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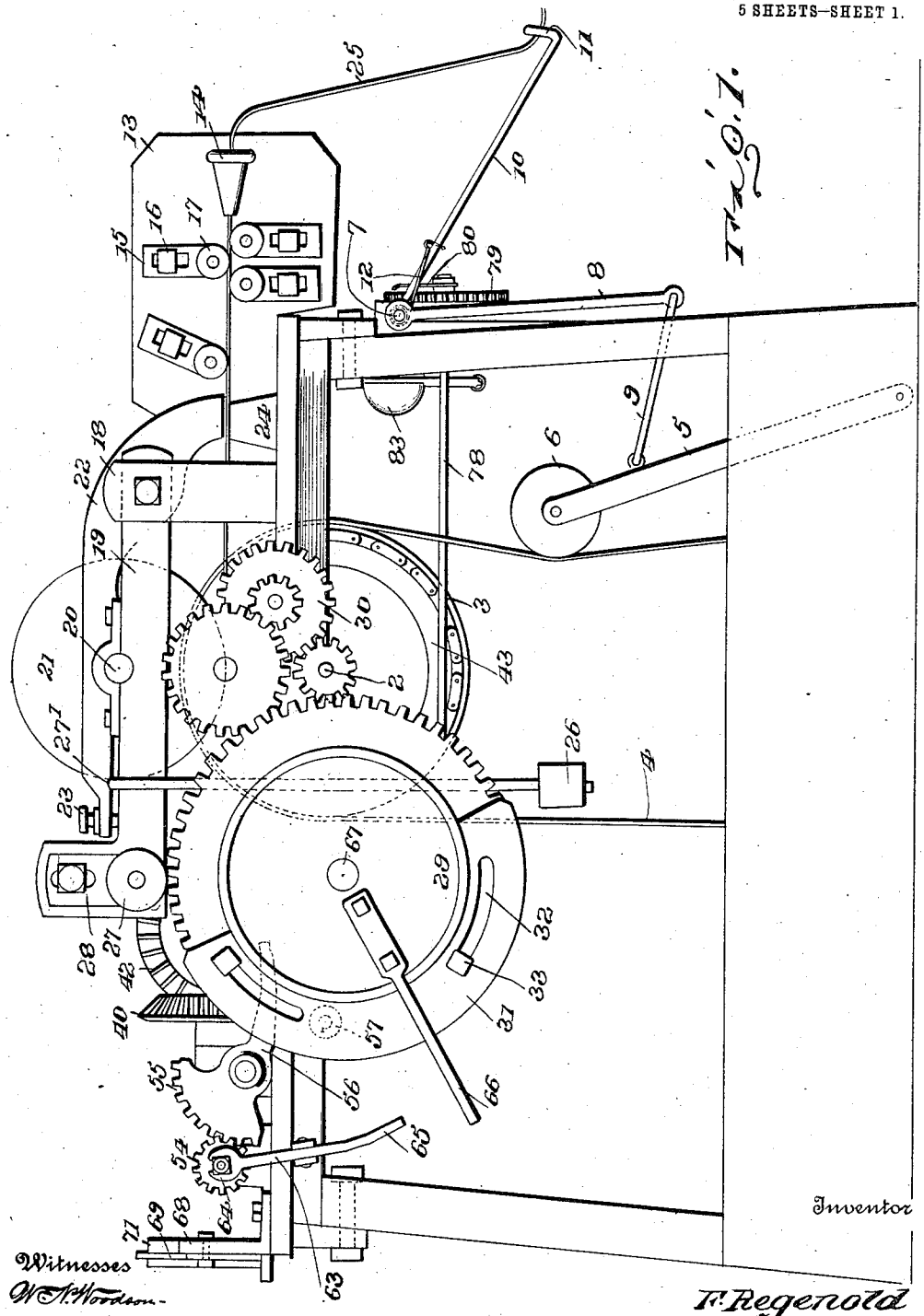
TIE WIRE LOOPING MACHINE.

APPLICATION FILED MAY 18, 1911.

1,011,082.

Patented Dec. 5, 1911.

