Aug. 28, 1928.

J. S. McCHESNEY

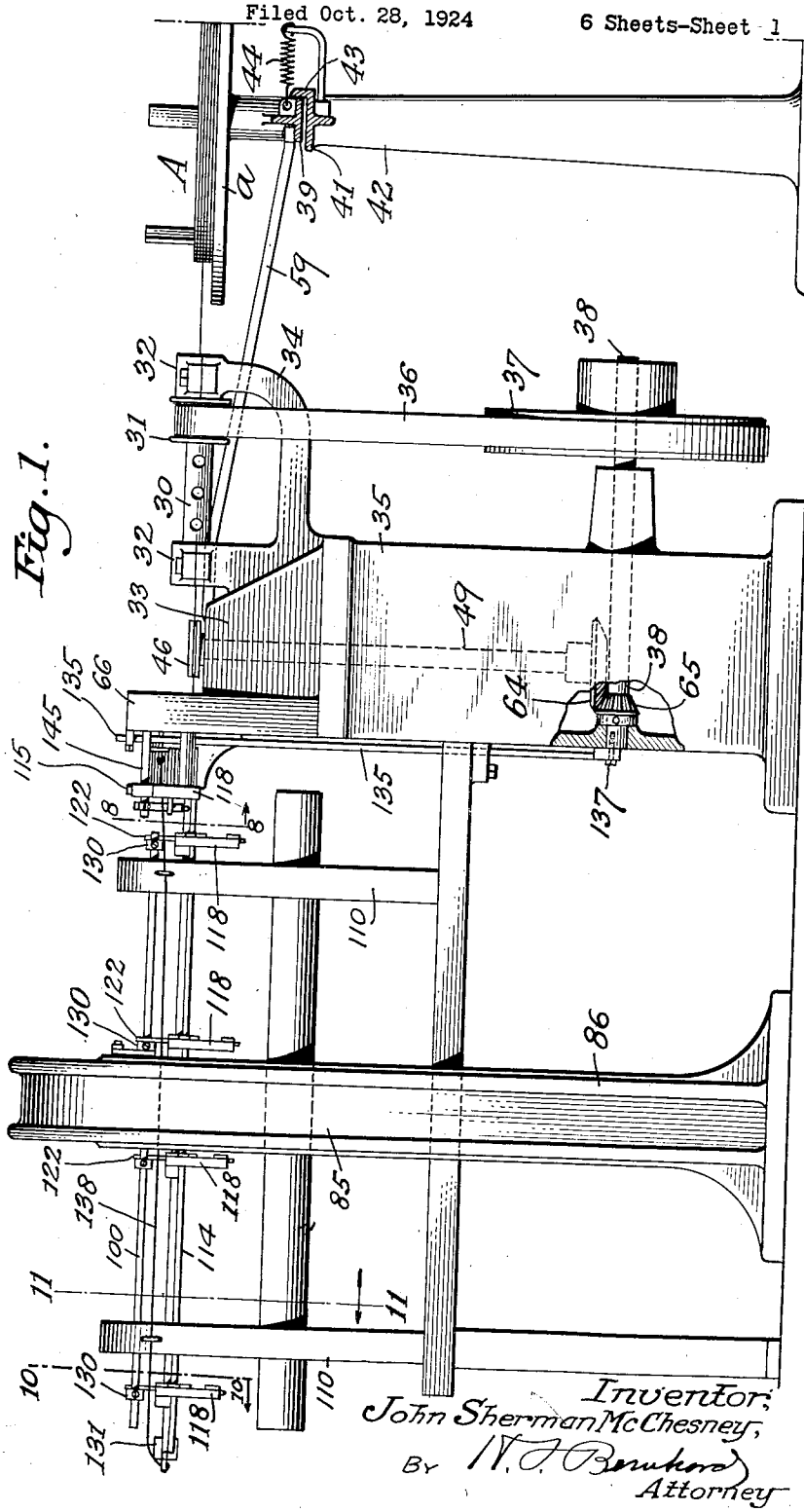
1,682,016

METHOD OF AND MACHINE FOR PRODUCING DEFORMED WIRE TIES

Filed Oct. 28, 1924

6 Sheets-Sheet 1

Fig. 1.



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METHOD OF AND MACHINE FOR PRODUCING DEFORMED WIRE TIES

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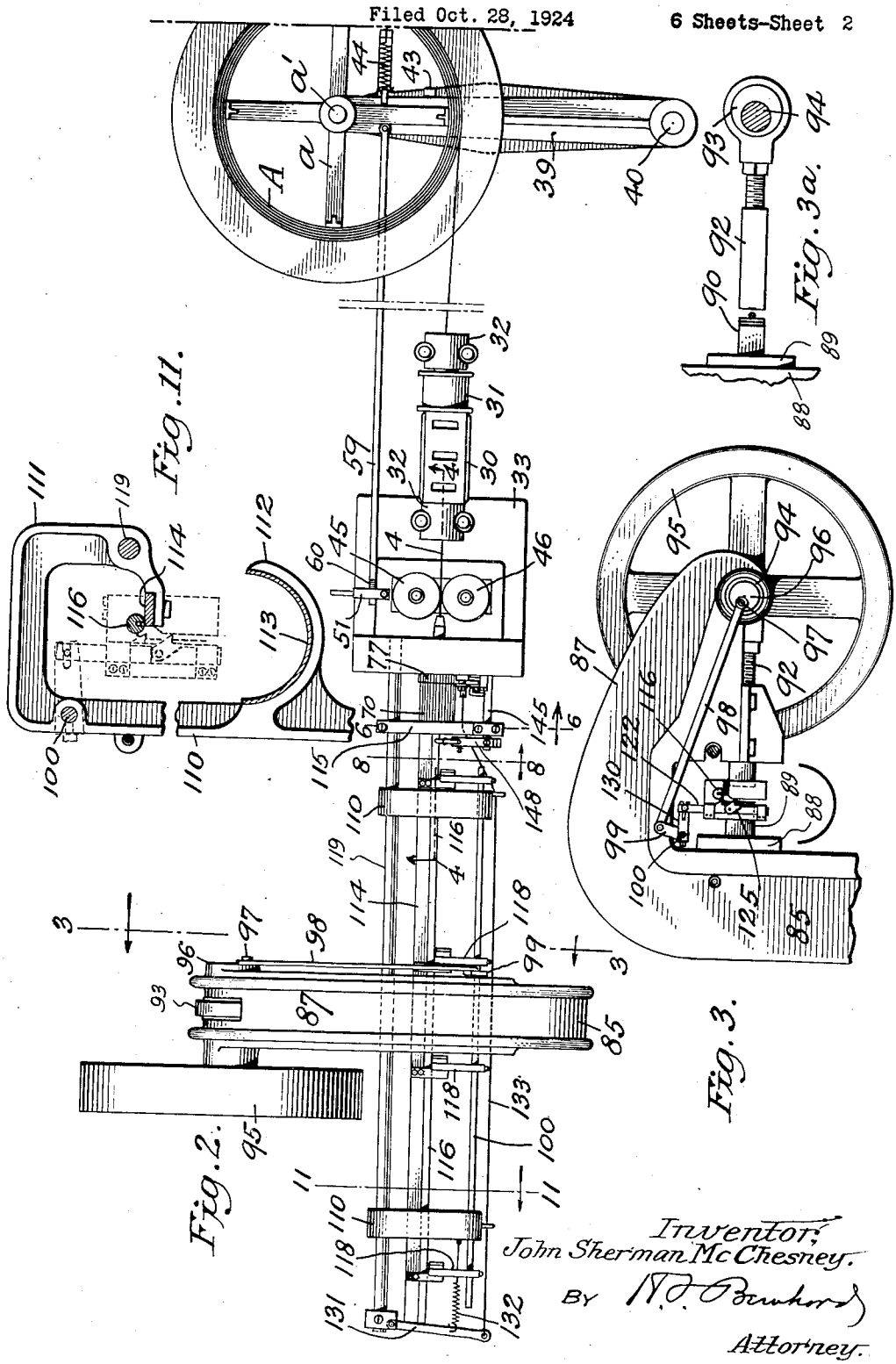


Fig. 1.

Fig. 3a.

Fig. 3.

Fig. 2.

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METHOD OF AND MACHINE FOR PRODUCING DEFORMED WIRE TIES

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Fig. 4.

