July 31, 1956 S. P. OSUCH 2,756,783

WIRE-TYING MACHINE

Original Filed April 19, 1949 3 Sheets-Sheet 1

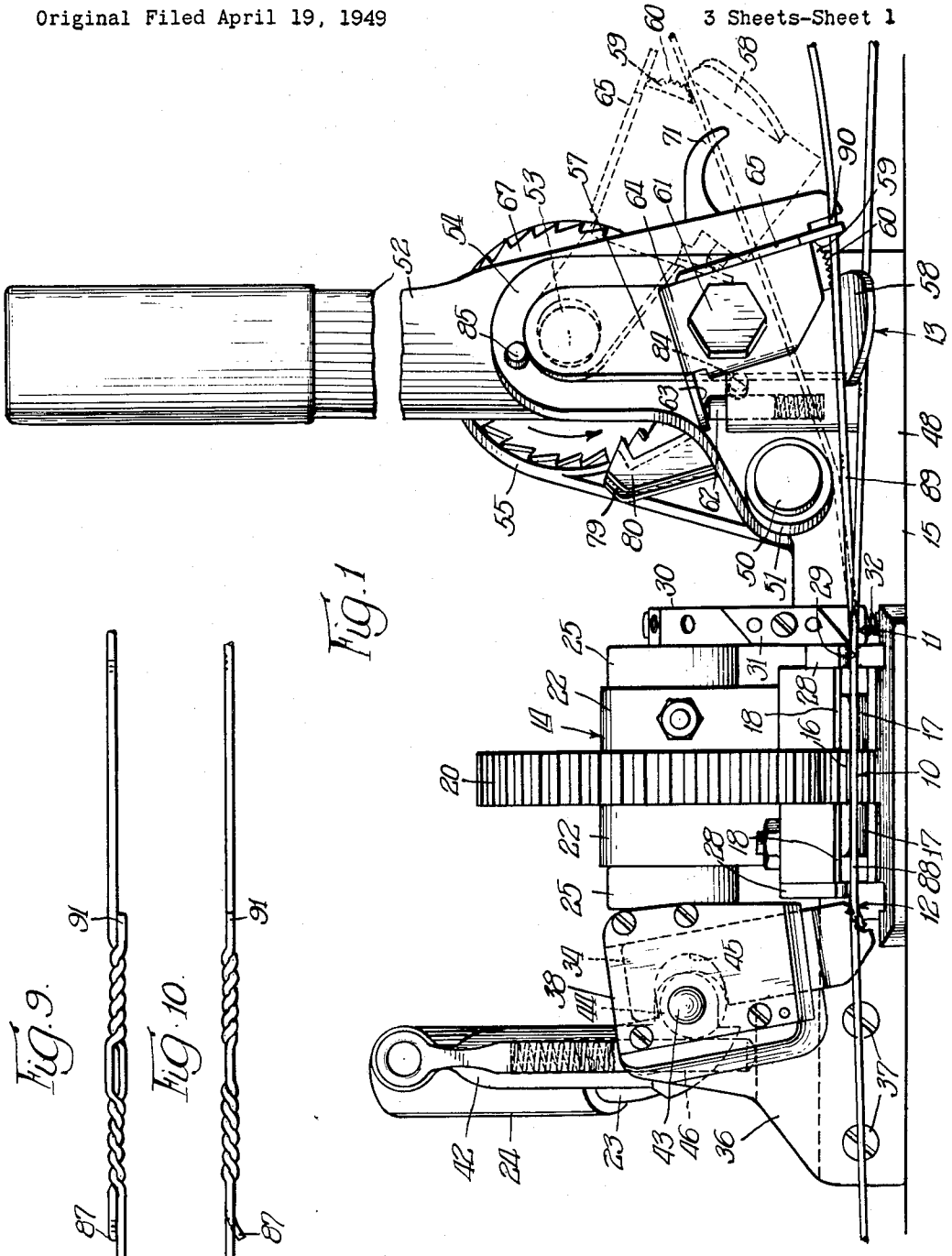


Fig. 1

Fig. 9.

Fig. 10.

