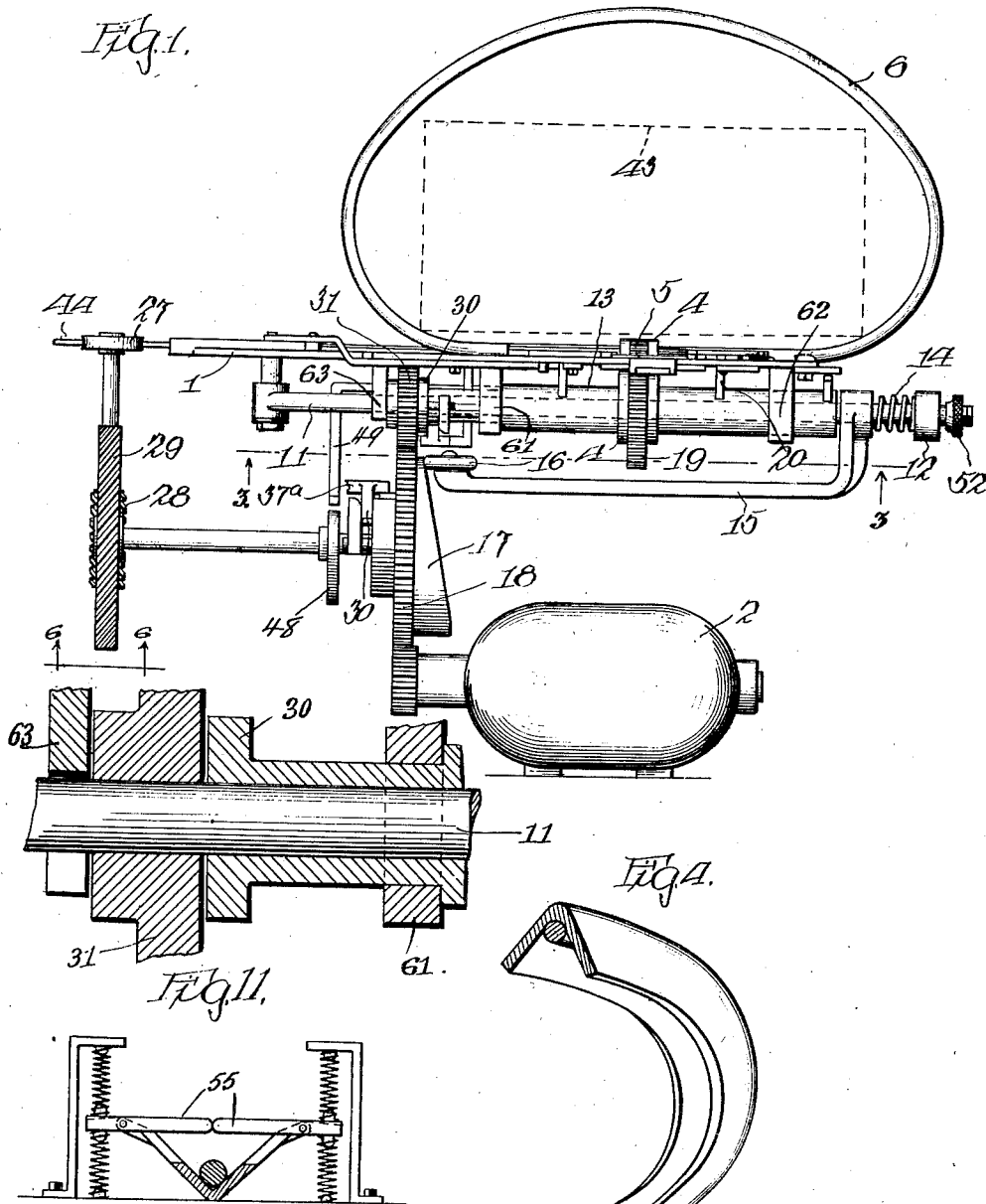


J. S. McCHESNEY.
WIRE TYING.
APPLICATION FILED JAN. 6, 1917.

1,357,883.

Patented Nov. 2, 1920.
3 SHEETS—SHEET 1.



