Dec. 5, 1933. F. H. LENNOX 1,937,767

WIRE TENSIONING AND TYING MACHINE

Filed July 27, 1932 2 Sheets-Sheet 1

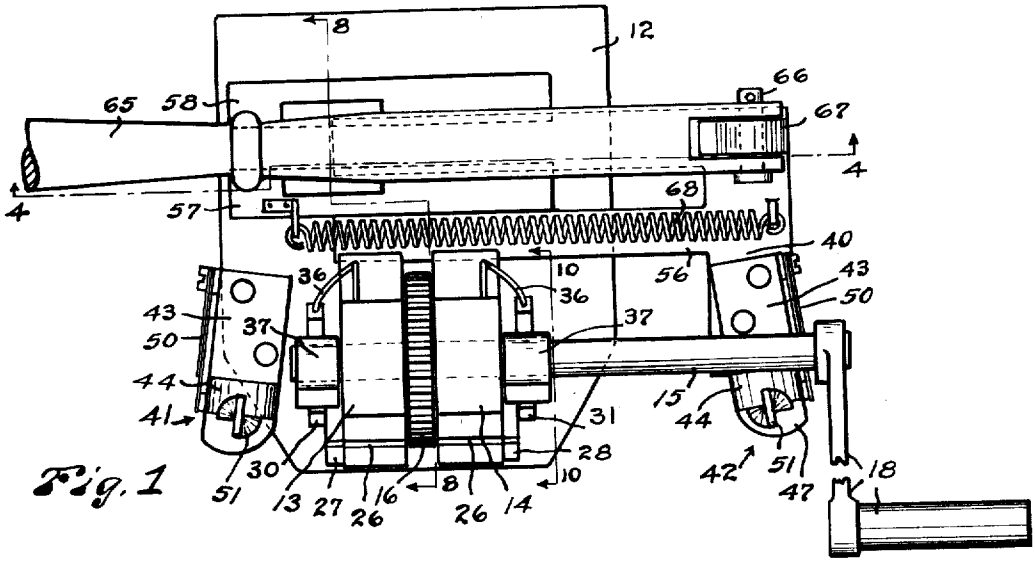


Fig. 1

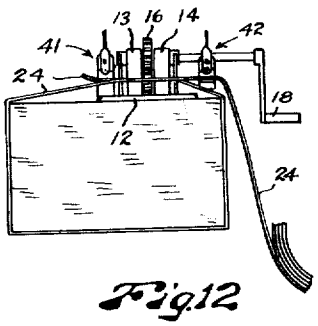


Fig. 12

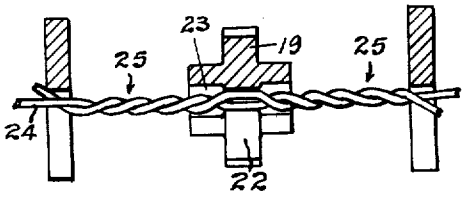
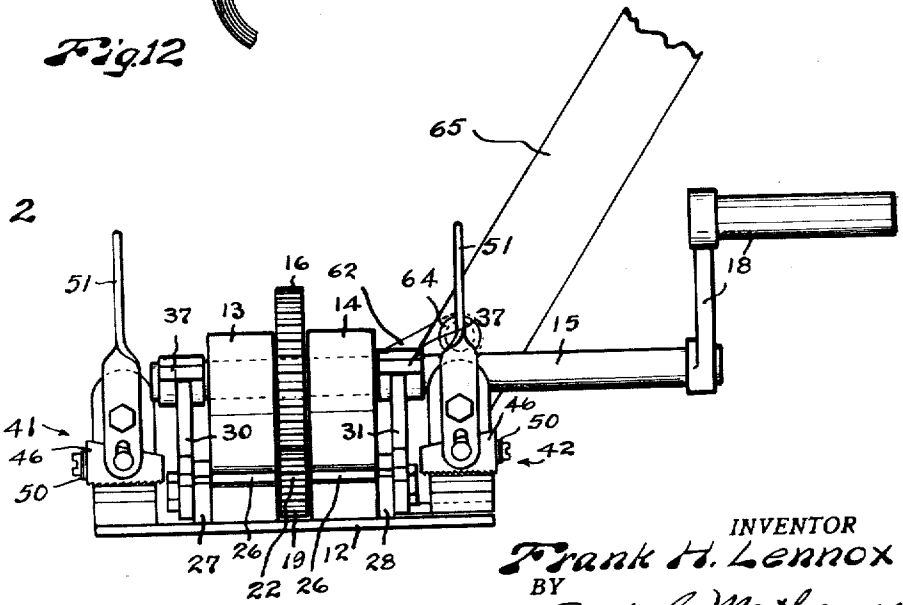