5 SHEETS—SHEET 1.



Witnesses

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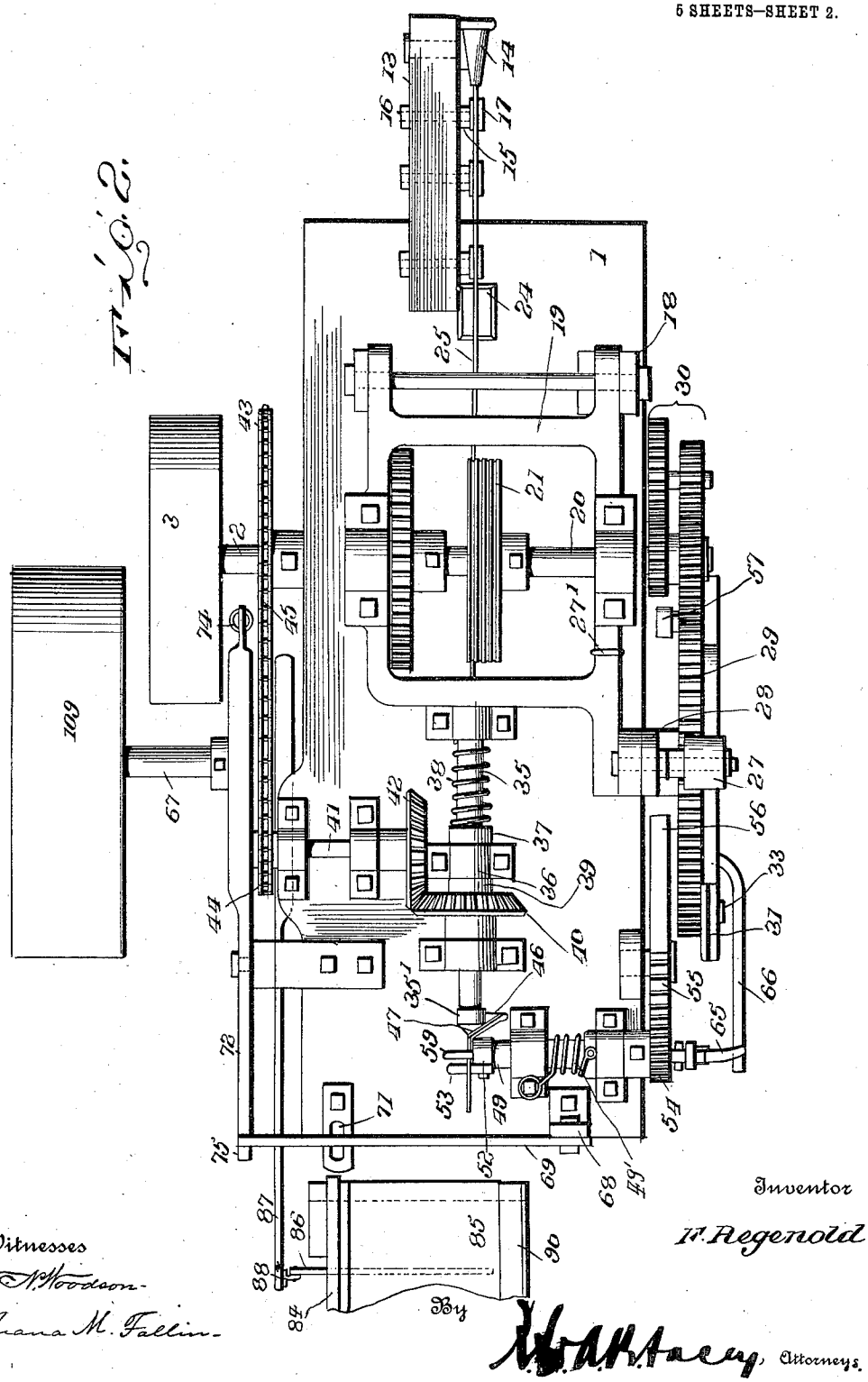
5 SHEETS—SHEET 2.

Fig. 2.



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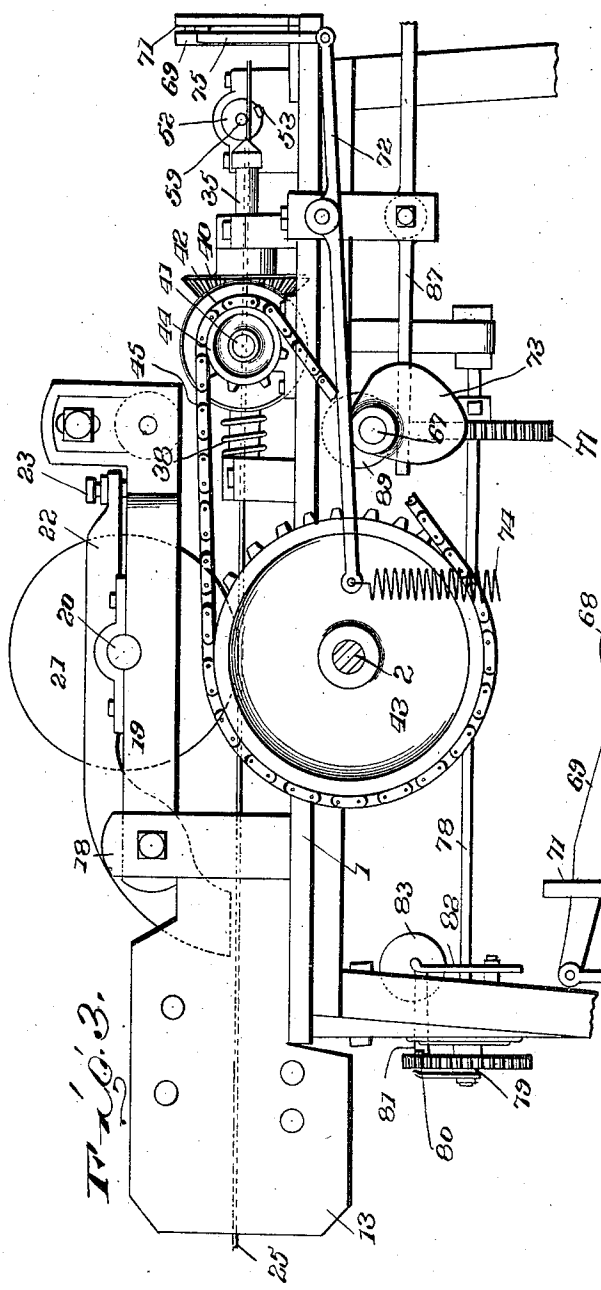

FIG. 3.