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WIRE-TYING MACHINE

Original Filed April 19, 1949 3 Sheets-Sheet 2

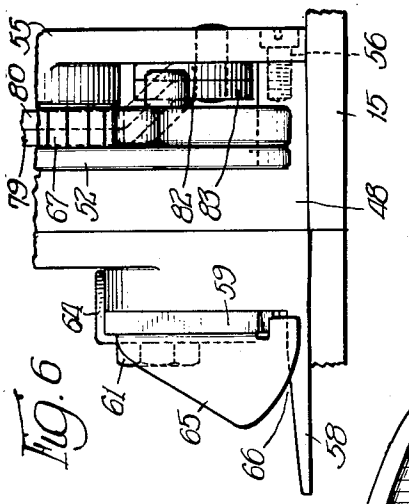


Fig. 6

Fig. 2

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WIRE-TYING MACHINE

Original Filed April 19, 1949 3 Sheets-Sheet 3

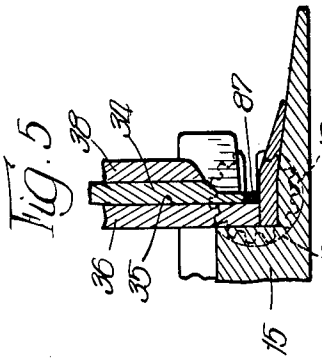


Fig. 5

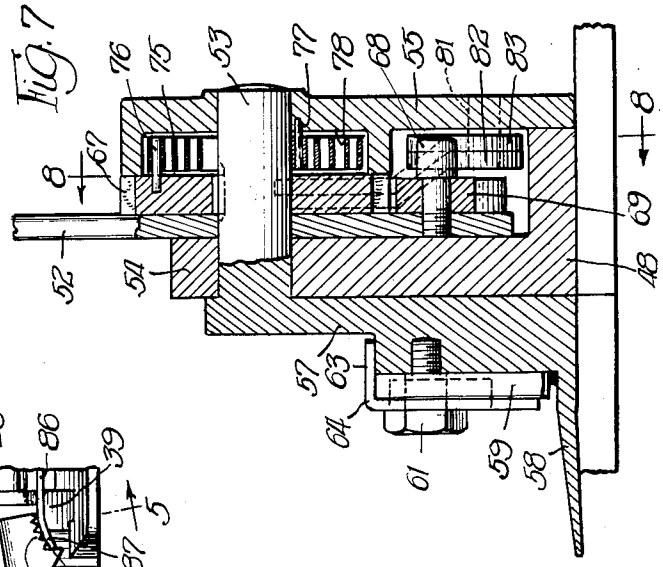


Fig. 7

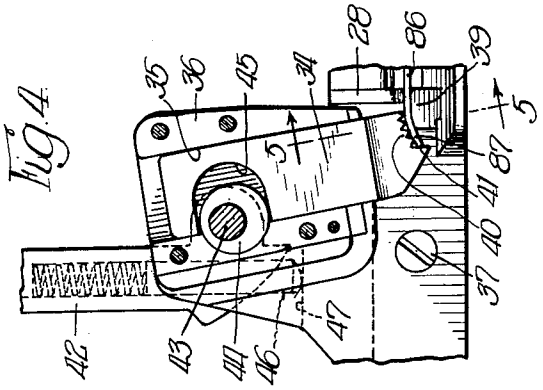


Fig. 4

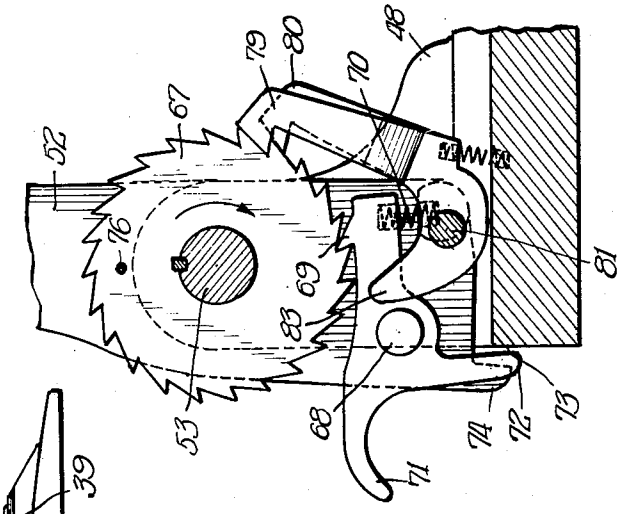


Fig. 8

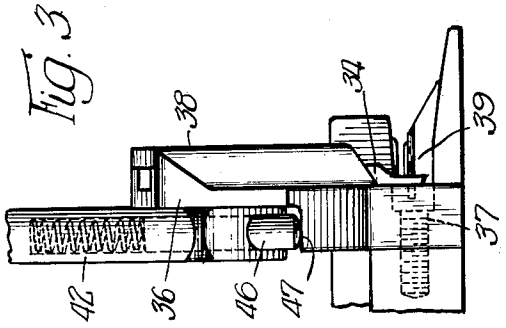


Fig. 3

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2,756,783

WIRE-TYING MACHINE

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Continuation of application Serial No. 88,335, April 19, 1949. This application April 8, 1954, Serial No. 421,840

9 Claims. (Cl. 140—93.6)

This invention relates to wire-tying machines of the portable or manual type.

This is a continuation of my application Serial No. 88,335, filed April 19, 1949, now abandoned.

The object of the invention is to provide an improved machine of the type described which will reduce the waste of tie wire taken from a coil or similar source.

A further object is to provide an improved machine, which is light in weight and easy to manipulate, will draw the wire tightly about an object with any desired degree of tension, will twist the overlapped ends of the wire together into a secure tie, and will cut off at one end of the tie the portion of wire leading back to the coil, all without injurious mutilation of the unused wire.

A preferred embodiment of the invention is disclosed herein by way of exemplification but it will of course be appreciated that the invention is capable of being incorporated in other structurally modified forms coming equally within the scope of the appended claims.

In the accompanying drawings:

