

Jan. 14, 1930.

L. M. HARVEY

1,743,855

WIRE TYING MACHINE

Filed Dec. 27, 1926

4 Sheets-Sheet 1

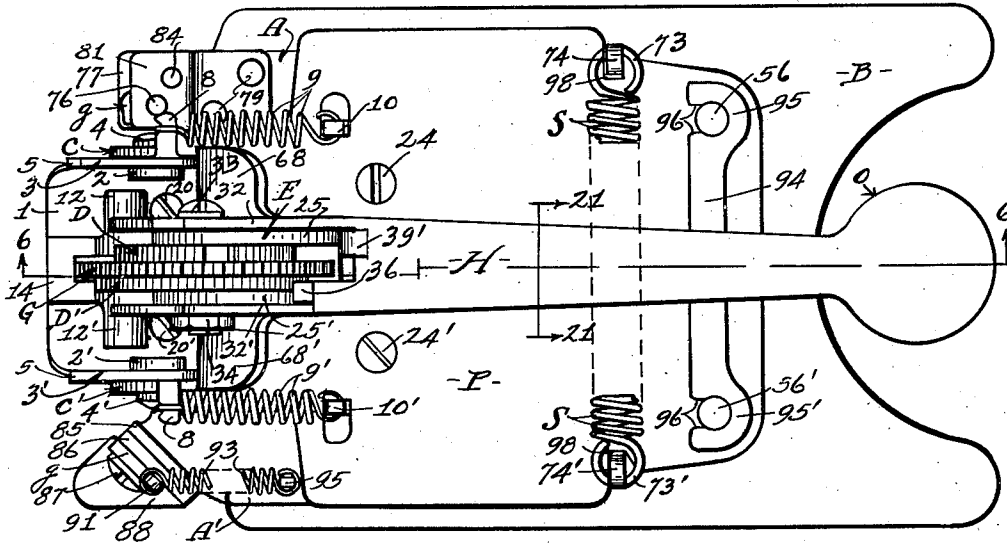


Fig. 1

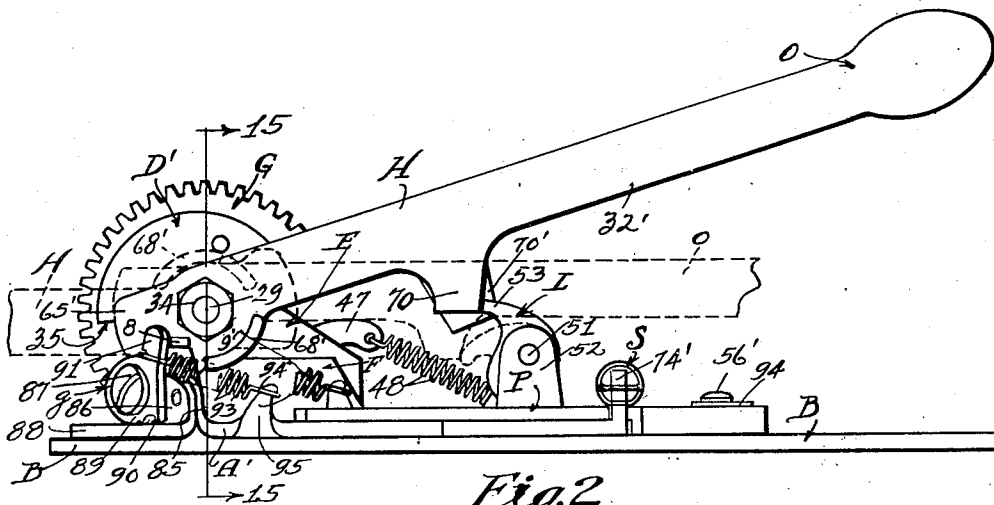


Fig. 2