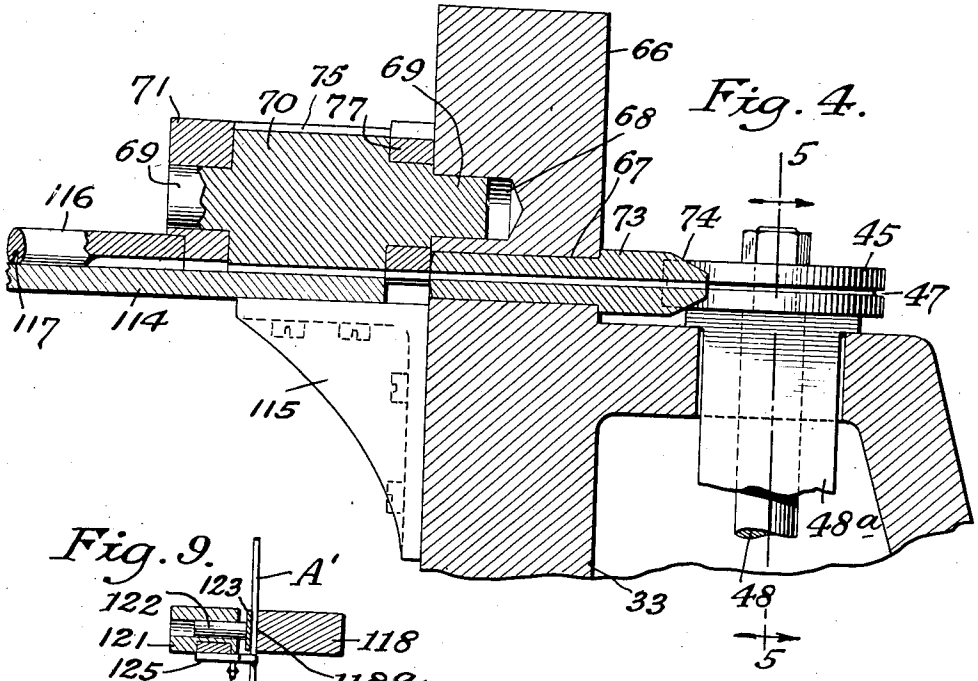


Fig. 9.



Fig. 10.

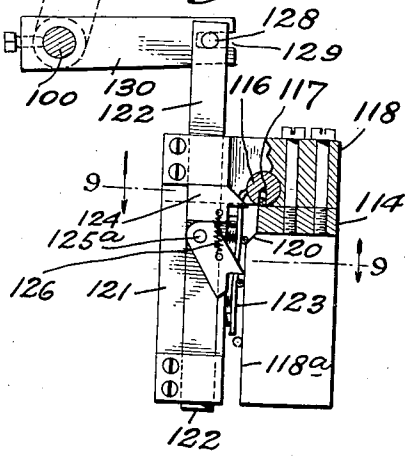
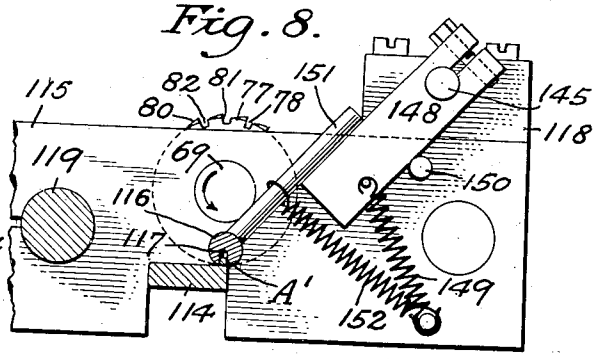


Fig. 8.



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METHOD OF AND MACHINE FOR PRODUCING DEFORMED WIRE TIES

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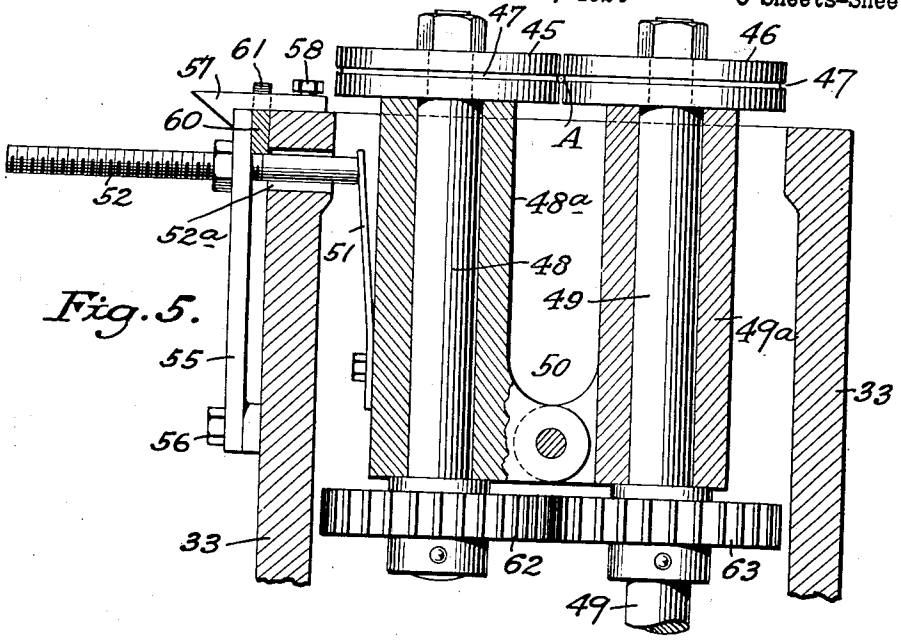
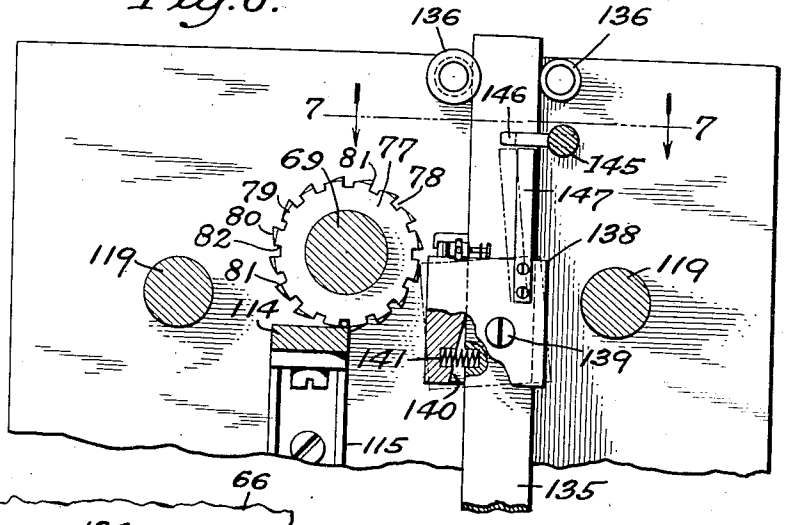


Fig. 5.

Fig. 6.



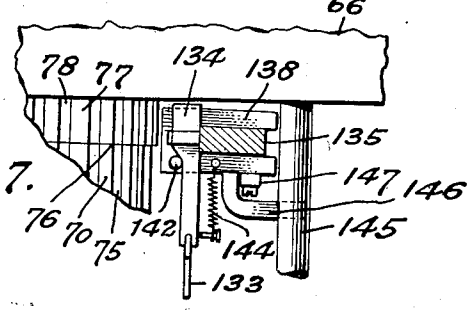


Fig. 7.