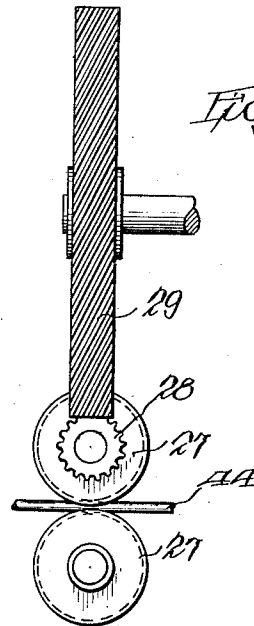
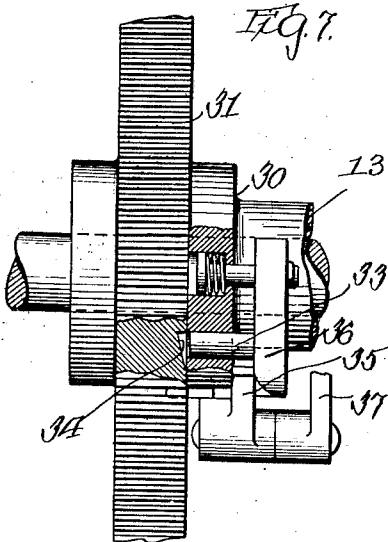
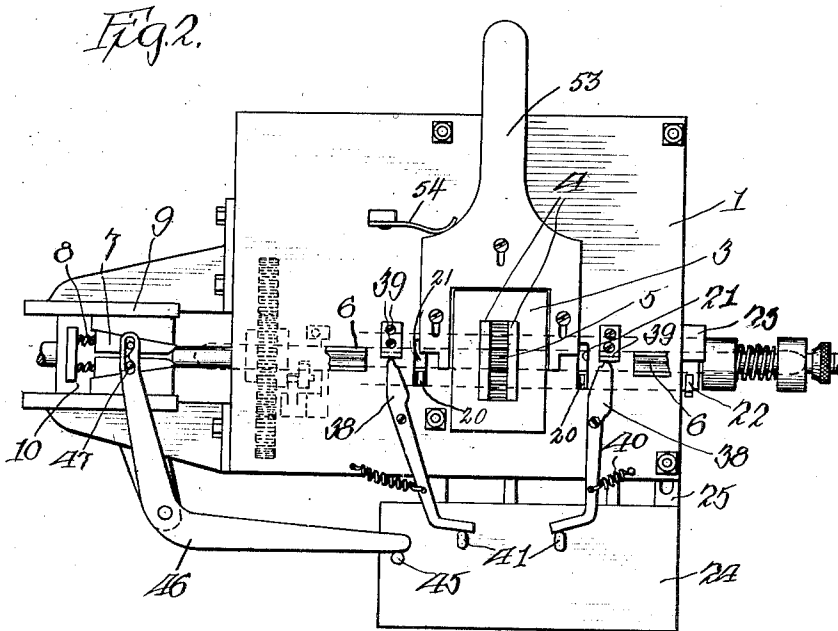
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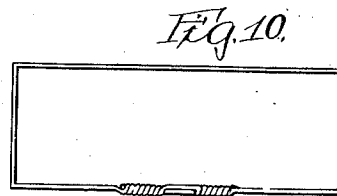
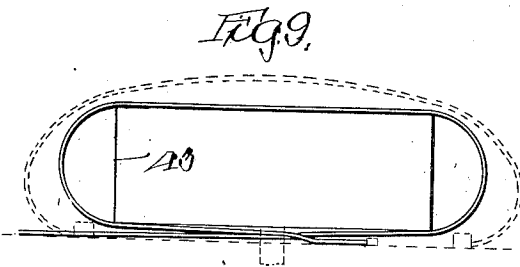
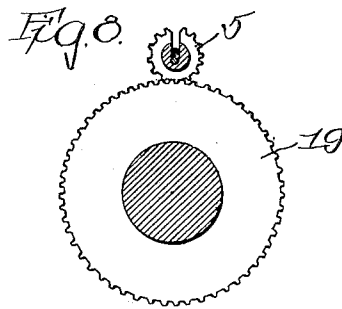
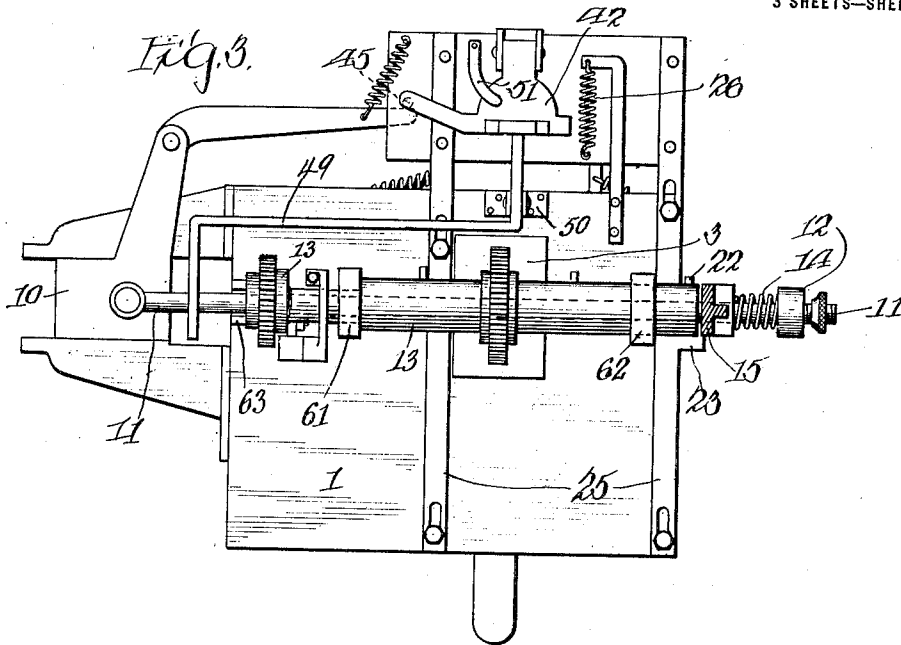
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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WIRE-TYING.