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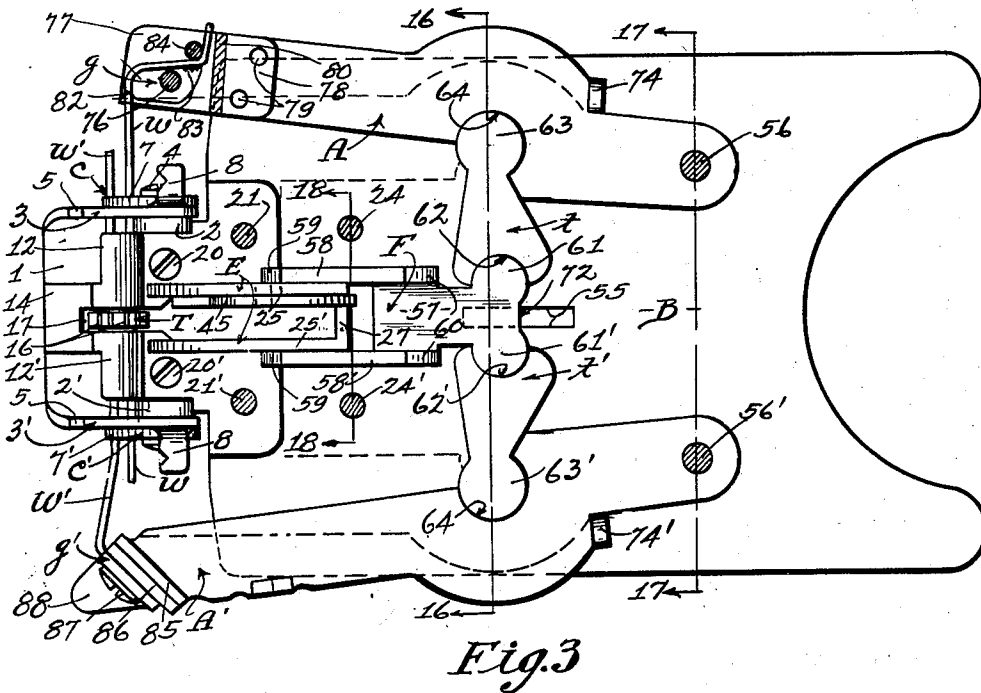
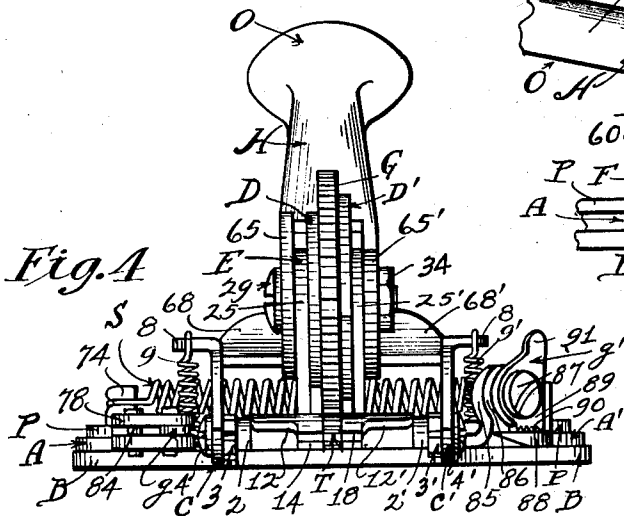
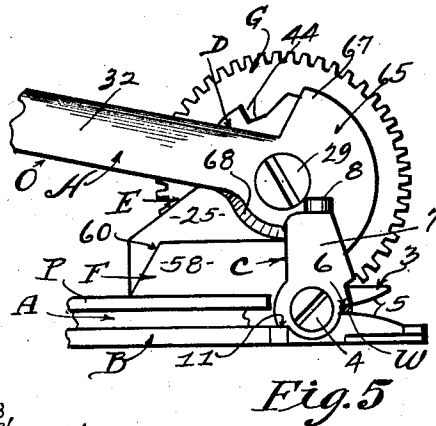
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4 Sheets-Sheet 2