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METHOD OF AND MACHINE FOR PRODUCING DEFORMED WIRE TIES

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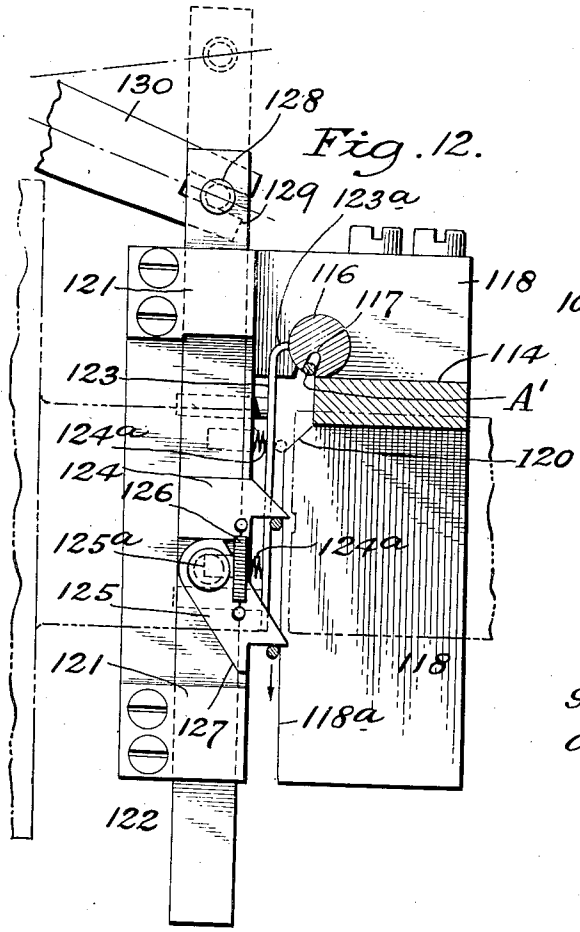


Fig. 12.

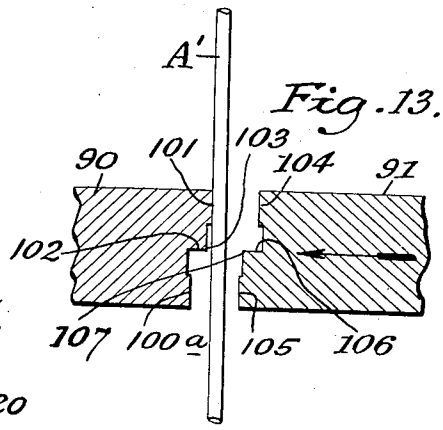


Fig. 13.

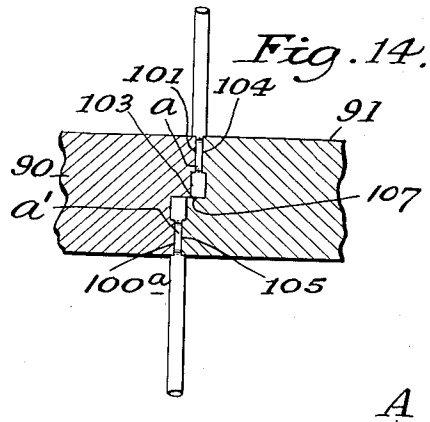


Fig. 14.

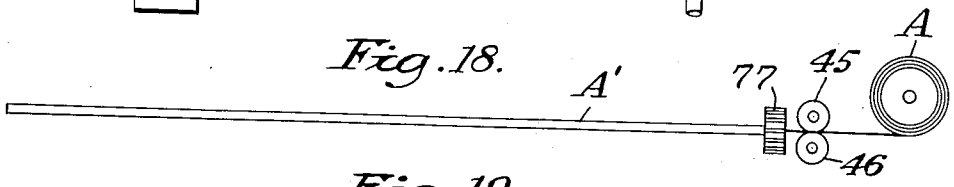


Fig. 18.

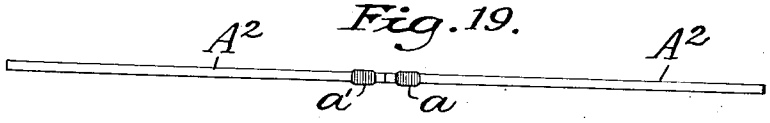


Fig. 19.

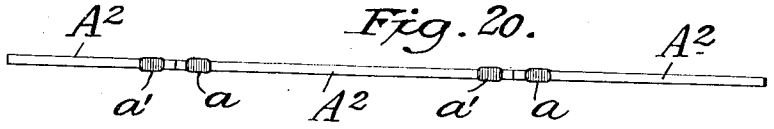


Fig. 20.

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1,682,016

METHOD OF AND MACHINE FOR PRODUCING DEFORMED WIRE TIES

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Fig. 15.

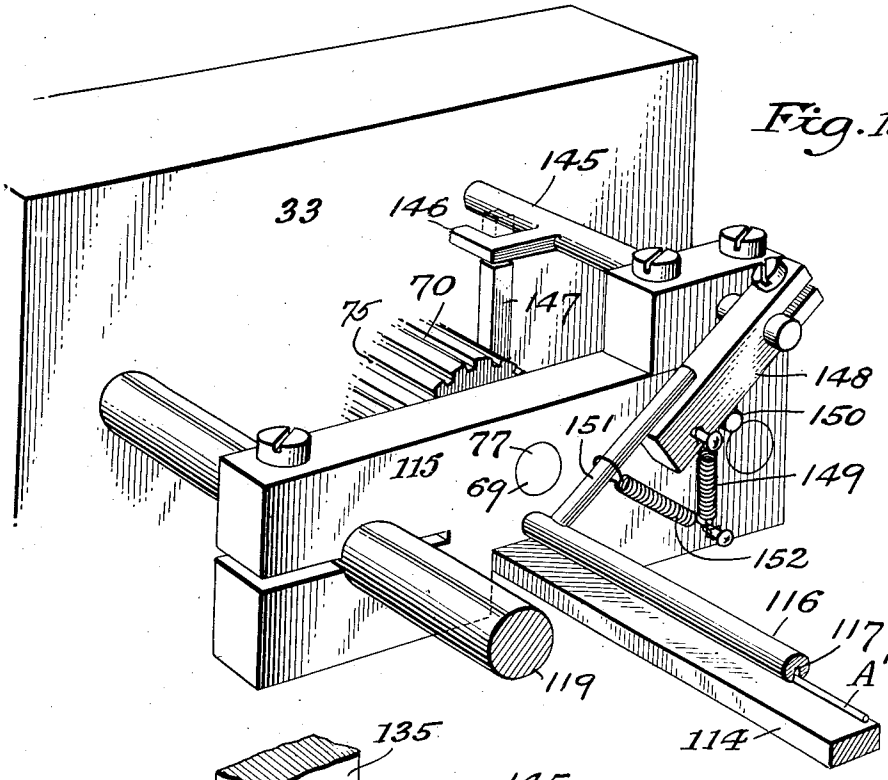
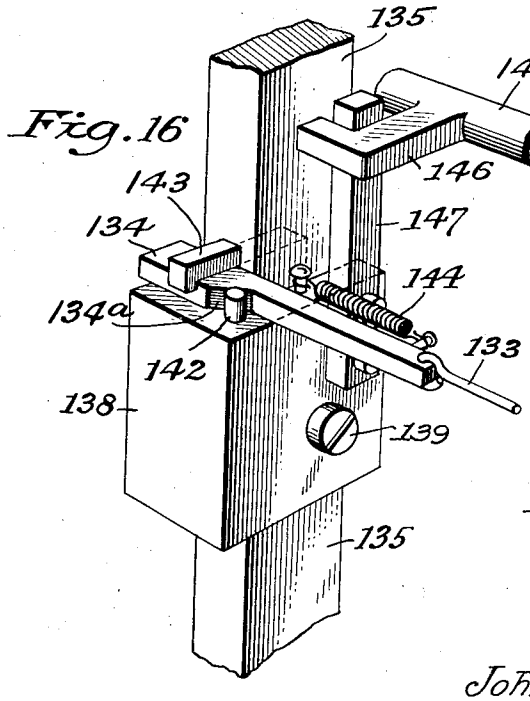


Fig. 16



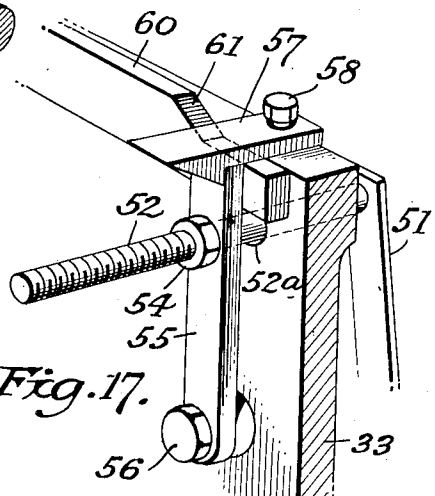


Fig. 17.

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Patented Aug. 28, 1928. 1,682,016

UNITED STATES PATENT OFFICE.

JOHN SHERMAN McCHESNEY, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE GERRARD COMPANY, INC., OF SAN FRANCISCO, CALIFORNIA, A CORPORATION OF DELAWARE.

METHOD OF AND MACHINE FOR PRODUCING DEFORMED WIRE TIES.