Fig 3

Fig. 2



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WIRE TENSIONING AND TYING MACHINE

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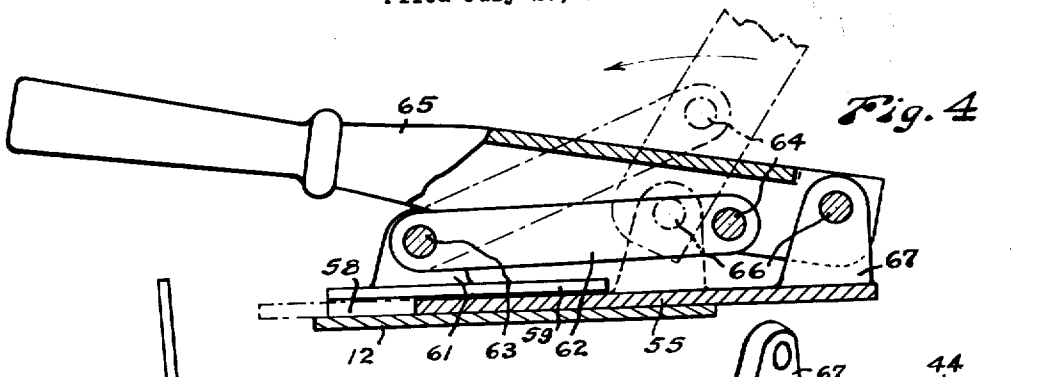