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WIRE TYING MACHINE

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4 Sheets-Sheet 3

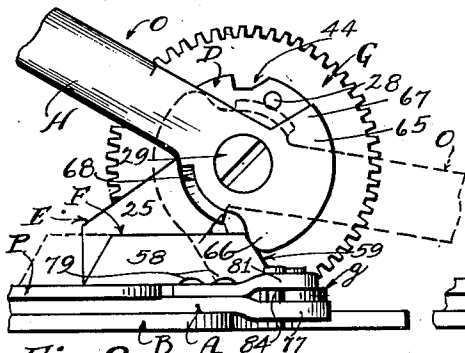


Fig. 8

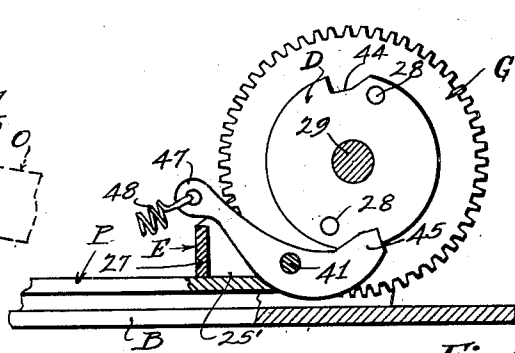


Fig. 9

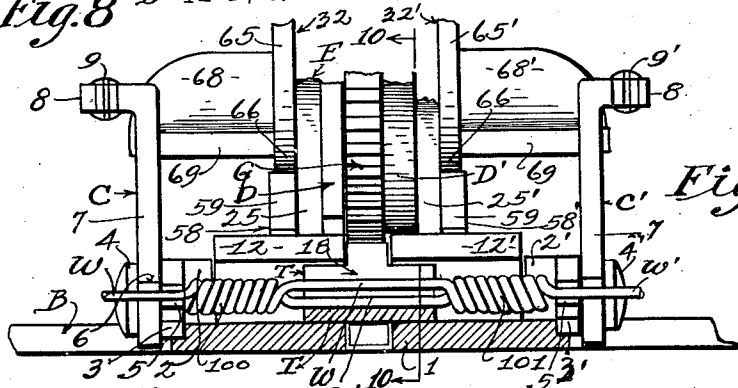


Fig. 7

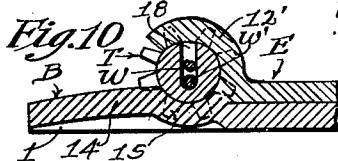


Fig. 10

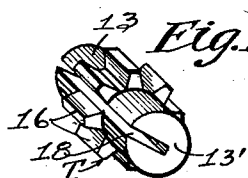


Fig. 12

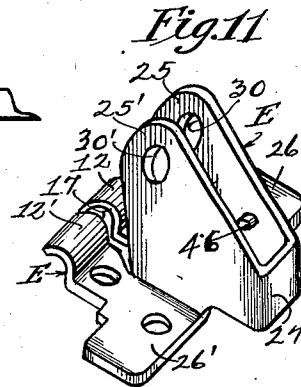


Fig. 11

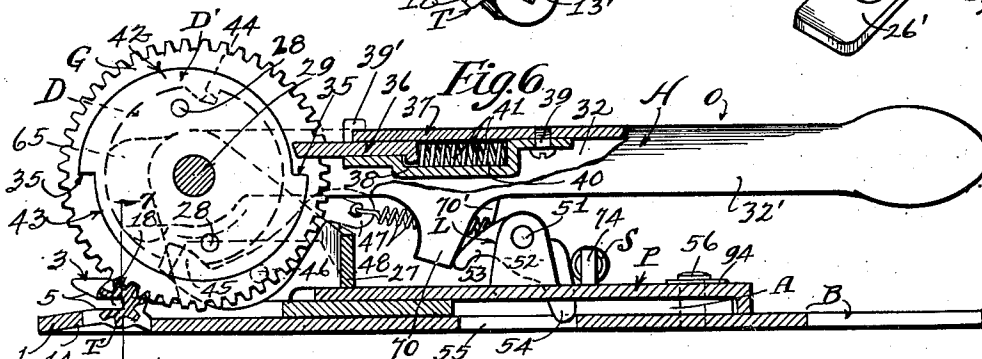


Fig. 6

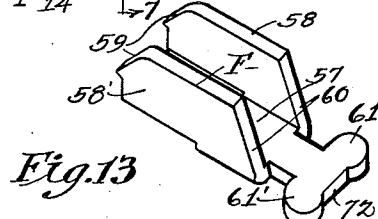


Fig. 13

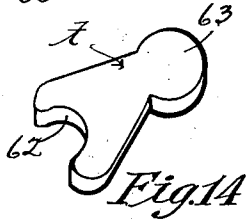


Fig. 14

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WIRE TYING MACHINE

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Fig. 22

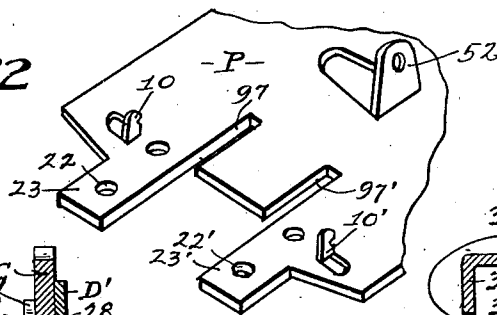


Fig. 15

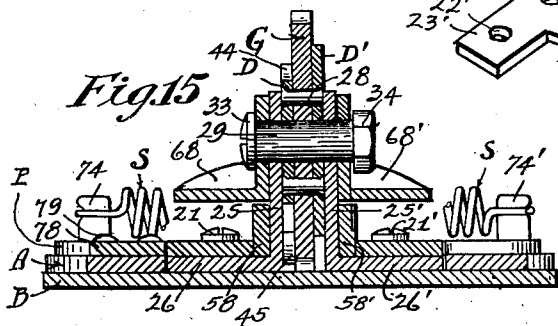


Fig. 21

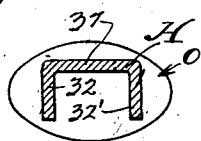


Fig. 20

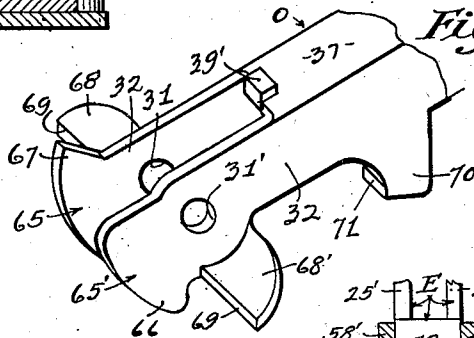


Fig. 18

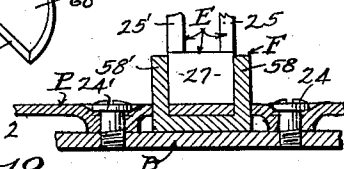


Fig. 16

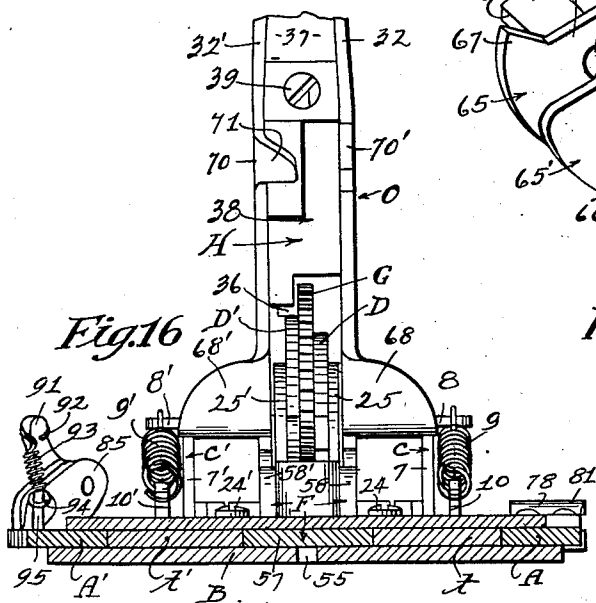


Fig. 19

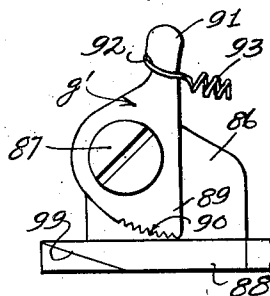
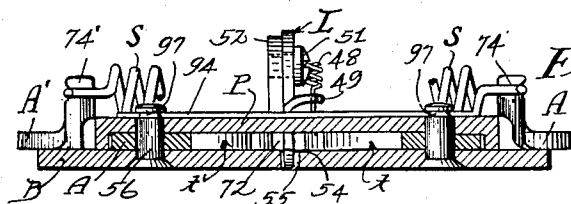


Fig. 17



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WIRE-TYING MACHINE

Application filed December 27, 1926. Serial No. 157,141.

This invention relates to and has for a main object the provision of new and useful improvements in wire tying machines, whereby strands of wire may be stretched tightly around a box or package and the ends thereof twisted together for a plurality of turns, for the purpose of protecting the box during shipment.

Another object is to provide a wire tying machine embodying improved means for initially tensioning the wire preparatory to the twisting thereof, and for subsequently twisting the ends of the wire together for a plurality of turns while the wire is still held in tension.

A further object is to provide improved means for actuating the tensioning and twisting means. Another object is to provide improved means for gripping the ends of the wire whereby the wire may be held in tension during the twisting operation.

A further object is to provide improved means for cutting the wire subsequent to the twisting operation.

Another object is to provide means for holding the wire in tension during the cutting operation, together with means for releasing and restoring the tensioning means to normal position after the cutting operation.

A still further object is to provide a wire tying machine provided with tensioning and twisting means and operating means adapted for movement in one direction for tensioning the wire and for movement in an opposite direction for twisting the wire, said tensioning means being held operative during the movement in both directions of said operating means, and adapted to be released and restored to normal position by the movement of the operating means in the first direction, to normal position.

A particular object is to provide a machine embodying wire tensioning, twisting and cutting means, and a common operating means adapted for operation in a given direction from normal position for operating the tensioning means, thereafter operable in a reverse direction to normal position for operating the twisting means, and operable further in a reverse direction for over-twisting the

wire and cutting the same while it is held under tension, and finally operable in the first direction to normal position for releasing the tension.