Application filed October 28, 1924. Serial No. 746,283.

This invention is a method of and machine for making wire ties, preferably deformed ties, and the object is to economically produce the article by a new mode of procedure and with a greatly increased capacity of the machine, the parts of which are so coordinated that while the operations of straightening a strand of wire and of cutting said strand to a determined length are being performed, certain other mechanisms are operating upon another of said cut lengths for the purpose of deforming said cut length and of cutting the same into a plurality of individual wire ties, each of the required length and possessing the required deformation, whereby the operation of deforming one length of wire does now slow up or decrease the speed of operation of the mechanisms by which the strand is initially straightened and cut to produce a piece the length of which is a multiple of the individual pieces of a plurality of wire ties.

My invention involves a certan novel procedure carried into practice by novel combinations of mechanism wherein a wire strand is straightened and cut to produce a piece of non-shouldered wire which is a multiple of a plurality of the tie wires to be ultimately produced, and subsequently to the production of such multiple length of wire it is shouldered at a plurality of places and concurrently therewith it is cut into a plurality of pieces to produce individual tie wires each of a determined length, each individual wire tie being deformed, whereby the speed of operation of straightening and cutting the multiple length of plain wire is not decreased by the subsequent operation of deforming and cutting the straightened length, thus greatly increasing the capacity of the machine, minimizing the shock and wear on the working parts, and affecting economy of time and labor.

My invention includes, also, means for feeding a wire strand from a coil, means for straightening said wire strand, means for receiving the wire strand, and trip-controlled cutting means adapted to remain at rest during the period of feeding the wire strand and operable to rotate within a restricted path sufficient to sever the wire, for the purpose of cutting off a piece to a desired length without retarding to an appreciable extent the feed movement of the wire strand by a rapidly operating feed means of high speed.

In contradistinction to reciprocating wire cutting means heretofore commonly used, my invention includes a rotary cutting member provided with a multiplicity of cutting edges, and trip-controlled actuating means therefor by which a rotative step feed motion is imparted to said multiple cutter, whereby on each rotation of the cutting member the wire edges thereof act successively on the wire, thus minimizing the wear on the individual cutting edges and greatly prolonging the service of the cutter without stopping the machine to sharpen the cutting edges or to replace a worn cutter with a fresh cutter.

A further feature of my cutting mechanism is that the rotative multiple edges member is turned for an angular distance which is slightly in excess of the diameter of the strand, and the desired motion is imparted almost instantaneously to said cutter member, with the result that there is no appreciable stoppage in the feed of the strand due to the action of said cutter, in consequence of which the strand of wire is moved constantly at a high linear speed, attaining increased capacity in the production of cut pieces, and resulting in material economy of time and labor.

My machine includes a plurality of mechanisms so coordinated that while a piece which is a multiple of individual ties is being straightened and cut, another multiple piece is at the same time undergoing the deforming operation and a cutting operation to produce a plurality of individual ties, each of which individual ties is deformed and of the required length, as a result of which operations of simultaneously carrying on the work upon two pieces of multiple length the capacity of the machine is greatly increased and economy effected in the production of the individual ties.

A piece of straightened multi length wire is transferred automatically from the initial cutting mechanism to a press mechanism, and said piece of multi length wire is shifted out of the line of feed of the strand from the coil, to adapt the press mechanism to perform its operations upon said cut multi length piece.

Said press mechanism is operable upon the cut multi length piece to shoulder and cut the same, and said press mechanism acts at a speed commensurate with the initial feed of the wire, so that the capacity of the press mechanism is equal to the output of the straightening and initial cutting mechanisms. The press mechanism is equipped with dies for performing the deforming operations upon the cut multi length pieces, and while said dies may perform a simple swaging operation upon a cut piece, still it is preferred to use multiple swaging dies and a cutting die whereby a cut piece may be swaged at a plurality of points about midway of its length and such cut piece may be severed intermediate the swaged portions, with the result that each cut piece is severed into a plurality of tie wires each provided with a swaged shouldered portion. Obviously, the output of the machine is greatly increased by the conjoint action of mechanisms which straighten and cut the strand into pieces the multiple of individual ties, and thereafter at a separate station in the machine each cut multiple piece is swaged and is cut into a plurality of ties, for the reason that the swaging at a separate station does not slow up the operations of producing the cut multiple pieces, and it is apparent, furthermore, that the subsequent operation of cutting the multiple pieces increases the total output of the individual ties. As one example, I may mention that instead of cutting and swaging individual ties, the wire strand is run for ten feet, or twice the length of two individual ties of five feet each, then this ten foot length of wire is cut from the strand at one operation of the rotary cutter, the multi length piece is then shifted to the press, and the dies in said press act to swage the cut piece and to sever it into two ties each having a length of five feet.

Other functions and advantages of the invention will appear in the course of the following detailed description taken in connection with the drawings, wherein—

Figure 1 is a side elevation of a tie-wire making machine embodying my invention.

Figure 2 is a plan view thereof.

Figure 3 is a sectional elevation, the plane of the section being indicated by the dotted line 3—3 of Figure 2, illustrating the punch press mechanism by which the multi length wire is swaged and cut to produce the individual shouldered wire ties.

Figure 3ª is a diagrammatic view of the means for actuating the punch press mechanism by which the multi length cut wire is swaged and severed into individual tie wires.

Figure 4 is a vertical enlarged sectional view on the line 4—4 of Figure 2, illustrating one of the feed rolls and the tubular feed member in conjunction with the rotary cutter mechanism by which a straightened wire is cut initially to a piece of determined multi length.

Figure 5 is a sectional elevation on the line 5—5 of Figure 4, illustrating the feed rolls and a releasable latch by which the feed rolls are rendered inactive when the wire of the coil becomes kinked or tangled.

Figure 6 is a sectional elevation on the line 6—6 of Figure 2, illustrating the rotary multiple cutter and the means for imparting a rotative step feed movement thereto.

Figure 7 is a detail horizontal section on the line 7—7 of Figure 6.

Figure 8 is a vertical section on the line 8—8 of Figure 1, illustrating means for automatically rocking the receiver for the multi length piece of straightened wire.

Figure 9 is a transverse vertical detail section on the line 9—9 of Figure 10.

Figure 10 is a detail section on the line 10—10 of Figure 1, illustrating means for dropping and positioning the cut multi length wire with respect to the press mechanism.

Figure 11 is a detail cross section on the line 11—11 of Figure 2, illustrating the means for dropping the multi-length straightened wire and for presenting the same to the press, and showing the trough into which the deformed individual tie wires are finally deposited.

Figure 12 is an enlarged view in side elevation of the wire dropping and positioning means shown in Figures 10 and 11, by which the multi length straightened piece is dropped and positioned with reference to the dies in the press mechanism.

Figure 13 is a view of the deforming and cutting dies showing the same opened for the introduction therebetween of the multi length piece of straightened wire, and

Figure 14 is a view of said dies closed for deforming and cutting the multi length piece of straightened wire.

Figure 15 is a perspective view of the cutting means and the receiver for the multiple length piece of straightened wire.

Figures 16 and 17 are perspective views of parts of the machine.

Figure 18 is a diagrammatic view of the procedure employed for feeding, straightening and cutting wire to produce a multi length of wire.

Figure 19 is a diagrammatic view of a multi length piece of straightened wire which is subsequently swaged and cut to produce two individual pieces constituting separate tie wires.

Figure 20 is a diagrammatic view illustrating a piece of multi length straightened wire swaged and cut to produce three individual wire ties.