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Specification of Letters Patent.

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Application filed January 6, 1917. Serial No. 140,883.

To all whom it may concern:

Be it known that I, JOHN SHERMAN McCHESNEY, a citizen of the United States, residing at Chicago, Illinois, have invented certain new and useful Improvements in Wire-Tying; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In one of its general aspects, my invention relates to a novel form of wire loop and novel method of forming a closure or fastening for wire loops, regardless of whether or not the wire comprising the loop is already disposed in effective position for performing the purpose for which the loop is intended. In another aspect, my invention relates to the intertwisting of overlapping portions of wires and to the production of twists in which the extreme tips of the wires are closed to the twists (or integral portions of the latter) and face in predetermined directions. In still another aspect, my invention relates to the production of finished wire loops, either as free loops or in operative position for their intended purposes, from a continuous supply of wire and with a minimum of both labor and waste.

Heretofore, in closing a wire loop by intertwisting portions of the wires, the twisting has been performed upon substantially parallel end portions of the wire which was to form the loop, thereby producing a twist which was not strictly a portion of the loop proper, which normally would project at a considerable angle to the adjacent loop portion and in which the tips of the wire were substantially contiguous. Where such a closure was used upon a loop forming a band or a tie for a package or other object, this twist, being substantially external of the loop, has proved unsightly and apt to catch upon adjacent articles, thereby rendering such a wire tie objectionable for boxes or packages likely to be shipped jointly with packages having relatively frail wrappers. Moreover, in wire-tying objects by this method, it has not been practical to adjust the actual amount of wire used to the variations due to lack of uniformity in the exact size of the objects, differences in the amount of compression or indenting caused by the tightening of the wire, and so on. Consequently, it has been necessary to start with a cut piece of wire of the probably required

maximum length and to waste the difference between this length and what was actually needed; and, if the wire used did not prove quite long enough, the result has been either an inadequate twisting or an undue compressing and indenting of the wire. Likewise, in forming "free" loops for use as hosebands or the like, the variations in the stretching of the wire have demanded an excess of wire over that which would be needed if the amount in each case were adjusted according to this stretching. So also, since the resulting twist if not made with ordinary pliers still closely resembled a plier-made twist, the opening of a loop and the reclosing of the same by means of common hand tools would readily escape detection, thus permitting of undetected tampering. Besides, the making of such wire joints has heretofore involved a relatively large amount of manual labor and has been at a low rate of speed.