Figure 1 is a front view of a wire-tying machine constructed in accordance with the invention;

Figure 2 is a plan view of the machine;

Figure 3 is a fragmentary side view of the machine, showing the stationary wire-gripping mechanism located at the left side of the machine;

Figure 4 is a front view of the wire-gripping mechanism shown in Figure 3 with a the front cover plate of the casing for the reciprocable gripper removed;

Figure 5 is a fragmentary vertical section through the same wire-gripping mechanism, taken on the line 5—5 of Figure 4;

Figure 6 is a fragmentary side view of the machine, showing the movable wire-gripping mechanism located at the right side of the machine;

Figure 7 is a vertical section through the movable wire-gripping mechanism, taken on the line 7—7 of Figure 2;

Figure 8 is another vertical section through the same mechanism, taken at right angles to Figure 7 on the line 8—8 of Figure 7;

Figure 9 is a top view of the wire tie formed by the machine; and

Figure 10 is a front view of the tie.

The improved machine includes, in addition to a wire-twisting mechanism **10** and a wire-cutting mechanism **11**, both of which are well known in the art, a novel stationary wire-gripping mechanism **12**, at the left side of the machine, and a novel movable wire-gripping mechanism **13**, at the right side of the machine.

The invention resides primarily in the construction, arrangement and operation of the wire-gripping mechanisms **12** and **13** which mechanisms cooperatively act upon wire placed in the machine in such manner as to enable the operator to bind an object with wire taken from a coil without injurious mutilation of any of the wire leading back to the coil, thus eliminating the waste which ordinarily occurs when any of the wire is mutilated and has to be clipped off prior to the next binding operation.