According to this invention, a wire is drawn from a coil A to be straightened in

suitable means herein shown as a rotary flier or straightener head 30, the spindle of which is journaled in bearings 32 provided on the pedestal head 33 and the bracket 34 of a frame or pedestal 35, said flier or straightener head 30 being provided with a belt pulley 31 around which passes a driving belt 36, driven from a pulley 37 on a main shaft 38, journaled in bearings provided on the lower part of the pedestal 35, all as usual in this art and as shown in Figure 1. The wire coil A is supported by a reel *a*, the spindle *a'* of which is on a swinging arm 39, pivoted at 40 to a fixed arm 41 of a post 42, said fixed arm having a stop member 43 against which the swinging arm is held by a coiled spring 44, see Figures 1 and 2. The wire passes to and between a pair of coacting feed rolls 45, 46, see Figures 2 and 5, provided with peripheral grooves 47 for the reception of the wire, said rolls being mounted on the upper ends of shafts 48, 49, journaled in bearings 48^a, 49^a, respectively, said bearings being pivoted at 50 for separating the rolls to arrest the feed motion of the wire. A spring 51 acts to normally press the roll 45 toward the companion roll 46 so as to engage and feed the wire, and with said spring coacts a releasing rod 52 shown in Figures 5 and 17 as being slidable in an opening 52^a provided in the pedestal head 33. The releasing rod is provided with a collar or nut 54 screwed on a threaded part of said rod, and contacting with said collar is an arm 55, pivoted for loose movement on a bolt 56, the upper part of said arm being fitted loosely on the rod 52 and the upper extremity of said arm being engaged by a latch member 57 attached by a bolt 58 loosely to the pedestal head 33. This latch member confines the arm 55 and rod 52 to afford resistance to the play of the spring 51 attached to bearing 48^a of the roll 45, and thus the spring applies its pressure to the rolls 45 for retaining the same in operative relation to the companion feed roll 46 whereby the two rolls coact normally to effect the feed of the wire from the coil. Should the wire kink or become tangled in the operation of drawing wire from a coil supported by the rotating reel A, however, it exerts a forward pull on the swinging arm 39 against the tension of the spring 44, and this movement of said coil carrying arm 39 is communicated by a thrust rod 59 to a cam bar 60, said thrust bar 59 being pivotally attached to the coil carrying arm 39, see Figure 1. Said thrust bar is attached to the cam bar 60, the latter being fitted slidably between the arm 55 and the pedestal head 33, see Figures 5 and 17, said bar 60 being provided with a cam face 61 and being fitted below the latch member 57. In the normal operative position of the reel and its arm 39, the spring 44 holds said arm in contact with stop 43 and the cam face 61 of bar 60 is away from the latch 57 so that the rod 52 and spring 51 coact in pressing roll 45 toward the roll 46; but in the event the wire becomes kinked or tangled, the arm 39 with the coil swings forward, whereupon the rod 59 imparts sliding movement to the bar 60, the cam face 61 of which lifts the latch 57, thus releasing the rod 52 so that the spring 51 is relaxed and the roll 45 separates from roll 46 to arrest the feed of the wire. As shown, the shaft 48 of roll 45 is provided with a gear 62, in mesh with a gear 63 of the shaft 49 of roll 46, and the shaft extends downwardly within the pedestal 35, see Figure 1, the lower end of said shaft having a bevel gear 64 in mesh with a bevel gear 65 on the main shaft 38, whereby the rolls 45, 46, are driven at the required speed.

The pedestal head 33 is shown in Figure 4 as provided with an upstanding web or plate 66 adjacent the feed rolls 45, 46, and this web or plate is provided with an opening 67 and with a recess 68, the latter affording a bearing for one of the journals 69 of a stationary cutting cylinder 70, the other journal 69 of which cylinder is mounted in a fixed frame member 71 which is provided with means for fixedly holding the cutter cylinder in operative position, such as a binding screw (not shown) supported in the member 71 and contacting with said journal 69. The opening 67 of the plate or web 66 accommodates a feed tube 73, one end of which is tapering at 74 to extend into the space between the rolls 45, 46, so that the opening in this feed tube is in the horizontal plane of the pass between the feed rolls, whereby the wire from coil A passes from the feed rolls into and through the feed tube 73.

The cutting cylinder 70 is provided in its periphery with a plurality or series of longitudinal grooves 75, the ends of each groove opening through the opposite ends of the cylinder, said end of the groove at one end of the cutter cylinder 70 being fashioned to present a cutting edge 76 in shearing relation to a rotary cutter member 77, the latter being positioned intermediate the delivery end of the feed tube 73 and the cutting edges 76 of the grooved cutter cylinder 70, see Figures 4 and 7. This rotary cutter is a disk with an axial opening which receives one of the journals 69 whereby the cutter is mounted for rotation freely on a part of the stationary cutter cylinder 70. Said rotary cutter is provided in its circumference with a series of short grooves 78, adapted to register with the longitudinal grooves 75 of the cutter cylinder, said grooves producing on the circumferential edge of the member 77 a series of teeth 79, the outer edges of which are beveled at 80 and thus produce on each

tooth a pawl engaging face 81 and a cutting edge 82, see Figure 8. The cutting edge 82 shears past the end of the feed tube 73 and the cutting edge 76 of the grooved cylinder 70, for cutting the wire into a piece, the length of which is a multiple of the individual wire ties to be produced. Since the cutter 77 is in shearing relation to the guide 70 and guide 73, it acts to cut out a piece of wire whose length is equal to the thickness of the cutter, the mechanism thus acting to cut off a multi-length of wire and in addition thereto the fragment whose length is equal to the thickness of the cutter, such fragments being waste material.

In my invention I employ a rotary cutter, in contradistinction to a reciprocating or swinging cutter, and this rotary cutter is provided with a multiplicity of cutting edges, adapted to act successively in cutting to length the strand as it is fed from the coil by the feed rolls. This rotary cutter is rotated with a step feed automatically, by mechanism to be described, and at each operation the cutter turns a certain angular distance equal to about or slightly exceeding the diameter of the wire to be cut. The cutter thus turns a minimum distance with a view primarily to avoiding any stoppage, or at most a very slight stoppage in the feed of the wire, whereby the wire may be run or fed through the machine at high speed due to the feeding action of the rolls 45, 46, the latter being speeded up as compared with ordinary straightening machines which cut the wire to predetermined length. The capacity of the machine to produce straightened wire in cut lengths is determined in ordinary machines by the speed in the cutting operation; but in my invention the rotary cutter offers no practical obstruction to or stoppage of the wire feed, hence the machine has great capacity in the production of straightened pieces cut to determined lengths. Again, the cutter member 77 is provided with a multiplicity of cutting edges acting successively on the wire, thus resulting in increased length of service of the cutter as compared with single edged cutters, and minimizing the necessity for replacing a dull cutter by a sharpened one. Furthermore, the cutting edges shear past the feed tube and the cutter cylinder; the cutter can be easily dismounted from the cutter cylinder for resharpening the cutting edges, and the binding screw for the cutter cylinder can be loosened in its bearing to permit the cutter cylinder to be rotated a slight distance for presenting a fresh cutting edge 76 to the shearing edges 82 on the cutter member.

As shown in Figures 1 and 2, the machine includes a press frame 85 provided with a standard 86 and with an overhanging horizontal arm 87, said press frame being fastened solidly to the floor and said frame being positioned intermediate the ends of the piece of multi length wire which is fed by the rolls 45 and 46 and which straightened piece passes through the cutter tube 73 and is cut to the desired multi length by the action of the rotary cutter 77. This press frame is equipped with means for deforming the multi length piece and for severing the latter into individual wire ties of the appropriate length for use in wiring or binding packages for a suitable form of wire tying machine, the latter being well known in the trade. For this purpose, the press frame is provided with a die bed 88 on the frame 85 and with a die holder 89, for receiving and supporting the dies 90, 91, see Figures 3, 13 and 14, said dies operating to deform the multi length wire and to sever the same into individual ties. The press includes a ram or plunger 92 operated by an eccentric 93 on a shaft 94 having a pulley 95, and on this shaft 94 is a crank disk 96, to the wrist pin 97 of which is pivoted a pitman 98, leading to and pivotally connected with a crank arm 99 extending upwardly from a horizontal rock shaft 100, the latter extending lengthwise of the machine, from the pedestal 35 outwardly toward the tripping end of said machine.

The coacting dies 90, 91, Figures 13 and 14 are formed with swaging faces, and with cutters so positioned that the swaging faces coact in deforming the wire at two places and the cutters act to sever the wire intermediate the deformations produced by the swaged surfaces. As shown, the die member 90 is provided with swaging faces 100^a, 101, positioned in different planes so as to be out of alinement and between these faces the die is provided with a shoulder 102 forming a cutting edge 103. The companion die member 91 is provided with swaging faces 104, 105, lying in different planes and out of alinement, and intermediate these faces, said die member is formed with a shoulder 106, constituting a cutting edge 107. The faces 101, 104, of the respective die members 90, 91, are opposite to each other; the swaging faces 100^a, 105, are opposite to each other, and the edges 104, 107, are in shearing relation to each other, as a result of which a piece of straightening wire A′ cut to a multiple length by the cutter 77 is adapted to pass between the dies when opened as in Figure 13, whereby the dies when closed swage or flatten the wire at two points, $a\ a'$, the faces 101, 104, acting to flatten the wire at one point, a, and the faces 100^a, 105, act to flatten the wire at a separate point, a', spaced to the first flattened point, a, and the cutters 103, 107, shear past each other for severing the wire between said flattened portions, see Figure 14. The dies coact on one stroke to successively deform the wire at a

a' and to sever the wire intermediate the successive swaging operations, whereby the multiple length piece of straightened wire is severed and deformed at one stroke of the press and this results in a plurality of pieces of deformed wire each constituting an individual wire tie.