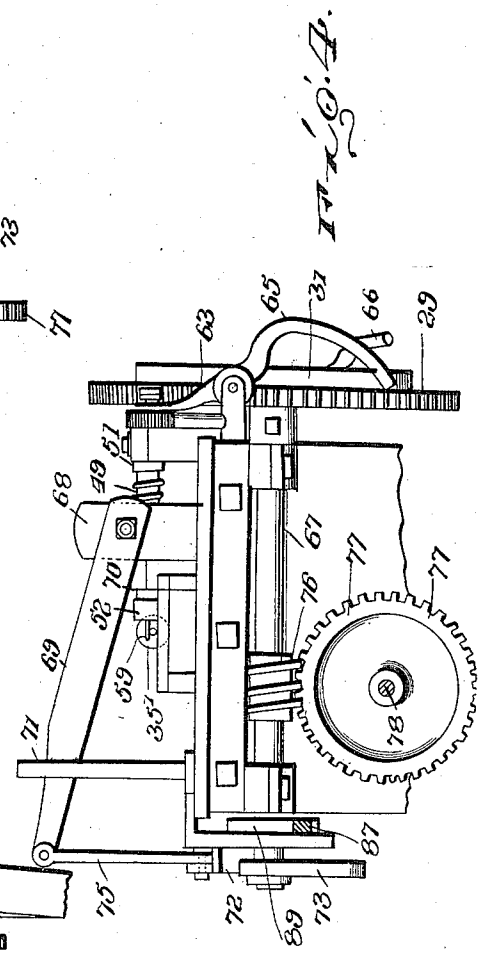

FIG. 4.

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5 SHEETS—SHEET 4.

Fig. 5.

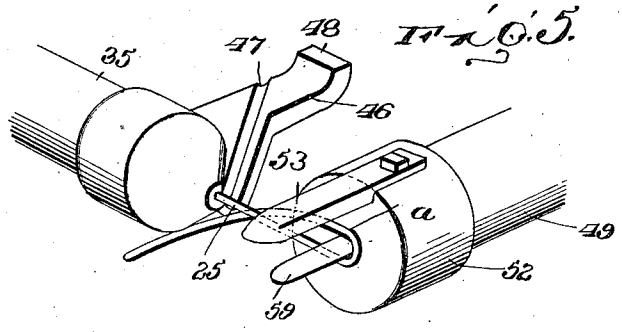


Fig. 7.

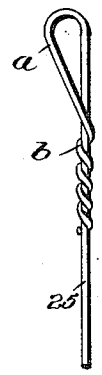
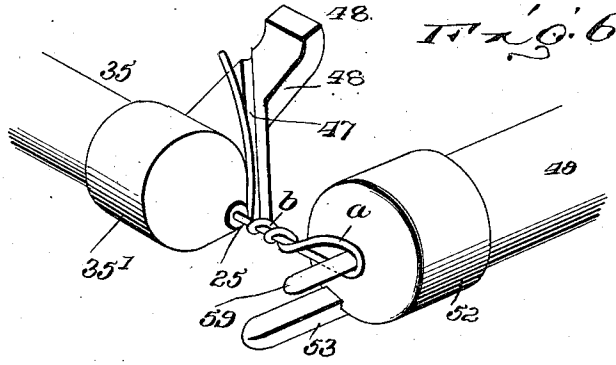


Fig. 6.



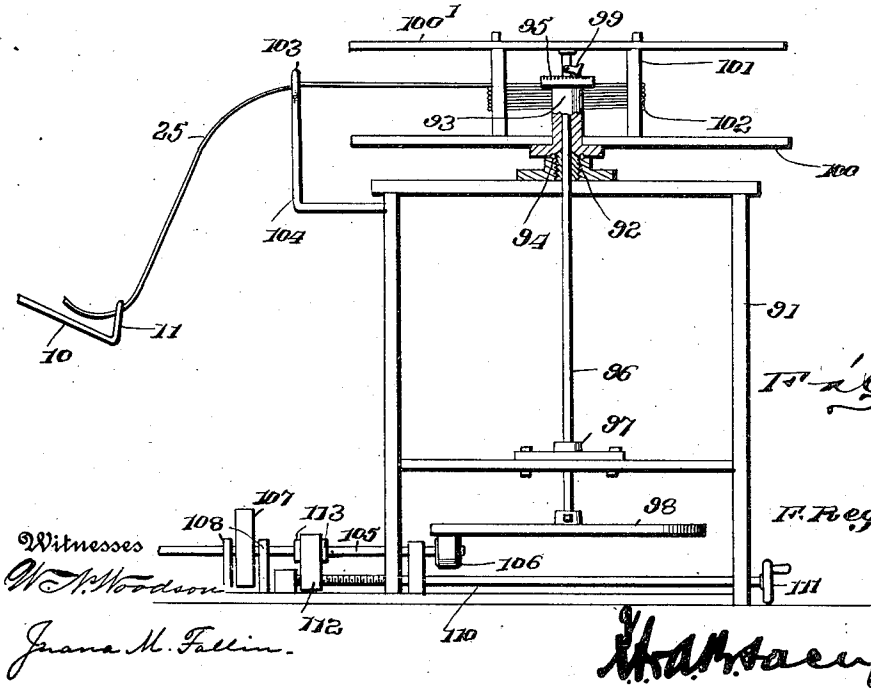


Fig. 11.

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5 SHEETS—SHEET 5.

Fig. 8.