Fig. 4

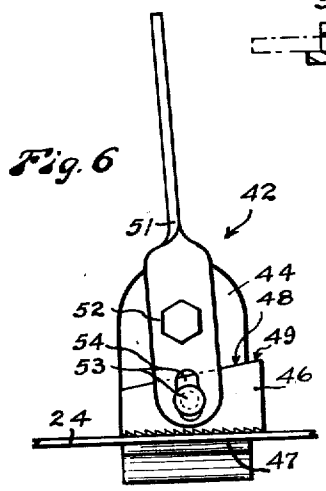

Fig. 6

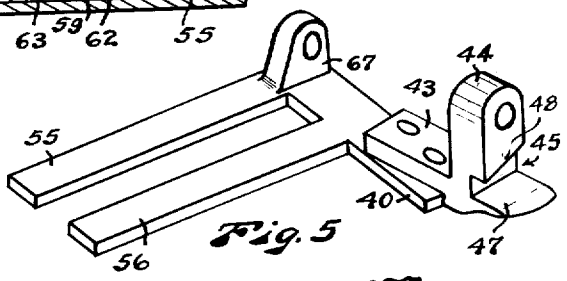

Fig. 5

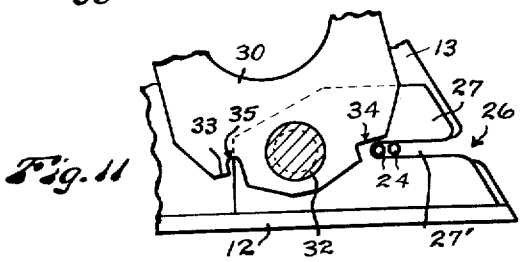

Fig. 11

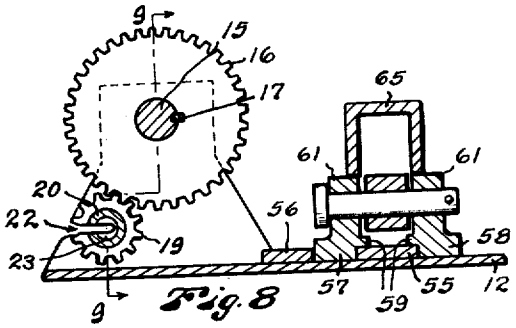

Fig. 8

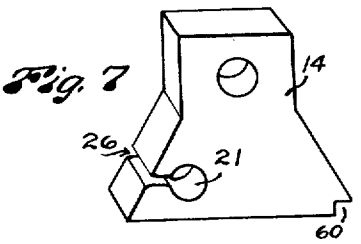

Fig. 7

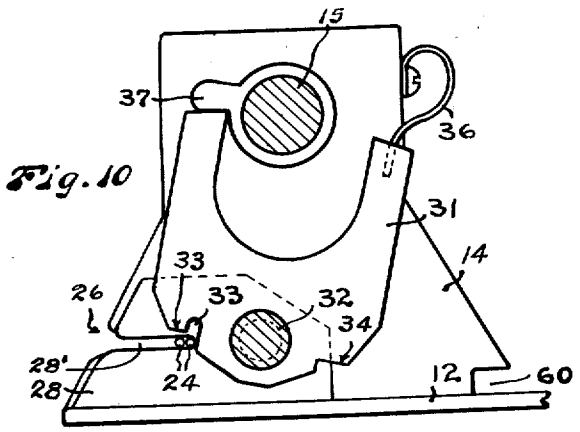

Fig. 10

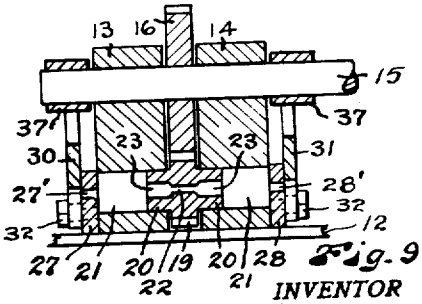

Fig. 9

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WIRE TENSIONING AND TYING MACHINE

Frank H. Lennox, Seattle, Wash.

Application July 27, 1932. Serial No. 625,069

6 Claims. (Cl. 140—93)

My invention relates to improvements in wire tensioning and tying machines and the general objects of my invention are to provide a wire tensioning and tying machine of strong and simple construction which is not expensive to manufacture and which is speedy and efficient in operation.

Another object of my invention is to provide a wire tensioning and tying machine which is capable of using wire directly off of a bale or roll; which does not require the wire to be previously cut into short lengths; and which forms the tie with a relatively small amount of wire and wastes very little wire in the cut off.

A further object is to provide a wire tensioning and tying machine embodying simple and efficient means for exerting a tension on a loop of wire which is passed around an object to be tied.

A further object is to provide a simple and efficient wire clamp or gripping jaw which has a relatively long gripping surface, thereby avoiding all danger of cutting the wire off in the gripping jaw and avoiding excessive wear on the gripping jaw and affording a positive and efficient grip on the wire which insures that the wire will not slip in the jaw.

Other and more specific objects of the invention will be apparent from the following description taken in connection with the accompanying drawings.

In the drawings Figure 1 is a plan view of a wire tensioning and tying machine constructed in accordance with my invention.

Fig. 2 is a front elevation of the same showing the tensioning lever in a different position from that shown in Fig. 1.

Fig. 3 is a plan view of a fragment of wire, showing a twist or tie in said wire made by this machine and showing parts of the machine in section.

Fig. 4 is a sectional view substantially on broken line 4—4 of Fig. 1, showing an extended position of the tensioning means by full lines and a retracted position of said tensioning means by dot and dash lines.