The wire-twisting mechanism **10**, which is located centrally of the machine between the stationary and movable wire-gripping mechanisms, is mounted in a low frame **14** which is provided with a flat out-spread base **15**. The mechanism **10** is characterized by a radially slotted wire-twisting pinion **16**. The pinion **16** is provided with similarly slotted end trunnions **17** which are journaled in bearing sleeves **18** in a bore **19** in the front part of the frame **14** immediately above the base **15**. The bearing sleeves **18** and the bore **19** are of C-shaped cross-section and open toward the front, to permit overlapped portions of wire to be inserted in the slot in the pinion **16**. The slot in the pinion **16** is only slightly wider than the diameter of the wire, while the slots in the end trunnions **17** are more than twice as wide as the diameter of the wire. A relatively large drive gear **20** meshes with the pinion **16** and is journaled on a shaft **21** which is supported on upstanding bearings **22** on the frame **14**. An upwardly and rearwardly inclined extension **23** of the shaft **21** provides a mounting for a steadying handle **24**. An operating lever **25** is also journaled on the shaft **21** at opposite sides of the bearings **22**. The lever **25** upon being tilted forwardly through an angle of about 180° will turn the gear **20** in the same direction through the instrumentality of one-way clutch dogs **26**, which dogs are resiliently mounted in the handle **25** adjacent the pivotal axis of the latter and engage within notches **27** in the sides of the gear **20**. Stationary wire holding yokes **28** are secured to the frame **14** at the ends of the bore **19**. The yokes **28** are provided with narrow forwardly opening slots **29** of but slightly larger size than the diameter of the wire used in the machine, whereby to hold the overlapped portions of the wire against turning about each other at the locations of the yokes while permitting the intervening sections to be be twisted by the pinion **16** into the tie formation shown in Figures 9 and 10.

The wire-cutting mechanism **11** consists of a blade carrier **30** which is pivotally attached adjacent its lower rear corner to the frame **14** in a position in shearing association with the right hand yoke **28**. The carrier **30** is provided on its front face with a replaceable blade **31** having a cutting edge which is relieved at a point in register with the rear end of the slot in the yoke, whereby to avoid cutting the rearmost wire portion in such slot while cutting the foremost wire portion. The carrier **30** which supports the blade **31** is oscillated forwardly against the yielding resistance of a spring **32** at approximately the end of the wire-twisting operation by means of a stud **33** mounted on the operating handle **25** adjacent the pivotal axis of the latter.

As wire-twisting mechanisms and wire-cutting mechanisms of the character above described are both well known in the art, being disclosed, for example, in Patent No. 1,971,021, the same will not be described in further detail here.

The stationary wire-gripping mechanism **12**, which is located immediately to the left of the left-hand yoke **28**, includes a gripper slide **34** (see particularly Figures 3, 4 and 5) reciprocably mounted in a generally upright position in a guideway **35** provided in a casing **36**. The casing **36** is secured to the front edge of the left-hand side of the base **15** by screws **37** and is provided with a removable cover plate **38** which forms the front wall of the guideway **35**. The lower end **40** of the slide **34** is serrated, reduced in thickness and cut away at the front, whereby to engage only with the rearmost of the two overlapped portions of wire which are adapted to be positioned in the slots in the twisting pinion **16** and yokes **28**. The lower end of the slide **34** is inclined downwardly away from the slot in the left-hand yoke **28** and is arranged directly above and in close proximity to a correspondingly inclined anvil **39** formed on the left-hand yoke immediately to the left of

the slot therein. The lower end 40 of the slide 34 is serrated to engage the extremity of the rearmost portion of wire and clamp it securely against the anvil 39 in a short downwardly bent formation. Beyond the serrations, the lower end 40 of the slide 34 is provided with a small vertical shoulder or stop 41 for endwise abutment with the wire, whereby to assist in correctly positioning the free end of the wire from the coil at the time of its insertion in the machine.

The slide 34 is reciprocable in the guideway 35 by a hand lever 42, located at the rear of the casing 36. The lever 42 is secured adjacent its lower end to a rock shaft 43, journaled in the casing 36 and provided within the guideway 35 with an eccentric cam 44. The cam 44 is disposed within a U-shaped follower notch 45 in the upper end of the slide 34, with the result that movement of the hand lever 42 to the left will retract the slide 34 from the anvil 39 and movement to the right will project the slide. The hand lever 42 is normally urged toward the right to project the slide 34 toward the anvil 39 by a downwardly spring-pressed plunger 46 which is housed within the lever 42 and bears against a ledge 47 on the side of the casing 36. The angle of contact between the cam 44 and the groove 45 in the fully retracted position of the gripper 34 is such as to frictionally retain the latter in that position.

The movable wire-gripping mechanism 13, which is located some distance to the right of the wire-cutting mechanism 11, includes a bracket 48 (see particularly Figures 6, 7 and 8) attached by screws 49 to the right-hand side of the base 15. The bracket 48 is set at a slight angle with respect to the center line of the slots in the twisting pinion 16 and holding yokes 28 and is provided with a forwardly projecting stub shaft 50 on which a roller 51 is journaled for free rotation.