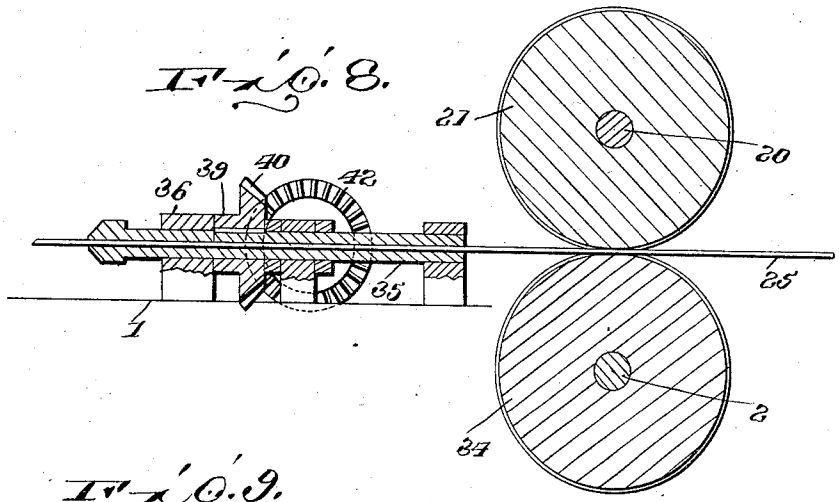


Fig. 9.

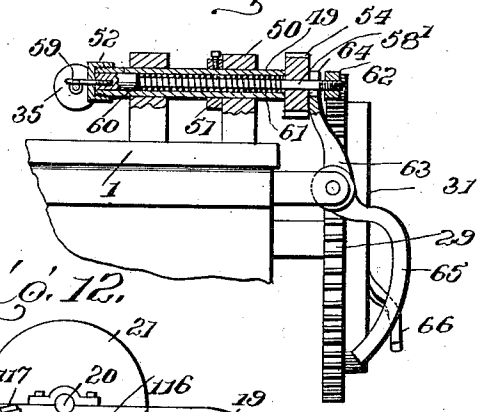


Fig. 12.

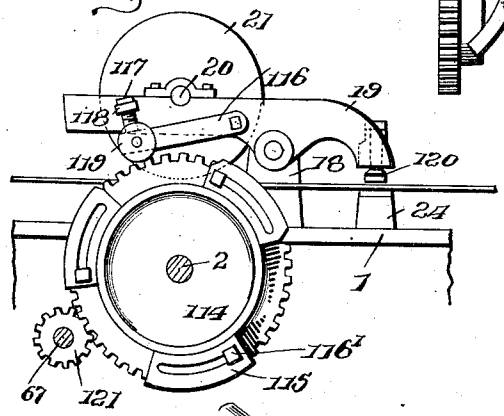
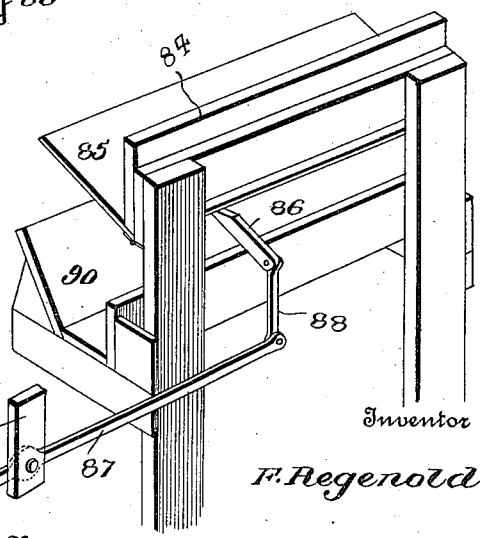


Fig. 10.



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UNITED STATES PATENT OFFICE.

FREDERICK REGENOLD, OF MEMPHIS, TENNESSEE.

TIE-WIRE-LOOPING MACHINE.

1,011,082. Specification of Letters Patent. Patented Dec. 5, 1911.

Application filed May 18, 1911. Serial No. 628,083.

To all whom it may concern:

Be it known that I, FREDERICK REGENOLD, citizen of the United States, residing at Memphis, in the county of Shelby and State of Tennessee, have invented certain new and useful Improvements in Tie-Wire-Looping Machines, of which the following is a specification.

This invention has relation to tie wire looping machines, and has for its object to provide a machine by the use of which bale ties may be cut in predetermined lengths and provided with eyes twisted at their end portions. The parts of the machine are so assembled and are so coöperated that the eye is formed at one side of the body portion of the tie and from the eye the extremity of the wire is wrapped about the intermediate portion thereof, whereby it is effectually secured to the body portion of the tie without necessitating the use of solder or other permanently attaching material.

The machine is arranged to coöperate with a spool supporting and unwinding mechanism from which the machine receives the wire strand as it is unwound from the spool. At the machine the wire is first passed through a straightening device and then passes between feeding rolls. The machine is provided with a tension means which engages the wire at its slack between the spool supporting mechanism and the straightening device, and this tension means is operatively connected with the feeding rolls in such manner that should the wire become tangled or kinked at any point, the said tangle or kink will engage said tension means and move the same so that the feeding rolls will automatically cease to feed the strand of wire. From the feeding rolls the strand of wire is threaded through a hollow shaft which is journaled for rotation upon the frame of the machine and which may slide longitudinally thereon. This shaft is provided at its delivery end with a detachable head carrying a laterally disposed finger. An eye forming shaft is journaled upon the frame of the machine and is transversely disposed with relation to the first mentioned shaft. The eye forming shaft is located just beyond the delivery end of the first mentioned shaft, and means is provided for rotating the same and also for moving the same longitudinally in order that the eye forming members carried thereby may disengage the eye of the tie after the same has been completed.

The machine also includes a cutting apparatus which is adapted to cut the ties in predetermined lengths after the eyes have been completed.