Fig. 5 is a detached perspective view of the tensioning slide forming part of this machine, a portion of one of the wire gripping members being shown connected with said slide.

Fig. 6 is a detached front elevation, on substantially twice the scale used in the preceeding figures, showing one of the wire gripping members.

Fig. 7 is a detached perspective view of one of the main frame blocks which forms a part of the mechanism for holding and twisting the wire.

Fig. 8 is a cross section substantially on a broken line 8—8 of Fig. 1.

Fig. 9 is a fragmentary cross section substantially on broken line 9—9 of Fig. 8.

Fig. 10 is a view partly in elevation and partly in cross section substantially on broken line 10—10 of Fig. 1, the scale of Fig. 10 being substantially twice that of Fig. 1, and parts of the machine being omitted.

Fig. 11 is a fragmentary view partly in section and partly in elevation illustrating the wire cutter on the reverse side from the one shown in Fig. 10.

Fig. 12 is a diagram showing the manner of applying the wire to the package.

Like reference numerals designate like parts throughout the several views.

In the drawings 12 designates a relatively flat plane base, preferably of steel, having two upright spaced apart frame blocks 13 and 14 rigidly mounted thereon near the front edge. A shaft 15 extends crosswise through the two frame blocks 13 and 14 near the upper ends thereof and a larger gearwheel 16 is non-rotatably secured to said shaft as by a key 17. A crank handle 18 is provided on one end of the shaft 15 for turning the same. The gearwheel 16 meshes with a pinion 19, Figs. 8 and 9, having hub members 20 which are journaled in a bore 21 in the frame blocks 13 and 14. The pinion 19 has a slot 22 extending from the periphery inward to a point beyond the center, said slot being just wide enough for the reception of the wires 24, Fig. 3, to be tied or twisted. The slot 22 is preferably about the same length from side to side as the pinion 19 and the pinion hubs 20 are bored from their outer ends inwardly to afford openings 23 of large enough size so that portions of the wires 24 positioned in the bore portions 23 may be twisted together, it being apparent that the portions of the wires 24 which lie within the slot 22 can not be twisted around each other but will be held alongside of each other while the adjacent portions on each side thereof will be twisted together, as shown at 25 in Fig. 3, when the pinion 19 is rotated.

The frame blocks 13 and 14 have slots 26 extending from the bores 21 outwardly to the front edge of said blocks through which the wires may be inserted. Wire holding plates 27 and 28 are fixedly secured to the outer sides of the frame blocks 13 and 14 respectively and are provided with slots 27′ and 28′ respectively extending from the front edge inwardly and positioned in alignment with the slots 26 in the frame blocks

13 and 14. The slots 27' and 28' are narrow enough so that the wires are held against twisting within these slots, the result being that when the pinion 19 is rotated those portions 25 of the wire between said pinion 19 and the holding plates 27 and 28 are rotated.

Two U shaped cutter members 30 and 31 of duplicate construction are pivotally mounted relative to the frame blocks 13 and 14 and are positioned against the outer sides of the wire holding plates 27 and 28. Stud screws 32 are used both as a holding means for the cutter members and as a holding means for the plates 27 and 28. These wire cutter members 30 and 31 each have two shearing shoulders 33 and 34, one of which is positioned in shearing relation with respect to the edge formed by the slot 27' or 28' of the adjacent wire holding plate 27 or 28.

The two wires which are to be cut lie side by side in the slots 27' and 28' of the wire holding plates 27 and 28 and it is necessary to cut off one of said wires on each side of the twist but to avoid cutting off both wires on either side of the twist, it being necessary to cut off the rear wire in the slots on one side and the forward wire in the slots on the other side. To accomplish this I position the cutter member 30, Fig. 11, which is at the operator's left as he faces the machine, so that it will engage and cut the rear wire but will miss the front wire when the shearing edge of said cutter member is moved down past the slot 27' in which the wires lie. This operation of the cutter member 30 will be readily understood from an inspection of Fig. 11.