My invention aims to overcome these objections and to fill widely varying commercial needs by forming the end portion of a supply of wire into the loop and cutting off the needed length only after this has been determined for each individual loop; by automatically tightening the operative wire portion to a predetermined tension; by intertwisting wire portions extending in the same general direction with parts of the loop at each side of the said portions, thereby producing a twist forming an integral part of the loop proper and one not adapted to project from the loop or to catch on adjacent objects; by intertwisting the free end of the wire with a wire portion spaced from the prospective other terminal of the loop, and preferably by simultaneously forming two twists in each of which one of the prospective loop tips is intertwisted with a wire portion disposed at a considerable distance from the other tip; by severing the wire supply from the loop, and preferably also severing a relatively small wire portion from the other terminal of the loop; by performing this severing at a predetermined point in the twisting, and preferably continuing the twisting thereafter to direct the wire tips toward the interior of the loop; by temporarily holding the looped wire in an initial position to permit the ready insertion of the object to be banded by the loop, and by releasing this temporary holding when the loop is being tightened; by holding the

object in operative position while the loop is being tightened and twist-closed; by spacing certain portions of the loop from the object to permit the twisting element to operate without contacting with the object, and by readily releasing the spacing means to permit removal of the object; by using slotted and relatively rotatable twisting elements and preferably by using a slotted pinion for one of these elements; and by automatically stopping the twisting operation when the twists have been completed.

Furthermore, my invention aims to feed the requisite quantity of wire into its looped position and thereafter to automatically stop the feeding of wire; to afford simple and positive means for gripping the wire portions which are to be held immovable during the forming of the twist; to automatically release the gripping when the twist is approximately completed, and to hold the wire-gripping means inoperative during the feeding of the wire.

Still further objects will appear hereafter.

In carrying out my invention, I may employ mechanism of widely varying types, such as the one shown in my copending application filed November 13, 1916 as Serial No. 130941 (showing the wire-tightening means as including a bell-crank lever and a cam on the main shaft), or the one shown in my copending application filed January 26, 1917 as Serial No. 144,604, I do not wish to be limited to any particular embodiment, nor to the particular disclosure as made herewith, since the latter might be modified in many ways without departing from the spirit of my invention. Hence, the accompanying drawings are merely illustrative of my method and of the distinctive type of wire loop or wire closure produced by the same. In these drawings,

Figure 1 is a front elevation of a machine embodying my invention, with the supporting legs omitted.

Fig. 2 is a fragmentary plan view of the same.

Fig. 3 is a bottom view of the portion of the machine shown in Fig. 2, taken from the line 3—3 of Fig. 1.

Fig. 4 is an enlarged perspective view of a portion of the channel for guiding the feeding of the wire.

Fig. 5 is an enlarged elevation showing one of the spring latches for retaining the wire in the channel.

Fig. 6 is an enlarged bottom view of a portion of the wire-feeding mechanism of Fig. 1, taken from the line 6—6 in Fig. 1.

Fig. 7 is an enlarged fragmentary view of the clutch on the driving shaft.

Fig. 8 is an enlarged transverse section through the wire-twisting pinion and the gear driving the latter.

Fig. 9 is a diagrammatic view showing two positions of the loop of wire during the progressive tensioning of the same.

Fig. 10 is a view of a finished loop embodying my invention and made according to the same.

Fig. 11 is an enlarged vertical and longitudinal section through the pinion 31 of Fig. 1 and the parts adjacent thereto.