The machine is also equipped with a register for indicating the number of completed ties turned out, and this register is provided with means for giving an audible signal when a predetermined number of ties have been completed. A receiving trough is arranged to support the wire from the cutting apparatus and is provided with a hinged bottom which is operatively connected with the main portion of the machine and which when the tie is cut from the wire is caused to swing, whereby the ties may gravitate into a receiving box from which they may be taken in the said predetermined quantities and put up in bundles in commercial form.

For a full understanding of the invention reference is to be had to the following description and accompanying drawings, in which:

Figure 1 is a side elevation of the main portion of the machine; Fig. 2 is a top plan view of the same; Fig. 3 is a side elevation of the same, viewing the machine at the opposite side from that illustrated in Fig. 1; Fig. 4 is an elevation of a portion of the delivery end of the main part of the machine; Fig. 5 is a perspective view of the adjacent end portions of strand directing and eye forming shafts used upon the machine, illustrating the manner in which the wire is bent during one stage of the formation of the eye; Fig. 6 is a similar view of the said shafts, illustrating the manner in which the extremity of the wire is wrapped around the body portion of the tie after the eye has been completed; Fig. 7 is a side view of a portion of the tie, showing the completed eye; Fig. 8 is a sectional elevation of the feeding rolls and a sectional view of the wire directing shaft used upon the machine; Fig. 9 is a sectional view of the eye forming shaft and adjacent parts; Fig. 10 is a perspective view of the tie receiving trough; Fig. 11 is a side elevation with parts in section of the spool unwinding device; Fig. 12 is a side

elevation of a modified form of mechanism which may be used for increasing the output of the machine.

Corresponding and like parts are referred to in the following description and indicated in all the views of the accompanying drawings by the same reference characters.

The eye forming machine includes a table 1 having a power shaft 2 journaled therein. A pulley 3 is fixed to the shaft 2 and a belt 4 having vertically disposed runs is trained over the pulley 3. The lower portion of the said belt 4 is trained around the belt pulleys of an engine or other source of power (not shown). An arm 5 is pivoted to the table 1 and is provided at its upper end with a roller 6. The upper portion of the arm 5 is inclined toward the outer run of the belt 4, and the roller 6 bears against the said outer run of the said belt. A shaft 7 is journaled upon the table 1 and is provided with a downwardly disposed arm 8 the lower end of which is pivotally connected by means of a link 9 with the upper portion of the arm 5. An arm 10 is pivoted upon the shaft 7 and is outwardly and downwardly inclined and provided at its extremity with a vertically disposed eye 11. One end of a coil spring 12 is made fast to the shaft 7 and the other end of the said spring bears against the upper side portion of the arm 10. This spring is under tension with a tendency to hold the outer portion of the arm 10 in a lowered position.

A vertically disposed plate 13 is mounted upon the table 1 and is provided with a strand directing thimble 14. Slotted blocks 15 are held in adjusted positions upon the plate 13 by means of bolts 16 which pass through the slots in the said plates and are tapped in the plate 13. Rollers 17 are journaled upon the blocks 15 and these rollers constitute the wire strand straightening device through which the said strand passes after leaving the directing thimble 14.

Standards 18 are mounted upon the table 1 and a frame 19 is pivotally mounted between the said standards. A shaft 20 is journaled in the frame 1 and carries a feed roll 21. A lever 22 is fulcrumed upon the same pivot that attaches the frame 19 to the standards 18, and an adjusting screw 23 is threaded through the said lever and bears upon the frame 19 and is adapted when turned to adjust the position of the lever 22 with relation to the said frame. A block 24 is mounted upon the table 1 with its upper surface approximately in parallel relation to the surface of the working end of the lever 22, and the wire strand, indicated at 25, after leaving the straightening device is passed between the upper surface of the block 24 and the working end of the lever 22. A weight 26 hangs pendant from the upper end portion of the frame 19 by means of a rod 27′ and the said weight is designed to hold the free end portion of the frame 19 in a lowered position. A block 28 is adjustably mounted upon the free end portion of the frame 19 and carries a journaled roller 27 adapted to coöperate with parts hereinafter to be explained, for the purpose of elevating the free end portion of the frame 19 at predetermined intervals.

A gear wheel 29 is journaled upon the table 1 and is operatively connected with the driving shaft 2 through a system of planetary gear wheels 30. The wheel 29 is provided upon its outer side with overlapping arcuate plates 31 which are provided with slots 32 and bolts 33, whereby they may be adjusted longitudinally with relation to each other and secured in adjusted positions upon the sides of the said wheel. The roller 27, hereinbefore described, lies in the path of movement of the outer edge portions of these plates 31, and as the wheel 29 rotates the said roller 27 is engaged by the plates 31 and lifted, whereby the free end portion of the frame 19 is swung in an upward direction against the lowering tendency of the weight 26. A wire feeding roll 34 is mounted upon the shaft 2 and the periphery of the roll 21 normally lies against the upper portion of the periphery of the roll 34. These rolls 21 and 34 are adjustably mounted upon their respective supporting shafts and their peripheries are provided with grooves, most clearly shown in Fig. 2 of the drawings, and these grooves may vary in width, whereby the said rolls may be shifted in their positions upon their supporting shafts to operate upon wires which vary in gage; although the peripheries of the said rolls may be smooth.