On the other side of the machine, which is at the operator's right as he faces said machine, it is necessary to position the wire cutter member 31 so that the shearing shoulder 33 thereof will overhang both wires and to provide means to prevent the cutting of the rear wire and allow the cutting of the front wire upon movement of the wire cutter member. This means for preventing the cutting of the rear wire may be in the nature of an upwardly extending recess 35 positioned at the inner end of the shearing shoulder 33 of the said cutter member 31. It will be readily understood from an inspection of Fig. 10 that the recess 35 is so positioned as to receive the innermost wire and fit over said wire and thereby avoid cutting said innermost wire when the shearing shoulder 33 of the cutter member 31 is moved downwardly on the shearing stroke. When the cutter members 30 and 31 are thus made with one straight shoulder 34 and one shoulder 33 having the recess 35 therein they may be interchanged from one side of the machine to the other but are not reversible on one side of the machine.

Springs 36 extending between the respective frame blocks 13 and 14 and the rear legs of the U shaped cutter members 30 and 31 yieldingly hold said cutter members in the released position but permit them to be moved throughout a cutting stroke by the cams 37 on the shaft 15. At the end of each cycle of operation the cams 37 rest on the top of the front leg of the cutter members. The space between the two legs of the U shaped cutter members afford clearance for the operation of the cams 37.

Two wire grippers of duplicate construction are provided, one being secured to the base plate 12 at one side of the wire twisting mechanism and the other being secured to a part 40 of a movable tensioning slide and positioned at the other side of the wire twisting mechanism. These wire grippers are designated generally at 41 and 42, Figs. 1 and 2. The following description of the wire gripper designated at 42, Figs. 5 and 6, will apply equally well to the wire gripper 41. Each wire gripper comprises a base 43 having an upright lug 44 notched as at 45 to receive a gripping dog 46 and having a forwardly projecting shelf like flange 47 below said gripping dog whereon the wire 24 rests, said flange 47 cooperating with the gripping dog 46 to grip and hold the wire.

The upper wall 48 of the notch 45 is inclined and the upper edge 49 of the gripping dog is similarly inclined and said two inclined surfaces cooperate to force the gripping dog more firmly into engagement with the wire in response to the exertion of a pull on the wire. A flat spring 50, Fig. 1, engages each gripping dog 46 and yieldingly urges it into gripping position at all times. A releasing lever 51, fulcrumed to the lug 44 by means 52 extends over the gripping dog 46 and is connected with said gripping dog 46 by a stud pin 53 which is rigid with said gripping dog and operative in a slot 54 in said lever. This lever 51 is provided for moving the gripping dog into released position and for preventing permanent displacement of said gripping dog. The lower toothed edge of the gripping dog 46 engages with the wire throughout its entire length thus making it substantially impossible to cut off or pinch off the wire, but holding the wire absolutely firm and without any slippage. The wear on the teeth of the gripping dog is also distributed over the entire length of the dog thus affording a gripping dog which will not wear out and have to be replaced. The pressure on the gripping dogs is all exerted against the inclined upper wall 48 and not against any pivot as is common with wire grippers of this nature. These factors all contribute to the efficiency and long life of the wire grippers.