The machine frame includes a plurality of frame members 110, of the general form shown in Figure 11 and the number of which varies according to the length of the piece of wire which is initially fed and severed by the cutter 77, to constitute a multiple of the individual ties, said frame members being spaced at required intervals and positioned at the respective sides of the press frame 85, see Figures 1 and 2. Any suitable form of frame members may be used; as shown, each member 110 has an overhanding arm 111 and a lower arm 112, the latter supporting a trough or rack 113 into which the deformed cut pieces constituting the individual ties are deposited. The frame members 110 are provided with bearings for the horizontal rock shaft 100, and the arms 111 of said frame members 110 afford means for supporting a horizontal ledger plate 114, the latter extending the length of the machine and passing through the frame members 110 and the press frame, and the inner end of said ledger plate being supported by a bracket member 115 attached to the pedestal head 33. The inner portion of this ledger plate is just below and adjacent to the opening in the feed tube 73 and to the peripheral cutters 82 of the rotary cutter 77 so that the wire as it is fed through the tube 73, a groove in the cutter 77, and a groove in the stationary cutter cylinder will rest upon the ledger plate 114, the latter supporting the fed wire throughout the length of said wire during the operation of feeding the wire, and also supporting the wire momentarily after it shall have been severed by the rotary cutter 77 preliminarily to the operation of dropping the wire and positioning the same within the dies 90, 91, of the press for the purpose of deforming the wire and severing the latter into individual ties.

Co-operating with the ledger plate 114 is a rockable wire receiver 116, the same being shown as an elongated shaft provided with a longitudinal groove 117. This rockable receiver is positioned above the ledger plate, with its groove 117 facing downwardly and closed by the ledger plate, and said receiver 116 extends through the frame members 110 and the press frame, said receiver being journaled at one end in a bearing provided by the member 115 and being journaled also in bearings provided intermediate its ends by a plurality of bearing blocks 118 which are tied together by a horizontal tie rod 119 constituting an element of the machine frame, see Figure 2. These bearing blocks 118 are fixedly attached to the ledger plate, and as shown in Figures 10 and 12, said bearing blocks are beveled at their upper corners, as at 120, just below a lower corner of the ledger bar 114 and below the dropping position of the rockable receiver 116. The bearing blocks 118 are spaced at intervals between the press frame 85 and the frame members 110, and as shown in Figure 12, said bearing blocks support guide-ways 121 for a series of wire-dropping and positioning bars 122, the latter being positioned vertically alongside the inner edges 118^a of each of the series of the bearing blocks 118. The wire is dropped from the groove 117 in the receiver 116 by the rocking motion of said receiver, the latter acting to push the wire sidewise to a position clear of the top edge of the ledger plate 114, as shown in Figure 12, and when said receiver is thus rocked to dislodge the cut multi length of wire from the ledger plate, said wire length drops or falls into the space bounded by the bevel 120 of the blocks 118. The wire length thus dropped into contact with the beveled corners 120 of the blocks 118 passes into contact with the edges 118^a of the blocks 118, against which the wire length is held or retained by a clamping action of a series of presser plates 123, one in each block 118. Said plates 123 are positioned vertically alongside of and substantially parallel to the vertical edges 118^a of the blocks, and each plate 123 is provided with guide pins 122 which are fitted slidably in openings provided in the vertical guides 121 so as to retain the plates 123 in movable relation to said edges 118^a of the blocks. The plates are under the influence of springs 124^a which tend to press the plates toward the blocks whereby the plates and the blocks co-operate in clamping a wire length between the said parts, it being apparent that the wire length is engaged frictionally a number of points intermediate its ends by the series of the co-operating spring backed plates 123 and the edges 118^a of the blocks. As shown in Figure 12 each clamping plate is bent at its upper end as at 123^a toward the rockable receiver 116, to preclude the wire length from moving except in a prescribed path when said wire length is dropped after it has been dislodged from the ledger plate by the rocking motion of the receiver 116.

The wire length, in a horizontal position and gripped between the blocks 118 and the plates 123, is moved positively in a downward direction by a plurality of pusher devices which apply such force to the wire length as to overcome the frictional engagement of the wire length with the blocks 118 and the spring backed plates 123. It should be stated that this positive downward movement of the wire length takes

place at successive stages, the first of which positions the wire length between the dies 90, 91, for the performance of the deforming and individual severing operations, and the second stage being to eject the cut individual deformed ties from the mechanism and into the receiving trough 113. To these ends, I employ a plurality of pusher bars or slides 122, one opposite or adjacent to each block 118, each pusher bar or slide being slidably fitted in the guideway 121 for vertical reciprocating play or movement therein and being movable crosswise of the horizontal position occupied by the multi length wire and the resulting pieces when deformed and cut into individual ties. Each pusher bar 122 carries a plurality of pusher dogs 124, 125, two being shown, positioned one above the other and spaced along the pusher bar. The upper dog 124 is fixedly connected to the pusher bar, and it is shown as having a beveled top edge and a straight lower edge, said dog acting on the downward travel of the bar to displace the cut wire length from the point at which said length lodges upon the beveled edge 120 of the block 118, whereby the dogs 124 of the series of pusher bars 122 act to engage the cut length of wire at a number of points intermediate the ends of the wire length and to force said cut length from the dotted position of Figure 12 to the upper of the full line positions for the wire in said Figure 12, and to thereby position the cut length of wire between the coacting dies 90, 91, the latter acting as described to deform the cut length at the points *a a'* and to sever such wire into individual ties. The other pusher dog 125 is connected movably to the pusher bar, as by the pivot 125ª, and it is held in an inclined yieldable position by a spring 126, the lower or free end of said dog having a depending finger 127 and a straight lower edge adapted for engagement with a length of wire when the latter occupies the upper full line position of Figure 12, whereby said dog is yieldable to clear the wire length on the upward travel of the pusher bar and it is adapted on the downward movement of the bar to displace the separate pieces composing the individual ties from the dies 90, 91, and to force said ties between the blocks 118 and the spring plates 123 so as to press down the ties below the lower ends of said plates 123 as in the third full line position of Figure 12, whence said ties drop or fall by gravity into the receiving trough 113.

The pusher bars are actuated simultaneously, and to this end, each bar is provided at its upper end with a stud 128 which fits in a slot 129 of a crank arm 130, a series of said crank arms being provided on the rock shaft 100 that is operated by the link 98 from the crank disk 96 of the press shaft. The pusher bars are thus actuated positively and in timed relation to the action of the dies 90, 91, and said pusher bars with their dogs afford simple and effective means for positioning the cut length of wire between said dies and for ejecting the resulting individual ties into the trough 113.