A hollow shaft 35 is slidably journaled in bearings 36 provided upon the top of the table 1 and the wire strand 25 after passing between the feeding rolls 21 and 34 is threaded through the shaft 35, and a detachable twister head 35′ carried at the delivery end thereof. The openings through different twister heads are of different sizes in order to receive various gages of wire. A collar 37 is fixed to the shaft 35 and a coil spring 38 bears at one end against the collar and at its other end against the side of one of the bearings 36. This spring 38 is under tension with a tendency to hold the shaft 35 away from the feeding rolls. A sleeve 39 is splined upon the shaft 35 and is held against longitudinal movement by two of the bearings 36 against which the ends of the said sleeve bear. A beveled pinion 40 is fixed to the sleeve 39. A shaft 41 is journaled for rotation upon the table 1 and is provided with a beveled pinion 42 which meshes with the pinion 40. A sprocket wheel 44 is fixed to the shaft 41 and a sprocket wheel 43 is fixed to the shaft 2.

A sprocket chain 45 is trained around the sprocket wheels 43 and 44 and is adapted to transmit rotary movement from the shaft 2 to the shaft 41, and from the last mentioned shaft the intermeshing pinions 40 and 42 transmit rotary movement to the shaft 35.

A laterally disposed finger 46 is mounted upon the twister head 35′ at the delivery end thereof and the said finger is provided upon one of its faces with an obliquely disposed groove 47, and at its outer end the said finger is provided with an angularly disposed extremity 48. The finger 46 is adapted to wrap the extremity of the wire strand about the body portion thereof after the eye has been formed, as will be explained hereinafter. During the wrapping of the extremity about the body of the strand, as indicated, the obliquely disposed groove 47 receives the extremity of the wire, and as the same is coiled about the body portion of the strand the said extremity located in the groove 47 pushes back upon the shaft 35 and the said shaft is moved longitudinally against the tension of the spring 38 and at the same time the said shaft continues to rotate. When the end of the wire comes in contact with the finger 46 and enters the obliquely disposed groove 47 the shaft 35 is forced back by the end of the wire against the tension of the spring 38, but as soon as the twist in the wire at the eye of the tie is completed there is then nothing to hold the shaft 35 back except the finger 59 in the eye of the tie which is withdrawn instantly when the wrapping of the wire end is completed. The shaft 35 is then moved to its normal position by the tension of the spring 58. At this time the rolls 21 and 34 are caused to frictionally engage the wire 25 and feed the same.

A hollow shaft 49 is journaled in bearings 50 provided upon the table 1 and a collar 51 is fixed to the said shaft and bears against the side of one of the bearings 50 and is adapted to hold the shaft 49 against longitudinal movement. A cap 52 closes the inner end of the shaft 49 and the said cap is provided at its periphery with a finger 53 which extends parallel with the long dimension of the shaft 49. A gear wheel 54 is fixed to the outer end of the shaft 49 and meshes with an arcuate gear segment 55 which is pivotally mounted upon the table 1. A coiled spring 49′ is provided upon the shaft 49 for returning the same to its normal position. The segment 55 is provided with an arm 56 which extends along the side of the wheel 29 and the said wheel 29 is provided upon its inner side with a journaled roller 57 which at times is adapted to encounter the arm 56 and swing the same, whereby the segment 55 is turned and the wheel 54 and shaft 49 are rotated. A rod 58′ is slidably mounted in the shaft 49 and at its inner end is provided with a finger 59 which projects through the center of the cap 52. The rod 58′ is provided at a point between its ends with a shoulder 60, and a coil spring 61 bears at one end against the said shoulder and at its other end against the side of the gear wheel 54 which is fixed to the shaft 49. The rod 58′ projects through the center of the gear wheel 54 and is provided with an adjustable nut 62. A lever 63 is fulcrumed to the table 1 and is provided with a forked end 64 which receives between its branches that portion of the rod 58′ which is between the nut 62 and the outer side of the wheel 54. The power end of the lever 63 is cam shaped, as at 65 (best shown in Fig. 9), and this cam projects into the path of movement of an arm 66 carried by the wheel 29. After the wire strand 25 has passed through the shaft 35 and prior to the formation of an eye upon the same the said strand passes through the space between the fingers 53 and 59 at the inner end of the shaft 49. Then as the wheel 29 rotates the roller 57 is brought in contact with the arm 56 of the segment 55 and the shaft 49 is rotated, as has been hereinbefore described. The edge of the finger 53 comes in contact with the end portion of the wire 25 and bends the same back over the finger 59 until the extremity of the wire strand 25 is approximately parallel with the body portion thereof, when the said extremity is engaged by the finger 46, as has been explained hereinbefore. As soon as the wire 25 is engaged by the finger 46, the shaft 49 is released and rotates back under the influence of the spring 49′, thereby bringing the finger 53 back to its normal position. After the twist has been formed the arm 66 comes in contact with the cam 65 of the lever 63 and the said lever is swung so that its working end engages the nut 62 and moves the rod 58′ longitudinally within the shaft 49 against the pressure of the spring 61. Thus the finger 59 is drawn within the cap 52 and out of the eye formed at the end of the strand 25. Thus the eye is formed in the strand and the extremity of the strand is wrapped about the body portion thereof. Of course it is to be understood that during the time that the eye is being formed upon the strand the said strand must come to a state of rest and during this operation the plates 31 come in contact with the roller 27 and lift the free end of the frame 19, as has been hereinbefore explained, and the roll 21 is lifted off of the strand 25 and continues to rotate, while the roll 34 also continues to rotate under the strand 25 but fails to move the same, for the reason that there is nothing to hold the said strand in frictional contact with the periphery of the said roll. By adjusting the plates 31 upon the wheel 29 with relation to each other, the interval of

time during which the roll 21 is held off of the strand 25 may be shortened or lengthened to correspond with the length of the tie to be cut from the wire 25. Also as the frame 19 is swung, as above indicated, the working end of the lever 22 comes down upon the strand 25 and clamps the same against the upper end of the block 24. Thus any tendency for the strand 25 to move longitudinally is positively checked.

