted to slide on said frame, and a tripper on said wire drawer adapted to operate said trips.

30. In a device of the class described, the combination with a frame, of a wire drawer adapted to slide on said frame, a tripper on said wire drawer, a trip on said frame adapted to be operated by said tripper, a link connected to said trip, a sector gear adapted to be operated by said link, bending fingers adapted to be rotated by said sector gear, a trip on said frame adapted to be operated by said tripper on said wire drawer, and a twisting mechanism on said frame adapted to be drawn in operation by said latter trip.

31. In a device of the class described, the combination with a frame, of a wire drawer adapted to slide on said frame, a tripper on said wire drawer, a trip on said frame adapted to be operated by said trip, a link connected to said trip, a double sector gear adapted to be rotated by said link, gears meshing with said gear sectors, bending fingers adapted to be rotated by said gears, a trip on said frame adapted to be operated by said tripper, a link connected to said trip, a cam lever adapted to be operated by said link, a twisting mechanism on said frame, driving means on said frame, and means adapted to be operated by said cam lever to connect in driving relation said twisting mechanism to said driving means.

32. In a device of the class described, the combination with a frame, of a wire bender on said frame, a trip on said frame adapted to operate said wire bender, a wire twister on said frame, a trip adapted to operate said wire twister, a wire cutter on said frame, a trip adapted to operate said wire cutter, a wire drawer on said frame, and a tripper on said wire drawer adapted to operate said trips.

33. In a device of the class described, the combination with a frame, of a wire drawer adapted to slide on said frame, a wire bender on said frame having downwardly curved fingers, shafts supporting said fingers, gears on said shafts, a double sector gear meshing with said gears, a trip on said frame adapted to rotate said gear sector, wire twisting hooks on said frame, driving means for said hooks, clutching means adapted to connect said driving hooks with said driving means, means for throwing said clutching means into operation, a trip on said frame adapted to operate said last mentioned means, a wire

cutter on said frame, a trip on said frame adapted to operate said wire cutter, a wire drawer on said frame, and a tripper on said wire drawer adapted to operate said trips.

5 34. In a device of the class described, the combination with a frame, of a wire clamp on said frame, a wire drawer adapted to slide on said frame, a trip on said frame adapted to actuate said clamp, a tripper on
10 said wire drawer adapted to actuate said trip, and means adapted to twist the wire while being held by said wire clamp.

35. In a device of the class described, the combination with a frame, of a wire bender
15 on said frame, a trip adapted to operate said wire bender, a twister on said frame, a trip adapted to throw said twister into operation, a wire cutter on said frame, a trip
20 adapted to operate said wire cutter, a wire drawer sliding on said frame, a tripper on said wire drawer adapted to operate said

trip, and wire stretching means adapted to be operated by said wire drawer.

36. In a device of the class described, the combination with a frame, of a wire clamp 25 on said frame, a wire drawer on said frame, and means adapted to be operated by said wire drawer to stretch wire while said clamp is closed.

37. In a device of the class described, the 30 combination with a frame, of a loop former, a carriage adapted to operate said loop former, means adapted to reciprocate said carriage, and means for driving said reciprocating means. 35

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN A. SCHARF.

Witnesses:

CLARENCE HILL,
GEO. W. WADEN.