Beyond the roller 51 is a wire tensioning hand lever 52 pivotally mounted near its lower end on a shaft 53, journaled in a bearing 54 formed on bracket 48. The shaft 53 is also journaled at its rear end, behind the lever 52, in a bearing in an upstanding plate 55, secured by screws 56 to the rear side of the bracket 48.

The shaft 53 projects forwardly from the upper portion of the bracket 48 and is provided with a radially extending arm 57, which arm normally extends downwardly. The arm 57 terminates at its lower end in a short forwardly projecting tongue 58. A wire-gripping dog 59 having teeth 60 on its lower edge is pivotally attached at 61 to the arm 57 in a position directly above the tongue 58 and is adapted to grip a portion of the wire against it. The dog 59 is biased toward the tongue 58 by a spring-pressed plunger 62 in the rear upwardly extending portion of the tongue, which plunger reacts against a ledge 63 on a stamping 64 secured to the dog. The stamping 64 is provided with a small forwardly projecting vertically disposed wing portion 65 which is shaped at its lower edge to provide with the tongue 58 a forwardly open throat 66 into which the wire is adapted to be pushed rearwardly. When the wire is pushed rearwardly in the throat 66 the resulting upward pressure on the wing portion 65 will cam the dog 59 into a raised position relative to the tongue 58, allowing the wire to enter and be gripped between the dog and the tongue. Wire grippers of this automatically opening type are well known in the art.

A ratchet wheel 67 is keyed to the shaft 53 immediately to the rear of the hand lever 52, and the hand lever 52 is provided at its lower end with a pin 68 on which a driving pawl 69 is pivotally mounted. The pawl 69 engages with the ratchet wheel 67 and turns the shaft 53, together with the arm 57, tongue 58 and dog 59, all as a unit, in a counterclockwise direction when the hand lever 52 is swung toward the left.

The pawl 69 is urged into engagement with the ratchet wheel 67 by a compressed coil spring 70, and is provided with an exposed finger piece 71 for use in manually releasing the pawl from the wheel. The pawl 69 is also provided with a downwardly extending projection 72 which is adapted to move into abutment with a shoulder 73 on the bottom of the bracket 48, whereby to automatically disengage the pawl from the ratchet wheel 67 when the hand lever 52 is forced from its upright position toward the right. The lower end of the hand lever 52 is also provided with a similar projection 74 for abutment with the same shoulder to limit the movement of the lever in that direction after the pawl 69 has been tripped and released from its engagement with the ratchet wheel.

The ratchet wheel 67 in being turned in a counterclockwise direction with the other parts of the movable wire-gripping mechanism 13 turns in that direction against the yielding resistance of a tensioned torsion spring 75, connected at its outer end 76 to the ratchet wheel and at its inner end 77 to the back plate 55. The spring 75, which surrounds the shaft 53 and is housed within a forwardly opening recess 78 in the plate 55, serves to return ratchet wheel 67, shaft 53, arm 57 and tongue 58 into the initial downwardly extending position of the arm upon the ratchet wheel 67 being released.

The ratchet wheel 67 is automatically locked in any position into which turned in a counterclockwise direction by holding means, preferably in the form of two staggered locking pawls 79 and 80, arranged side-by-side and pivotally mounted on a pin 81 carried by the plate 55. The pawls 79 and 80 are of different effective lengths, and are adapted to engage, one after the other, with the teeth of the ratchet wheel 67, whereby to lock the tongue 58 in intermediate as well as full-tooth positions, thus permitting a finer tensioning adjustment than would be possible with a single pawl operating with teeth of the same circumferential spacing. The pivotal portions of the pawls 79 and 80 are offset laterally with respect to the wheel engaging portions thereof and are provided respectively with tail portions 82 and 83, disposed in the path of movement of the end of the pin 68 on which the pawl 69 is pivotally mounted. As a result of this arrangement, when the hand lever 52 is swung back into its upright position and forced toward the right to disengage the pawl 69, the staggered locking pawls 79 and 80 will both be automatically released at the same time, completely freeing the ratchet wheel 67 and allowing the latter to be turned by the torsion spring 75 back into the lowermost position of the gripping dog 59 and clamping tongue 58. A stud 84 on the bracket 48 engages with the arm 57 when the latter reaches its initial position, stopping it in that position. Another stud 85 on the upper end of the bracket 48 limits the arm 57 in its other direction of movement.