The wheel 29, hereinbefore described, is mounted upon a shaft 67 journaled to the table 1. A standard 68 is mounted upon the table 1 and one end of a cutter 69 is pivoted to the said standard. A block 70 is mounted upon the table 1 below the lower edge of the cutter 69 and beyond the forming mechanism described. A guide 71 is mounted upon the table 1 and the free end portion of the cutter 69 is arranged to move along the said guide. A lever 72 is fulcrumed to the table 1 and a cam 73 is mounted upon the shaft 67 and is arranged to operate against the lower side of the lever 72 between its fulcrum point and the extremity of its power end. The upper end of a spring 74 is connected with the power end of the lever 72 and the lower end of said spring is attached to any fixed part of the machine or object. The working end of the lever 72 is pivotally connected with the free end of the cutter 69 by means of a link 75. Therefore it will be seen that as the shaft 67 rotates the cam 73 will be carried around and when its deep portion is between the axis of the shaft and the lever 72 the said lever is swung against the tension of the spring 74 and its working end is caused to descend, whereby the free end portion of the cutter 69 is swung in a downward direction and the strand 25 is cut into lengths. This cutting operation occurs after the formation of the eye and when the strand has been moved longitudinally to the desired length of the finished tie. The length of the strand remaining upon the table between the cutter and the shaft 49 is just long enough to form the eye upon the next tie and wrap the extremity about the body portion thereof.

A worm 76 is mounted upon the shaft 67 and meshes with a worm wheel 77 which is mounted upon a shaft 78 journaled for rotation under the top of the table 1. This shaft 78 is operatively connected with an indicator and register 79 supported by the table 1, and the said indicator and register in addition to performing its function in showing the number of ties that have been completed is also provided upon one of its moving parts with a lug 80 which is adapted at times to engage a bar 81 and release a hammer 82 which strikes a gong 83, thereby serving as an audible signal for announcing that a predetermined number of the ties have been completed.

A trough 84 is located beyond the delivery end of the table 1 and is provided with a hinged bottom 85 upon which the ties are passed as they are completed and cut from the length of the strand 25. An arm 86 is fixed to the bottom 85 and a lever 87 is fulcrumed to the frame of the table 1. The working end of the lever 87 is pivotally connected with the arm 86 by a link 88. An eccentric 89 is interposed between the axis of the shaft 67 and the working end of the lever 87, by which eccentric the said lever is swung so that the link 88 elevates the arm 86 and swings down the bottom 85. The parts are so arranged that the bottom 85 holds up the single strand of wire while it is being run out from the machine and is held up until the tie is cut off. As soon as this takes place the bottom 85 swings down and delivers the finished tie into the box 90. This operation is continuous, but when a predetermined number of ties have been assembled in the box 90 the attention of an attendant is called to this fact by the sounding of the gong 83. By such an arrangement all of the bundles will contain the same number of ties.

A stand 91 is arranged adjacent the receiving end of the table 1 and is provided upon its top with a bearing 92. A spool 93 is mounted upon the bearing 92, there being ball bearings 94 interposed between said spool and bearing. The spool 93 is provided at its upper end with a set of crown teeth 95. A shaft 96 passes vertically through the bearing 92 and its lower portion is journaled in a bearing 97 mounted at the lower part of the stand 91. A disk 98 is carried at the lower end of the shaft 96, and a reversible pawl 99 is pivotally attached to the upper end of the shaft 96 and is adapted to engage the set of crown teeth 95. A bottom 100 is carried by the spool 93 and a top 100′ on the upper end of the shaft 96 and the said parts are held in spaced relation by vertically disposed bars 101. The coil of wire, indicated at 102, is adapted to be positioned upon the bars 101 between said top and bottom, as indicated in Fig. 11 of the drawings, and the strand 25 from the said coil is passed through an eye 103 carried at the upper end of an arm 104 mounted upon the stand 91. A shaft 105 is journaled at the lower portion of the stand 91 and is provided at its inner end with a friction roller 106 which bears against the lower surface of the disk 98. A belt pulley 107 is slidably mounted upon the shaft 105 that is held against movement with relation to the stand by means of standards 108 between which it is located. A belt pulley 109 (shown in Fig. 2) is fixed to the shaft 67 and a belt (not shown) is trained around the pulley 109 and pulley 107. A screw shaft 110 is journaled in the