In the embodiment of the drawings, the machine for carrying out my method consists of wire-feeding, tensioning and twisting means largely carried by a table 1, the supports for this table as well as for the gearing being omitted to avoid confusion in the drawings, and driven by a motor 2. The table 1 has an aperture surrounding a vertically movable stripper frame 3, which in turn surrounds a pair of slotted guides 4 spaced by a slotted floating pinion 5. Mounted on the table 1 is a guide channel or raceway 6 disposed in the form of a loop forming a continuation of normally aligned slots in the guides 4 and the pinion 5 and presenting end portions extending in opposite directions longitudinally of the table. One end of the channel 6 is disposed adjacent to and in alinement with a gap between two wedge-shaped jaws 7, which jaws are normally pressed by springs 8 against guides 9, thereby contracting the space between these jaws. The jaws 7, springs 8 and guides 9 are all carried by a slide 10 (as shown in Figs. 2 and 3), which slide can be reciprocated by the movement of an arm 11 extending through the quill-shaft 13 which carries part of the gearing for the wire-twisting part of the mechanism. This arm 11 has a sleeve 12 adjustably mounted on it at the end opposite the slide 10, where this sleeve 12 takes the thrust transmitted through a compression spring 14 by an arm 15 which latter arm carries a roller 16 continuously engaging a cam 17. This cam 17 is fast upon the intermediary gear 18 which transmits motion from the continuously driven motor 2 to the quill-shaft 13, so that each rotation of this cam reciprocates the arm 15 and this reciprocation is transmitted through the arm 11 to the slide 10. The quill-shaft 13 which thus has its bore acting as a guide for the arm 11 is journaled in bearings 61 and 62 depending from the under side of the table 1, and this table also carries a depending fork 63 which prevents the hereafter mentioned spur gear 31 from being moved longitudinally toward the slide 10 or out of engagement with the gear 18.

Fast upon the gear shaft 13 is a gear 19 meshing with and supporting the slotted pinion 5, as shown in Fig. 8; also, the shaft 13 carries a pair of cutters 20 each adapted to project through an opening 21 during a portion of every revolution of the said shaft, and a finger 22 disposed slightly behind the

cutters and adapted to engage a lug 23 associated with an extension table 24. This extension table is connected to the main table by slides 25, one of which slides is here shown as carrying the lug 23, and is continuously urged away from the main table by the spring 26 shown in Fig. 3. Associated with the left-hand or entrance end of the guide channel 6 are suitable wire-feeding means, such as a pair of rollers 27, one of which is driven through a worm 28 by a worm-wheel 29 axially aligned with the intermediate gear 18 and connected to the latter through a one-revolution clutch 30; that is to say, through a clutch which automatically disconnects the worm-wheel 29 from the gear 18 after a predetermined rotational movement of the former. The clutch for this purpose may, for example, be of the type shown in my copending application, Serial No. 130941, and also shown here on the gear shaft 13 for affording a temporary connection between the latter and the spur gear 31 which meshes with the gear 18. Thus, constructed, the clutch 30 includes a body member slidably carrying a spring-pressed latch pin 33 adapted to engage a ratchet formation 34 on the gear 18 and also adapted to be drawn out of its said engagement by a finger 35 which engages a strap 36 fastened to the pin 33 when the latter is completing one revolution. This finger 35 may in turn be moved out of its said engagement by a lever 37, so that the movement of this lever will set the clutch into action. In this connection it will be noted that the wire is guided, by the channel 6, in a predetermined plane and held in such plane untensioned about the object. The guide channel thus accurately determines the plane of the proposed wire band about the box and enables the operator to position the loop exactly with respect to the same.

Mounted on the table 1 are a pair of pivoted grippers 38, presenting tips adapted to bear against stops 39, the grippers being urged continually into their said relations to the stops by springs 40 but adapted to be moved in the opposite direction by fingers 41 projecting through perforations in the extension table 24 and carried by a frame 42 pivoted to the under side of the latter.

Thus, arranged, the machine illustrated operates as follows in carrying out my method for wire-tying a package 43, in dotted lines in Fig. 1: With the motor 2 running continuously, the lever 37^a is first thrown, thereby actuating the clutch for connecting the intermediate gear 18 with the wire feeding means for a period corresponding to one revolution of the latter, during which period the rollers 27 will then move the wire 44 forcibly toward the right or into the loop-shaped guide channel 6. While this is occurring the gear shaft 13 is station-