As is usual in machines of the type for straightening and cutting wire into lengths, the feed of the wire, when a determined length is advanced, controls the action, or sets into action, tripping means by which the cutter 77 is rotated and the slotted receiver 116 is rocked. As shown in Figure 2, a trip lever 131 is positioned at the distant end of the machine and in the path of the wire strand present and moving within the slot 117 of the rockable receiver 116. This trip lever is pivoted to the machine frame and controlled by a spring 132, and to the trip lever is connected a rod or member 133 which extends to a cam slide 134 associated with a vertically positioned cutter-actuating bar 135, see Figures 1, 2, 6 and 16. Said bar 135 is positioned alongside the pedestal 35 and its head 33, and said bar is guided between a pair of rollers 136 mounted on the pedestal head for movement therebetween, said bar being attached at its lower end to a crank pin or eccentric stud 137 provided on the end of the driver shaft 38, see Figure 1. The bar 135 is thus supported by the pin or stud 137, it is reciprocated by said stud when shaft 38 is rotated, and is directed for movement in a determined path by the guide rollers. The cutter-actuating bar is arranged alongside of the rotary cutter 77, and said bar carries a cutter-feed pawl 138, the same being shown in Figures 6 and 16 in the form of a box-shaped member fitted loosely around the bar 135 and connected pivotally thereto by a pin or screw 139. The inner face of the box-shaped pawl 138 is cut away or beveled at 140, Figure 6, and this pawl is under the control of a concealed spring 141, housed partly within recesses provided in the bar and the pawl, Figure 6. The pawl is movable with the cutter-actuating bar and it is arranged for engagement with the feed shoulders 81 of the rotary cutter 77, but normally the pawl is pressed by the spring 141 for the free edge portion of the pawl to clear, or be free from contact with, said rotary cutter, whereby the bar and the pawl are reciprocable in the normal operation of the machine in which the rolls 45, 46, feed the wire to a determined length without the pawl engaging with the rotary cutter 77; but when the said wire has been fed far enough for the end of the wire to be pushed against and apply pressure to the trip lever 131, then this lever is moved to pull the rod 133 and actuate the cam slide 134, the latter acting to shift the pawl 138 on the pivot 139 and against the pressure

of the spring 141 so that the pawl engages with one shoulder 81 of the cutter 77, so that on the upward movement of the bar 135 and pawl 138, the latter acts to rotate the cutter 77 one step for the pupose of severing the wire present in the feed tube 73 and the rockable receiver 116, the rotative movement of the cutter being that movement required to sever the wire and such rotative cutting movement presenting a peripheral groove 78 through which the wire is free to travel, whereby the cutting action takes place without arresting or stopping the feed of the wire by the rolls 45, 46. As shown in Figure 16, the cam slide 134 is provided with a cam surface 134^a presented for contact with a stud 142 fixed to the upper part of the box-shaped pawl 138, said cam slide resting upon the box-shaped pawl and confined or limited to sliding movement between the bar 135, the stud, 142, and the stop member, 143, extending laterally from the bar 135, said cam slide 134 being drawn in one direction by a spring 144 anchored on the pawl 138.

For imparting rotatative movement to the slotted wire receiver element 116, I employ a short rock shaft 145 journaled in bearings provided in the pedestal head 33 and the frame block 115, the latter having a bearing 71 for the trunnion 69 of the cutter cylinder 70, see Figures 4, 15 and 16. This rock shaft is provided with an angular finger 146 with which is adapted to engage an upstanding arm 147 provided on the box-shaped pawl 138. In the reciprocating movement of the actuating bar 135 under the action of the eccentric stud 137, the pawl 138 and the arm 147 move up and down and the free end of the arm works or plays within the angular part of the finger 146, but when the pawl 138 is pushed over by the cam slide 134, then the arm 147 is shifted into contact with the finger 146 and the shaft 145 is rocked in its bearings. Said rock shaft 145 is provided at one end with an arm 148 engaged and held by a spring 149 against a stop 150. Said arm 148 of the rock shaft is in contact with a radial finger 151 provided on the rockable receiver 116, said finger being under the influence of a spring 152 anchored on the frame bearing 118, see Figure 15. The foregoing construction provides means controllable by the cutter actuating bar 135 and its pawl 138 for the automatic operation of the slotted wire receiver 116 in timed relation to the action of the rotary cutter 77 whereby the wire is cut and concurrently therewith the receiver 116 is turned for dislodging the cut wire from the ledger plate, said cut wire being a multiple of the individual tie wires produced by the deforming and cutting operation of the dies 90, 91.

From the foregoing description taken in connection with the drawings, it will be seen that the wire is drawn from a coil and fed through the feed tube 73 by the rolls 45, 46, and passes into the slot 117 of the receiver 116, the wire being straightened by the flier 30. This feed of the wire continues at a rapid rate until the end of the wire presses the lever 131 and actuates the cam slide 134 to press the pawl 138 of the reciprocating bar 135 laterally into contact with the cutter 77, the latter being thus turned an angular distance for severing the piece of wire, the length of which A′ is a multiple of the individual wire ties. At this period, the shaft 145 is rocked by the arm 147 and thus the coacting members 148, 151, are moved to rock the slotted receiver 116 for dislodging the cut length of wire A′ from the ledger plate, the feed of the strand from the coil A being continued. This dislodged cut multi length wire A′ drops into the space bounded by the bevels 120 of blocks 118 and clamping plates 123, the wire A′ being thus shifted out of the path of the oncoming strand passing into the receiver 116, and thereupon the pusher bars 122 impart movement to the dogs 124, 125, the former acting to press the cut length of wire A′ into contact with the edges 118^a and plates 123 and to position the cut length between the dies 90. 91, whereupon said dies act on the wire length A′ of Figure 18 to swage said wire at two places as at a, a', in Figure 19, and at the same time to sever the wire A′ into two pieces resulting in the production of individual swaged ties A^2 A^2, Figure 19. The swaging and cutting operation by the dies 90, 91, takes place on a length of wire A′ which is out of the path of the wire strand drawn from the coil and fed into the receiver 116 by the rolls 45, 46, and thus the swaging and tie cutting operations while performed concurrently with the feed of the wire from coil A does not in any way stop or retard the feed of the wire, the feeding and deforming operations, generally, being carried on concurrently and at different stations, whereby the productive capacity of the machine is greatly increased for the reason, mainly, that there is no stoppage of the wire feed, and the rolls 45, 46, can be run at high speed.

It should be stated that my invention may be embodied in a machine which utilizes two or more press and die mechanisms similar to the press mechanism of Figures 1 and 2 and similar to the dies of Figures 13 and 14 to deform and cut wire lengths into three or more pieces A^2, as in Figure 20 and, furthermore, the swaging dies may be constructed and operated for deforming the cut tie wires at each end thereof as also shown in Figure 20. Again, the swaging dies may be changed to simple cutting dies, the latter operating on a straight multi length of wire

to cut the same into two or more straight non-deformed individual wire ties.

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

1. In the art of making wire ties, the process which consists in straightening wire and feeding it in a prescribed path, cutting said wire to produce a piece the length of which is a multiple of a plurality of individual ties, shifting the multi-length piece out of the path of feed of the wire, and severing the shifted multi-length piece to produce a plurality of individual ties.

2. In the art of making wire ties, the process which consists in straightening wire and feeding it in a prescribed path, cutting said wire to produce a piece the length of which is a multiple of a plurality of individual ties, shifting the multi-length piece out of the path of feed of the wire, and swaging and cutting the multi-length piece into a plurality of individual deformed wire ties.

3. In the art of making wire ties, the process which consists in straightening wire and feeding it in a prescribed path, cutting said wire to produce a piece the length of which is a multiple of a plurality of individual ties, shifting the multi-length piece out of the path of feed of the wire, and while said multi-length piece is in the shifted position subjecting it to the conjoint action of dies which swage the wire at a plurality of places and sever the wire intermediate said swaged places to produce a plurality of individual deformed wire ties.

4. In a machine of the class described, a grooved stationary cutter cylinder, a rotative cutter in coaxial relation to the cutter cylinder, said cutter having a series of peripheral notches and provided with successively acting radial cutting edges and means co-operable with the notched part of said cutter for imparting a rotative step feed thereto.

5. In a machine of the class described, wire feeding means, a rotary cutter having a series of cutting edges movable transversely to the path of feed of the wire, a reciprocable member, and a trip controlled pawl carried by said member for engagement with said rotary cutter.

6. In a machine of the class described, wire feeding means, a rotary cutter having a series of cutting edges movable transversely to the path of feed of the wire, a reciprocable cutter-actuating bar, a feed pawl carried by said bar in position for engagement with said cutter, and a trip controlled cam member for shifting the pawl into contact with said cutter.

7. In a machine of the class described, wire feeding means, a rotary cutter having a series of cutting edges movable transversely to the path of feed of the wire, an eccentric-driven cutter-actuating member, a feed pawl carried by said member and normally free from contact with said cutter, and a trip controlled cam member co-operating with said pawl for shifting it into contact with said cutter.

8. In a machine of the class described, a feed tube, a rotary cutter having a series of grooves and a series of cutting edges, means for imparting a rotative step motion to said cutter the grooves in which are alined successive with said feed tube opening, a ledger plate co-operable with said cutter for receiving a length of wire cut thereby, and a rockable feeder positioned to sweep the cut length of wire from said ledger plate.