The tensioning slide may be in the nature of an integral plate shaped to afford two spaced apart slide members 55 and 56 with the integral part 40 to which the wire gripper 42 is secured projecting sidewise therefrom at one end. The slide members 55 and 56 are guided for sliding movement by two fixed guide members 57 and 58 having flanges 59 which overhang the slide member 55 and by the frame blocks 13 and 14 which are notched at their rear edge as at 60 to overhang the slide member 56. The guide members 57 and 58 are rigidly secured to the base plate 12 and are provided with upwardly extending lugs 61 between which one end of a link 62 is pivoted by a pin 63. The other end of the link 62 is pivoted by a pin 64 to a tensioning lever 65. The end of the tensioning lever 65 is pivoted by a pin 66 to a lug 67 which is provided on the tensioning slide at one end of the slide member 55. This structure constitutes a very efficient and powerful link and lever means for moving the tensioning slide. When the lever 65 is raised into the position shown by full lines in Fig. 2 and by broken lines in Fig. 4, the tensioning slide will be moved to the left and the wire gripper 42 will be moved close to the wire twisting mechanism. When the lever 65 is moved into the lowered position shown by full lines in Fig. 4, the tensioning slide will be moved outwardly and the wire gripper 42 will be moved away from the wire gripper 41 and from the wire twisting mechanism into a position as shown in Fig. 1. When the lever 65 is raised it will pass the vertical and be inclined to the right

as shown in Fig. 4, and said lever will stay in this raised and inclined position while the machine is being handled and applied to the package without requiring any holding means. However, if desired, a spring may be used to more securely hold said lever in the raised position. As the lever 65 is moved downwardly the link 62 and that portion of the lever 65 between the two pivots 64 and 66 will straighten out like a pair of toggle links affording a faster movement of the tensioning slide at the beginning of the downward movement of the lever and a very powerful leverage as the lever 65 nears the lowermost position in its travel and the three pivots 63, 64 and 66 approach alignment. This constitutes a very efficient tensioning mechanism as obviously the resistance offered by wires will be less at the beginning of the tensioning movement, and will be very much greater as the wires are tightened around the package and approach the ultimate desired tension. When the lever 65 is entirely down the pivot 64 will pass slightly below a straight line drawn through the centers of the pivots 63 and 66 and the lever will be locked in the down position until it is manually raised.

In the operation of this wire tensioning and tying machine wire, which is being unreeled from a spool is then passed around the bundle or package in the form of a loop with the end of said wire extending across the top of the package and grasped in the gripper 41 and the portion of wire nearest the spool extending across the top of the package and gripped in the wire gripper 42, Fig. 12, said last mentioned portion of wire being the outermost wire in the slots of the members 27 and 28 and the pinion 19. I find that if the wire grippers 41 and 42 are set at an angle as shown in Fig. 1 so that the front ends of said grippers are inclined away from the frame blocks 13 and 14 the wires are much more quickly and easily applied and stay in the slots of the tying mechanism better and time is saved and work speeded up. When the wire is being applied to the package the lever 65 is in the raised position and the movable wire gripper 42 is positioned as close as possible to the frame block 14. The slack is manually taken out of the loop of wire which passes around the bundle, at the time said wire is drawn into the tying mechanism and wire grippers. To tension the wire around the bundle the lever 65 is moved downwardly thus moving the wire gripper 42 which grips one end of the loop that passes around the bundle away from the wire gripper 41 which grips the other end of said loop. This contracts the loop around the bundle. While the lever 65 remains down the crank handle 18 is moved rotatively to rotate the shaft 15 and gearwheel 16 in a clockwise direction, as viewed in Figs. 8 and 10. This rotates the pinion 19 in a reverse direction and twists the two lapped portions of wire together as shown in Fig. 3. Just before the shaft 15 completes one full revolution the cams 37 engage the front legs of the U shaped cutter members and move said cutter members forwardly thus shearing off the rear wire in the slot of the wire holding plate 27 and the front wire in the slot of the wire holding plate 28 freeing the package from the tool. The only wire wasted will be the short end portion held in the wire gripper 41, and as this gripper 41 does not move away from the adjacent cutter member it will be obvious that the length of this waste piece is reduced to a minimum. At the other side, the wire which is connected with the spool or source of supply, is cut off adjacent the end of the twist and no wire is lost. This end of the wire is subsequently released from the wire gripper 42. In tensioning the wire around the package the tensioning handle may be depressed less than the full amount and manually held while the wires are being twisted, if desired. I find that for use in wire tying packing boxes it is desirable to provide for a take up of from two to two and one half inches and allow the tensioning handle to be completely depressed each time. When this is done the pivot 64 passes below the common line of the pivots 63 and 66 and the lever 65 is automatically held down while the tensioned wire is being twisted or tied.