ary (owing to the unlatching of the upper clutch by the finger controlled by another lever 37) and the finger 22 on this shaft is pressing against the lug 23 and thereby holding table 24 in closed position. When thus pressed toward the main table, the extension table 24 through a pin 45 upon the latter moves a lever 46 pivoted on the slide 10 and presenting a perforated tip partially housing pins 47 on the jaws 7, so that a wedge shaped portion of this perforated tip spreads the jaws 7 apart while this tip is moving the latter toward the left against the pressure of the springs 8. Consequently the jaws 7 are spread farther apart than the thickness of the wire 44, so that the feeding mechanism can readily slide the latter between these jaws and into the loop-shaped guide-channel, in doing which portions of the wire are fed respectively between the stops 39 and the tips of the grippers 38, and overlapping portions of the wire are fed through the aligned slots in the floating pinion 5 and the guides 4 adjacent to the latter. As soon as the lower clutch has made one revolution and approximately coincident with the automatic disconnection of this clutch, a cam 48 strikes the end of a lever 49 pivoted in a bearing 50 under the table thereby moving the pivoted frame 42 against the pressure of a spring 51. This depressing of the frame 42 moves the fingers 41 out of the path of the gripper levers 38 so that the springs 40 force the latter to grip wire portions between the latter and the stops 39. The depressing of the frame 42 also carries the pin 45 out of the path of the lever 46, thereby permitting this lever to swing freely and without further effect upon the jaws 7. Consequently, the next movement of the slide 10 to the left will cause the wedges carried by the slide to force the jaws against the wire 44, thus pulling upon the wire of a loop. During the return movement of the slide the jaws will slide upon the wire, which is kept from retraction by the left-hand gripper 38, and the next leftward movement of the slide will again pull on the loop. In this way the slide (which is continuously reciprocated by the action of the cam 17 through the roller 16 and the arm 11) will tension the wire around the object until the effective tension equals that of the spring 14, after which a further movement of the arm 15 will merely compress the spring 14 without moving the sleeve 12 and the arm 11 connecting this sleeve with the slide 10. Hence, by turning the adjusting nut 52 and thus altering the compression of the spring 14, the tightening of the wire loop about the object can be adjusted to any desired tension, and the operator readily sees when the point is reached from the standing still of the slide 10.

When the loop has thus been tensioned, 130

the operator moves the clutch lever 37, thereby setting the gear shaft 13 in motion and hence rotating the wire twisting pinion 5, so as to intertwist the two sets of overlapped wire portions disposed respectively between each stop 39 and the adjacent gripper 38. Thus, the twisting is performed while the loop is under tension, the number of turns in each twist depends upon the ratio of the gear 19 to the pinion 5. Before the twisting is completed, and desirably anticipating this completion by a quarter turn of the pinion 5, the cutters 20 on the main shaft will operate through the openings 21 in the table 1, thereby severing the lowermost portions of the wires respectively from the extreme tip or free end of the original wire stock and from the supply of wire. This severing is performed upon the same wire portions which were originally lowermost, as in Fig. 9, and the final quarter turn of the twisting then turns the terminals of the twists approximately toward the interior of the loop, so that these terminals cannot catch on objects outside the loop. Finally, the engagement of the pin 22 with the lug 23 moves the extension table toward the main table, thereby causing the fingers 41 to move the grippers 38 out of operative relation to the wire, while the automatic clutch on the main shaft stops the latter with the pinion 5 in the position of Fig. 8. The left-hand cutter 20 after performing its cutting operation engages one corner portion of a slide 53, thereby moving this slide out of its normal position of Fig. 2, or upward in this figure. This slide, as shown in Fig. 1, normally presents tips disposed between the lower portion of the loop and the object which is being banded, thereby spacing these apart to allow room for the rotating of the pinion 5 without damaging the object.

These fingers would prevent the banded object from being raised off the table after the wire-banding operation is completed, but the left-hand cutter moves the slide 53 so as to carry the fingers clear of the wire loop. The banded object can then be withdrawn and another object (package, loop form or the like) substituted for it, after which the cycle of operations is resumed, the slide 53 being moved into its operative spaced position by a spring 54 as soon as the main shaft carries the left-hand cutter tip 20 out of engagement with this slide.

To prevent the wire from accidentally leaping over the edge of the guide channel while being fed into the same, I preferably provide the latter at a number of points with spring latches for resisting a movement of the wire out of the channel as for example, the latch shown in Fig. 5, in which pivoted arms 55 are so held by springs that they will resist the upward movement of the wire past them, but will permit this if the force

is sufficiently great. However, I do not wish to be limited in the carrying out of my method to this or other particular features of the apparatus or procedure as herein described nor to use of my method for the tying of objects, it being obvious that by substituting a form (collapsible or otherwise) for the package or other object as described, I can produce distinctive wire loops by my method, which loops can then be slipped off the form.