9. In a machine of the class described, wire feeding means, a rockable wire-receiving member into which the wire is advanced by said feed means, a rotary cutter positioned at the receiving end of said wire-receiving member, a die positioned for operating upon a cut length of wire, and means for feeding said cut length from the rockable member to said die.

10. In a machine of the class described, wire feeding means, a ledger plate upon which the fed wire is adapted to lodge, cutting means, a wire-receiving member having a slot into which said fed wire is received, said member being movable relatively to the ledger plate for dislodging the cut length of wire from said ledger plate, a die positioned for operating a length cut by said cutting means, and means for feeding said cut length of wire from said receiving member to said die.

11. In a machine of the class described, wire-cutting means, a stationary ledger plate upon which the fed wire is adapted to rest, a slotted wire-receiving means rotatable with respect to said ledger plate and operable to dislodge the cut fed wire therefrom, a die positioned for acting upon a length of wire dislodged from said ledger plate, and means for feeding said dislodged length of wire to said die.

12. In a machine of the class described, wire feeding means, a ledger plate upon which the fed wire is adapted to lodge, a rotative slotted wire-receiving member co-operable with said ledger plate, a rotary cutter adjacent the wire-receiving member, means for synchronously actuating the rotary cutter and the wire-receiving member whereby a cut length of wire is dislodged from the ledger plate, a die positioned for operation upon a length of wire dislodged from said ledger plate, and means for feeding said dislodged length of wire to said die.

13. In a machine of the class described, a movable coil carrier, coacting feed rolls mounted in movable bearings, a pressure member for retaining said feed rolls in co-operable relation, a latch for said pressure member, and means operable by a movement of the coil carrier for releasing the

latch and relaxing the tension of said pressure member.

14. In a machine of the class described, a movable coil carrier, coacting feed rolls mounted in movable bearings, a pressure spring for retaining said feed rolls in active relation, a movable part co-operable with said spring, a latch for said movable part, and a cam slidable for releasing said latch on the movement of said coil carrier.

15. In a machine of the class described, wire feeding means, wire-receiving means into which the wire is advanced, means for cutting the advanced wire to produce a piece the length of which is a multiple of individual ties, means for shifting the cut multi-length of wire to a different station and out of the path of feed of the wire, and means for cutting the multi-length wire when shifted to a different station for producing individual ties.

16. In a machine of the class described, wire feeding means, wire straightening means, wire-receiving means into which the wire is received as advanced by said feed means, means for severing the advanced wire to produce a piece of straightened wire the length of which is a multiple of a plurality of individual ties, means for shifting the straightened cut length of wire out of the path of feed, whereby the feeding is continued into the path out of which the cut length is shifted, and means for subsequently severing the multi-length piece into a plurality of individual ties.

17. In a machine of the class described, wire feeding means, wire straightening means, wire-receiving means into which the wire is received as advanced by said feed means, means for severing the advanced wire to produce a piece of straightened wire the length of which is a multiple of a plurality of individual ties, means for shifting the straightened cut length of wire out of the path of feed whereby the feeding is continued into the path out of which the cut length is shifted, and means for subsequently deforming the cut length and severing it to produce a plurality of individual deformed ties.

18. In a machine of the class described, wire feeding means, wire straightening means, wire cutting means by which is produced a piece of straightened wire the length of which is a multiple of a plurality of individual ties, and means for subsequently cutting said multi-length piece of straightened wire into a plurality of individual disconnected ties.

19. In a machine of the class described, wire feeding means, wire straightening means, wire cutting means by which is produced a piece of straightened wire the length of which is a multiple of a plurality of individual ties, and means for swaging the straightened multi-length piece and for severing the same to produce a plurality of deformed straightened individual ties.

20. In a machine of the class described, wire feeding means, wire straightening means, a rotary cutter with a series of grooves and a series of successively acting cutting edges operable to sever a wire without stoppage of the feed to produce a straightened piece the length of which is a multiple of a plurality of individual ties, and means for subsequently severing the multi-length piece into a plurality of individual ties.

21. In a machine of the class described, wire feeding means, wire straightening means, a rotary cutter with a series of grooves and a series of successively acting cutting edges operable to sever a wire without stoppage of the feed to produce a straightened piece the length of which is a multiple of a plurality of individual ties, and means for subsequently swaging and severing the multi-length piece to produce a plurality of individual deformed and straightened ties.

22. In a machine of the class described, wire feeding means, wire cutting means for producing a piece of wire the length of which is a multiple of a plurality of individual ties, additional cutting means operable on the multi-length piece, and means for positioning the multi-length piece into operative relation to the additional cutting means.

23. In a machine of the class described, wire feeding means, wire cutting means for producing a piece of wire the length of which is a multiple of a plurality of individual ties, swaging and cutting means operable on the multi-length pieces to deform and sever the same to produce a plurality of individual ties, and means for positioning the initially cut and multi-length piece with respect to said swaging and cutting means.

24. In a machine of the class described, the combination with swaging means, and means for producing a cut length of wire, of a plurality of wire retaining devices for positioning a cut length to said swaging means, and means for forcibly advancing the cut length to successive positions with respect to said wire retaining devices.

25. In a device of the class described, a plurality of wire-retaining devices including relatively movable parts between which a length of wire is frictionally held, and means for applying force to said length of wire whereby it is moved to a plurality of positions between said relatively movable parts of the retaining devices.

26. In a machine of the class described, a plurality of wire-retaining devices including relatively movable parts between which a length of wire is frictionally held, a plu-

rality of pushers movable relatively to said parts of said retaining devices and operable for displacing a wire retained therebetween, and means for severing the held wire to produce a plurality of individual ties.

27. In a machine of the class described, a plurality of wire positioning devices embodying relatively movable parts engageable with a piece of wire at a plurality of points intermediate its ends, a plurality of pushers movable relatively to said retaining devices, and means for acting on the wire held within said retaining devices.

28. In a machine of the class described, a plurality of wire positioning devices embodying relatively movable parts engageable with a piece of wire at a plurality of points intermediate its ends, a plurality of pusher bars each having a plurality of dogs engageable with a wire held in said retaining devices for moving said wire to successive positions, and means acting on the wire while so held by the retaining devices.

29. In a machine of the class described, a plurality of wire positioning devices embodying relatively movable parts engageable with a piece of wire at a plurality of points intermediate its ends, a plurality of pushers movable relatively to said positioning devices, means for concurrently actuating said pushers, and severing means for cutting the wire while held in said positioning devices.

30. In a machine of the class described, a plurality of wire positioning devices embodying relatively movable parts engageable with a piece of wire at a plurality of points intermediate its ends, means for swaging and cutting the held wire, and means operable to move a piece of wire relatively to the positioning means and to swaging and cutting means.

31. In a machine of the class described, a plurality of wire positioning devices embodying relatively movable parts engageable with a piece of wire at a plurality of points intermediate its ends, means for cutting the held wire, means for moving the wire with respect to the positioning devices whereby the wire is adapted to be held during the action of the cutting means, and means for ejecting the held wire subsequently to the operation of the cutting means.

32. In a machine of the class described, a plurality of wire positioning devices, embodying relatively movable parts engageable with a piece of wire at a plurality of points intermediate its ends, a ledger plate common to said positioning devices, means for dislodging a cut wire from said ledger plate, means for positively moving the dislodged wire with respect to the parts of said positioning devices, and means for severing the held wire.

33. In a machine of the class described, a plurality of wire positioning devices embodying relatively movable parts engageable with a piece of wire at a plurality of points intermediate its ends, a plurality of slides each having a fixed dog and a movable dog movable relatively to said parts of the positioning devices, means for imparting movement to said slides, and wire severing means operable upon the held wire.

34. In a machine of the class described, a plurality of wire positioning devices embodying relatively movable parts engageable with a piece of wire at a plurality of points intermediate its ends, means for shifting a cut piece of straightened wire into position to enter said positioning devices, means acting on the shifted piece of cut wire to apply force thereto and insure its movement between the parts of the positioning devices, and cutting means for severing the wire held by said pushing devices.

35. In a machine of the class described, a plurality of wire positioning devices embodying relatively movable parts engageable with a piece of wire at a plurality of points intermediate its ends, a plurality of coacting dies having swaging faces and cutters operable on the piece of wire retained by said positioning devices for deforming and cutting the same to produce individual ties, and means for ejecting the deformed and cut ties from said dies.

In testimony whereof I have hereto signed my name this 23rd day of October, 1924.

JOHN SHERMAN McCHESNEY.