lower portion of the stand 91 and is provided with a hand wheel 111. The threaded portion of the shaft 110 passes through an arm 112 and the said arm engages the shaft 105 and is located between collars 113 which are adjustably mounted upon the said shaft 105. Therefore it will be seen that means is provided for rotating the shaft 105 from the shaft 67, and as the said shaft 105 rotates the roller 106 will rotate the disk 98 and the shaft 96. Inasmuch as the pawl 99 engages the crown gear teeth 95 the spool 93 is rotated which carries around with it the arms 100 and 100′ and thus the strand 25 is unwound from the coil 102. By manipulating the shaft 110 through the use of the hand wheel 111 the shaft 105 may be moved longitudinally, whereby the roller 106 may be positioned in close proximity to or remote from the center of the disk 98, and thus means is provided for adjusting the rate of speed at which the said disk will rotate. Also by adjusting the collars 113 upon the shaft 105 the roller 106 may be positioned to operate against the disk 98 at either side thereof, and thus means is provided for changing the direction of rotation of the said disk. This change in direction of rotation may also be effected by crossing the driving belt, as is the usual practice. When the change in direction of rotation of the disk 98 has been effected the pawl 99 is turned so that it engages the teeth 95 to cause the spool 93 to rotate with the shaft 96. This provision is necessary for the reason that some coils of wire unwind readily when being rotated in one direction, while other coils require to be rotated in an opposite direction. From the eye 103 the strand 25 is trained through the eye 11 and thence through the thimble 14 and straightening devices, as hereinbefore described. If at any time the strand 25 should become kinked or tangled the said kink or tangle will engage one or the other of the eyes 103 or 11 and the said strand will cease to pass through the said eyes. Consequently the slack in the strand between the eye 103 and thimble 14 will be taken up which will swing the arm 10 in an upward direction, and when the tension of the spring 12 has become excessive the shaft 7 will be partially rotated which will carry the arm 8 away from the table 1 and the link 9 will swing the upper end of the arm 5 so that the roller 6 will be moved away from the outer run of the belt 4. Thus the said belt 4 becomes loosened upon the pulley 3 and will cease to turn the same, and therefore in such an emergency the entire machine will come to a state of rest and will remain in this state until the obstruction has been removed and the parts readjusted.

In Fig. 7 of the drawings is illustrated the eye as completed at the end of the strand 25. The eye is indicated at *a* and it will be noted that it is located at one side of the body portion of the strand 25, while the coiled extremity, indicated at *b* is twisted around the body portion of the said strand with its convolutions in spaced relation.

The foregoing description of the arrangement of parts will be usually followed when the completed ties are turned out at a minimum rate of speed, but should it be desired to increase the capacity of the machine, the plates 31 upon the wheel 29 and the roller 27 upon the frame 19 are dispensed with, also the lever 22 upon the frame 19 is dispensed with and a wheel 114 is placed upon the shaft 2. A series of slotted plates 115 are secured to the side of the wheel 114 in adjusted positions by means of bolts 116′ which pass through the said slots and which are tapped in the wheel 114. An arm 116 is pivoted to the frame 19 and an adjusting screw 117 is passed through a lug 118 provided upon the said frame and at its lower end engages the arm 116. A roller 119 is journaled at the lower end of the arm 116 and is located in the path of movement of the edge portions of the plates 115. In lieu of the lever 22, hereinbefore described, the frame 19 is provided at its outer end with an adjustable block 120 which is adapted to operate against the wire strand 25 when the frame 19 is swung and grip the same against the upper surface of the block 24. The operation of the machine as thus changed is the same as hereinbefore described, with the exception that the ties are completed and delivered at intervals of short duration. The wheel 114 is loosely mounted upon the shaft 2 but is geared with a wheel 121 fixed to the shaft 67.

Having thus described the invention, what is claimed as new is:

1. In a machine for forming ties, a wire feeding means, a shaft journaled for rotation, means for positively rotating the shaft in one direction, means for automatically rotating the shaft in an opposite direction to return it to an initial position, a finger fixed to the shaft at one side of the center, a finger slidably mounted at the center of the shaft, and means operable by a movable part of the machine for withdrawing the last-mentioned finger within the shaft at the completion of its rotary movement in one direction.

2. In a machine for forming ties, a means for feeding wire, a shaft journaled for rotation, a finger carried at the end of the shaft at one side of the center thereof, a finger slidably mounted at the end of the shaft at the center thereof, means for withdrawing the last-mentioned finger within the shaft, means for rotating the shaft positively in one direction, means for automatically rotating the shaft in an opposite direction to

return the same to an initial position, and a member rotatably mounted upon the machine and adapted to engage the finger withdrawing means and the means for positively rotating the shaft to operate the same.

3. In a machine for forming ties, a hollow shaft journaled for rotation, a finger fixed to the end of the shaft at one side of the center thereof, a finger slidably mounted in the shaft at the center thereof and normally projecting beyond the end thereof, means for feeding wire between the said fingers when the last-mentioned finger is in extended position, a gear wheel fixed to said shaft, a pivoted segment meshing with said gear wheel and having an extended arm, a cam arm operatively connected with the movable finger in the shaft, and a wheel journaled for rotation and carrying means for engaging the segment arm and the cam arm at predetermined intervals.

4. In a machine for forming ties, a master shaft having a pulley, a belt arranged to drive the pulley, wire feeding, loop forming and twisting devices operatively connected with the shaft, an arm pivotally mounted and normally disposed in an inclined position, a roller journaled at the upper end of said arm and bearing against one run of the belt and adapted to maintain the same in taut condition, and an arm pivotally mounted and operatively connected with the first-mentioned arm and carrying an eye through which the wire may be threaded before passing to the operative parts of the machine.

5. A machine for forming ties, comprising a frame, a master shaft journaled thereon, a loop forming means mounted upon the frame and operatively connected with the master shaft, a wire twisting means mounted upon the frame and operatively connected with the master shaft, a pulley mounted upon the master shaft, a belt trained around the pulley, means mounted upon the frame and bearing against the belt to maintain the same in taut condition and shiftable to render the belt loose, and an unreeling device located adjacent the frame and operatively connected with the master shaft, the parts being so arranged that a wire passing from the unreeling device operatively engages a part of the means for holding the belt taut.

In testimony whereof, I affix my signature in presence of two witnesses.

FREDERICK REGENOLD. [L. S.]

Witnesses:
EDWARD E. TAENZER,
WALTER S. DARNELL.