The machine is adapted to be used to tie wire about an object in the following manner:

The machine is placed upon the box or other object to be strapped, the lever 42 of the stationary wire-gripping mechanism 12 is moved to the left to retract the slide 34 from the anvil 39, and the free end 86 of a wire leading back to a coil (if the wire is in coil form) is inserted from the front of the machine into the slots in the twisting pinion 16 and holding yokes 28, with its extremity 87 beneath the slide, after which the lever 42 is released, allowing the slide to move downwardly against the wire extremity, not only securely clamping such extremity against the anvil 39 but also deflecting the same downwardly at a slight angle at the same time, as shown in Figure 4. With the extremity 87 of the wire thus securely held, the wire leading back to the coil is looped about the object, after which a portion 88 of the wire is inserted again into the slots in the twisting pinion 16 and holding yokes 28, immediately in front of the previously described end portion 86. Another adjacent portion 89 of the wire leading back to the coil is then placed under the roller 51 and a further removed portion 90 is engaged between the dog 59 of the movable gripper unit in clamped engagement with the tongue 58, the dog 59 and tongue 58 being at that time in their lowermost or initial loading positions.

The machine, having thus been threaded with wire, is

ready to be operated to tension, twist and cut the wire. To do this the hand lever **52** is moved to the left, either in one long stroke or in several short strokes, depending on the resistance encountered and the convenience of the operator, thereby causing the dog **59** and tongue **58** to travel in an arc in the same direction, drawing the wire with it about the guide roller **51**, which roller is disposed in substantially the same plane as the slots in the twisting pinion **16** and holding yokes **28**.

After the wire has been drawn tight with the desired amount of tension, variable within wide limits, as desired, the hand lever **25** is swung forwardly through an angle of approximately 180°, turning the gear **20** through a corresponding angle and rotating the twisting pinion **16** to impart the desired twist in the overlapped portions of the wire, resulting in a tie formation of the character shown in Figures 9 and 10.

Near the end of the forward movement of the handle **25** the stud **33** on the latter engages with the carrier **30** for the cutter **31**, causing the cutter to sever the outermost wire portion, as shown at **91** in Figures 9 and 10.

With the tie complete, the machine can be moved backwardly into a position free of the tie and the remaining wire leading back to the coil can be released from the gripper **59** by swinging the wing portion **65** of the stamping **64** a short distance to the right.

The machine is now ready to perform another wire tying operation of the same sort. The arcuate movement of the clamping unit of the movable wire-gripping mechanism **13**, together with the guiding and gradual bending of the wire effected by the anti-friction roller **51**, leaves a practically straight end remaining on the wire leading back to the coil, free of injurious mutilation, which can be inserted in the stationary wire-gripping mechanism **12** at the commencement of the next tying operation without the necessity of cutting off and scrapping any of the wire.

I claim:

1. In a wire tying machine of the type having a wire twisting mechanism for producing a tie between overlapped portions of a wire looped around an object, and a wire cutting mechanism for cutting one of the overlapped wire portions at the end of the tie, the provision of a stationary wire gripping mechanism at one side of the machine for holding the extremity of one of the overlapped wire portions, a movable wire gripping mechanism at the opposite side of the machine for tensioning and holding the wire after the wire has been looped about the object, and a guide roller between the wire twisting mechanism and the movable wire gripping mechanism beneath which a portion of the wire is adapted to be passed, said movable wire gripping mechanism including a wire gripping unit beyond the roller which is movable upwardly in an arc away from the roller, a hand lever for moving said unit, means for locking said unit in any position into which it is moved, a releasable connection between the hand lever and said unit, and means for releasing said locking means upon return movement of the hand lever into a predetermined position.