The foregoing description and accompanying drawings clearly disclose a preferred embodiment of my invention but it will be understood that this disclosure is merely illustrative and that such changes in the invention may be made as are fairly within the scope and spirit of the following claims.

I claim:

1. In a wire tensioning machine, a wire gripper embodying a base portion having an upright lug recessed on one side and having an inclined wall at the top of said recess, a shelf like member below said recess, a gripping dog positioned in said recess, said gripping dog having an inclined top edge engaging the inclined top wall of said recess and having a toothed bottom edge cooperating with said shelf like member to grip a wire, and a releasing member connected with said gripping dog.

2. In a wire tensioning machine, a wire gripper embodying a base portion having an upright lug recessed on one side and having an inclined wall at the top of said recess, a shelf like member below said recess, a gripping dog positioned in said recess, said gripping dog having an inclined top edge engaging the inclined top wall of said recess and having a toothed bottom edge cooperating with said shelf like member to grip a wire, and a releasing lever fulcrumed on said upright lug and extending over said gripping dog and operatively connected with said gripping dog.

3. In a wire tensioning machine, a wire gripper embodying a base portion having an upright lug recessed on one side and having an inclined wall at the top of said recess, a shelf like member below said recess, a gripping dog positioned in said recess, said gripping dog having an inclined top edge engaging the inclined top wall of said recess and having a toothed bottom edge cooperating with said shelf like member to grip a wire, a releasing lever fulcrumed on said upright lug and overlapping said gripping dog said releasing lever having a slot therein and a pin rigid with said gripping dog and operatively positioned in said releasing lever slot.

4. In a wire tensioning and tying machine for using wire from a spool, a base plate, wire tying mechanism mounted on said base plate adjacent the front edge thereof, a fixed wire gripper secured to said base plate in close proximity to one side of said wire tying mechanism, a tensioning slide movably mounted on said base plate and having a portion extending alongside of said wire tying mechanism on the side opposite said fixed wire gripper, a movable wire gripper secured to said tensioning slide, lever means connected with said tensioning slide, an operating shaft for said wire tying mechanism extending beyond the limit

of movement of said tensioning slide and a crank handle on the end of said operating shaft.

5. In a wire tensioning and tying machine for using wire from a spool, a base plate, wire tying mechanism mounted on said base plate adjacent the front edge thereof, a wire gripper secured to said base plate in close proximity to one side of said wire tying mechanism, a tensioning slide mounted on said base plate to the rear of said wire tying devices, guide members for said tensioning slide secured to said base plate, lever means interconnecting said tensioning slide and said base plate whereby said slide may be moved, an extension on one end of said tensioning slide extending toward the front edge of said base plate on the side of said wire tying mechanism opposite to said fixed wire gripper, another wire gripper mounted on said extension, an operating shaft connected with said wire tying mechanism and extending across said tensioning slide extension in spaced relation thereabove, and a crank handle on the end of said operating shaft beyond the limit of movement of said slide extension.

6. In a wire tensioning and tying machine for using wire from a spool, a base plate, wire tying mechanism mounted on said base plate adjacent the front edge thereof, a wire gripper secured to said base plate in close proximity to one side of said wire tying mechanism, a wire tensioning slide having two spaced apart slide members movably disposed on said base plate to the rear of said wire tying mechanism, guide members secured to said base plate between said spaced apart slides and on both sides of said spaced apart slides respectively, lugs on said guide members, a lug on the outer end of said wire tensioning slide, a lever pivoted to said last named lug, a link pivoted at one end to said lever and at the other end to said first named lugs, a transverse extension on the end of said tensioning slide extending toward the front edge of said base plate, another wire gripper mounted on said extension, an operating shaft for said wire tying mechanism extending across said extension and a crank handle on the outer end of said operating shaft.

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