I claim as my invention:

1. In the wire-tying of an object, the steps of holding the wire in a loop formation against retrograde movement and loosely encircling the object, tightening the loop to tension the loop about the object, and thereafter securing terminal portions to each other by intertwisting the same.

2. In the wire-tying of an object, the steps of holding the wire in the form of a loop loosely encircling the object and with a free end portion of the wire extending in parallel overlapping relation to a non-terminal portion of the wire, while permitting forward movement of the said non-terminal wire portion but preventing retrograde movement thereof; tightening the loop by such forward movement of the wire alongside the said free end portion while continuously maintaining the latter in overlapping relation to the moving wire portion and thereby tensioning the loop about the object, and thereafter intertwisting the said free end portion with the other wire portion overlapped by the same after the said tensioning has been accomplished.

3. In the wire-tying of an object, the steps of disposing a loop of wire around the object to effect a parallel and contiguous overlapping of wire loop portions spaced from the initial ends of the loop, holding the loop against retrograde movement, tightening the loop about the object to a predetermined tension, and thereafter securing the overlapped wire portions to each other.

4. In the wire-tying of an object, the steps of disposing a loop of wire around the object to effect a parallel and contiguous overlapping of wire loop portions spaced both from the initial ends of the loop, and from the object, holding the loop against retrograde movement, tightening the loop about the object to a predetermined extent while maintaining the said relation of the wire loop portions, and thereafter intertwisting the said wire portions.

5. The method of closing a wire loop having terminal portions overlapping in contiguous parallel relation in the general direction of the wire portions leading thereto, which includes the holding in relatively fixed spacing of wire parts disposed beyond the terminals of the proposed loop, while

intertwisting the overlapped wire portions intermediate of said parts, and severing the intertwined portions from the extreme tip portions during the said intertwisting and
 5 prior to the completion of the latter, thereby turning the effective ends of the wire loop toward the interior of the latter.

6. In the wire-tying of an object, the successive steps of feeding one end of a supply
 10 of wire into a loop formation around the object, discontinuing the feeding and gripping the free end of the wire, tensioning the loop about the object to a predetermined tension, intertwisting overlapped loop portions while maintaining the loop under tension, and simultaneously severing the wire
 15 of the loop from the supply and from its extreme tip.

7. In the manufacture of a wire loop, the
 20 steps of disposing the wire in loop form about an object with a part of the loop in parallel overlapping relation to the part leading to the free end of the wire, gripping the said free end, retracting the other end
 25 of the loop by a step-by-step movement to produce a predetermined tensioning of the loop, and thereafter intertwisting a portion of the overlapping wire parts.

8. The method of closing a wire loop
 30 which includes the steps of disposing the wire with each of its prospective terminals contiguous to and in parallel overlapping relation to a wire portion spaced from the other terminal, and intertwisting a part of
 35 the overlapped wire portions between the terminals while maintaining the wire under tension, severing terminal portions of the wire adjacent to the loop at points disposed peripherally of the loop and close to the in-

tertwisting and thereafter turning the loop 40 ends toward the interior of the loop.

9. In the wire-banding of an object, the steps of holding wire in a loop formation of greater bore than the periphery of the object and with portions thereof longitudinally overlapped, inserting the object in the
 45 loop, contracting the loop about the object to a predetermined tension, and securing the said overlapped portions to each other while maintaining the tensioning. 50

10. In the wire-banding of an object, the steps of holding wire in a predetermined plane and in a loop of greater bore than the periphery of the object, providing support adjacent to the loop for the object, positioning
 55 the object upon the support, tensioning the loop by a pull on the wire exerted in a plane substantially coincident with that of the loop, and thereafter intertwisting terminal portions of the loop. 60

11. In the wire-banding of an object, the steps of holding the wire in the form of a loop spaced from the object so as to loosely encircle the same and disposed in a predetermined plane, tightening the loop to tension
 65 the latter about the object, and thereafter securing terminal loop portions to each other by intertwisting the same.

12. In a wire-banding of an object, the steps of guiding and holding a loop of wire
 70 of greater circumference than the periphery of the object in a predetermined plane, tightening the loop about the object while in the said plane, and thereafter securing the end portions of the loop-forming wire to
 75 each other by intertwisting the same.

Signed at Chicago, January 4, 1917.

JOHN SHERMAN McCHESNEY.