2. In a wire tying machine of the type having wire twisting and cutting mechanisms, a wire holding yoke at the left side of the wire twisting mechanism having a forwardly opening slot therein for the reception of two overlapped wire portions, said yoke being provided on the side thereof opposite the twisting mechanism with a lateral extension in approximate register with the bottom of the slot, a vertically reciprocable wire gripper positioned directly above said extension for movement bodily at substantially a right angle to the face of the extension for clamping the end of the rearmost of the two overlapped wire portions against the extension, a gripper operating handle, an eccentric cam connection between the handle and the gripper for retracting the latter from the extension upon movement of the handle, and spring means acting on the cam connection to project the gripper toward the extension, said cam connection between the handle and the gripper being movable by the handle into a position wherein the action of the spring on the cam connection is nullified and the cam connection will act frictionally to retain the gripper retracted when moved by the cam connection into its fully retracted position.

3. In a wire tying machine of the type having wire twisting and cutting mechanisms, a stationary wire gripping mechanism at the left side of the machine, and a movable wire gripping mechanism at the right side of the machine, said movable wire gripping mechanism including a stationary bracket, a shaft journaled horizontally in the bracket, a handle pivotally mounted on the shaft, a radially extending arm secured to the shaft, a wire gripping unit on the free end of the arm, a ratchet wheel secured to the shaft, a releasable spring pressed driving pawl pivoted to the handle on one-way clutched engagement with the wheel for turning the latter when the handle is moved in the direction, a releasable spring pressed locking pawl pivoted to the bracket in one-way clutched engagement with the wheel, spring means for turning the wheel in the direction opposite to that in which the same is turned by the handle and driving pawl, and means for automatically releasing both the driving pawl and the locking pawl upon movement of the handle into a predetermined position, whereby to cause said spring means to return the wheel, shaft, arm and gripping unit into their initial positions.

4. A wire-tying device comprising a base, a slotted twister pinion journaled horizontally on the base, two forwardly open slotted yokes, one at each end of the pinion, adapted to receive overlapping portions of a tie and hold them against rotation during rotation of the pinion, a stationary wire gripper immediately adjacent one yoke, a bearing bracket upstanding on the base on the opposite side of the pinion from said stationary gripper and spaced from said other yoke, a shaft journaled horizontally in said bracket having an arm extending downwardly therefrom in front of said bracket, a tongue projecting forwardly from said arm, a gripper pivoted on said arm cooperating with said tongue to seize a wire placed therebetween, and manual means for turning said shaft to swing said arm away from said pinion and tension the end of a wire tie held between the tongue and gripper.

5. The apparatus defined by claim 4 characterized by said shaft making an angle less than a right angle with the vertical plane through the axis of the twister pinion.

6. The apparatus defined by claim 4 characterized by a horizontal roller journaled on said bracket between said arm and said other yoke, at an elevation such that the bottom of the roller will be engaged by said end as it is raised on angular movement of said arm.

7. The apparatus defined by claim 4 characterized by said means including a ratchet wheel secured to said shaft, a lever loose on said shaft, a driving pawl on said lever engageable with said wheel, said pawl having a projection engageable with a fixed abutment on movement of the lever to a predetermined position, effective to disengage the pawl from the wheel.

8. The apparatus defined by claim 4 characterized by said means including a ratchet wheel secured to said shaft, a lever loose on said shaft, a driving pawl on said lever engageable with said wheel, a holding pawl pivoted on said bracket and engageable with said wheel, said holding pawl having a tail portion whereby it may be disengaged from the wheel, and means on said lever engageable with said tail portion when said lever is moved to a predetermined position.

9. A wire-tying device comprising a base, a slotted twister pinion journaled horizontally on the base, two forwardly open slotted yokes, one at each end of the pinion, adapted to receive overlapping portions of a tie and hold them against rotation during rotation of the pinion, an anvil immediately adjacent one yoke, a casing upstanding on said base adjacent said anvil, a generally vertical guideway in said casing, a gripper slidable in said guideway

having its lower end shaped to cooperate with said anvil in gripping a wire end, a manually operable lever pivoted on said casing, an eccentric actuated thereby and working in a notch in said gripper for reciprocating it and a spring-pressed plunger reciprocable in said lever longitudinally thereof, said plunger being offset from the pivotal axis of the lever, projecting from the lever at the pivoted end thereof and bearing on a fixed abutment, whereby the spring pressure constantly urges said lever in a direction such as to move said gripper toward said anvil.

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