Another object is to provide, generally, a satisfactory, economical, convenient and effective machine for gripping, tensioning, twisting and cutting the ends of a piece of wire and for stretching the same around a box or package.

Other and more detailed objects of invention will appear as the description progresses.

In the accompanying drawings I have shown a preferred embodiment of my invention, subject to modification within the scope of the appended claims without departing from the spirit thereof, in which:

Fig. 1 is a plan view of my assembled machine.

Fig. 2 is a right hand side elevation of the same as seen from the left end of Fig. 1.

Fig. 3 is a plan view of the machine with the cover and certain of the operating elements omitted.

Fig. 4 is a front end view of the assembled machine.

Fig. 5 is a fragmentary left hand side elevation, as seen from the left end of Fig. 1, with certain parts omitted.

Fig. 6 is a sectional elevation of the assembled machine on line 6—6 of Fig. 1.

Fig. 7 is an enlarged sectional elevation of the same on line 7—7 of Fig. 6.

Fig. 8 is a fragmentary side elevation with certain parts omitted, of the left hand side of the machine as seen from the front of Fig. 1; and

Fig. 9 is a sectional elevation of the same.

Fig. 10 is an enlarged fragmentary section on line 10—10 of Fig. 7.

Fig. 11 is a perspective view of the bracket forming a support for the operating mechanism of the machine.

Fig. 12 is a perspective view of the wire twisting pinion.

Fig. 13 is a perspective view of the tensioning member.

Fig. 14 is a perspective view of one of the toggles forming a part of the tensioning mechanism.

Fig. 15 is a transverse sectional elevation on line 15—15 of Fig. 2.

Fig. 16 is a transverse sectional elevation on line 16—16 of Fig. 3.

Fig. 17 is a sectional elevation on line 17—17 of Fig. 3.

Fig. 18 is a sectional elevation on line 18—18 of Fig. 3.

Fig. 19 is a front end view of the right hand tensioning arm and wire grip.

Fig. 20 is a fragmentary perspective view of the operating member.

Fig. 21 is a transverse section of the operating handle on line 21—21 of Fig. 1.

Fig. 22 is a fragmentary perspective view of the cover plate.

Briefly described, my improved machine includes a flat base B, on which a pair of tensioning arms A and A' are pivotally mounted and partially enclosed by means of a cover plate P. A bracket E is fixed to the upper side of the base B and rotatably supports a gear G and an operating member O. Said gear has discs D and D' attached thereto for rotation therewith, and a twisting pinion T is rotatably mounted on and between the base B and the bracket E and meshes with and is adapted to be operated by the gear G. A tensioning member F is slidable longitudinally on the base B with respect to the bracket E by means of the engagement therewith of the operating member O, as hereinafter described.

Cutters C and C' are mounted on opposite sides of the bracket E and pinion T, and are pivotally attached to the base B internally of the arms A and A'. Said arms carry on their forward ends wire gripping devices g and g' respectively. As shown in Fig. 3, the arms A and A' are operatively connected with the tensioning member F by means of toggle links t and t', so that when the member F is moved rearwardly over the plate B the arms A and A' will be spread apart for tensioning a wire as at W, held in the gripping devices g and g'.

As hereinafter described in detail, the several elements of the device are so arranged that when the operating member O is moved forward the gear G will be held stationary but the member F will slide rearwardly over the base B for spreading the arms A and A' apart and placing the wire in tension in the pinion T, and when said operating member is moved rearwardly to normal position the gear G will be rotated in a clockwise direction for turning the pinion T and twisting the two ends of the wire W together, the toggles t and t' being moved over the center so as to retain the arms A and A' in their extended positions during the twisting operation. The operation of the member O, however, is continued in its rearward movement beyond normal position in an over-twisting operation, during which additional movement of said member the cut-

ting operation is completed and said member is then restored to normal position by a slight movement forwardly, which serves to release the tensioning arms A and A'.

Just prior to the final movement of operating member O, the cutters C and C' are actuated for cutting the ends of the wire, and thereafter a portion of said member O is adapted to engage a dog L which in turn engages the member F and breaks the toggle joint, for restoring all of the parts to normal, all of which operations will be hereinafter described in detail.

The base B is formed of a sheet metal plate of substantial thickness and strength, and has a centrally formed narrow tongue 1 at the forward end thereof, which has lugs 2, and 2' bent upwardly therefrom at the sides, to which wire guides 3 and 3' of similar form are attached by means of screws 4 and 4'. Said guides have horizontal slots 5, 5' formed therein for receiving a wire W, and said slots are tapered outwardly as shown in Fig. 5.

Cutters C and C' are pivotally supported on the screws 4 and 4' respectively, and are provided with cutting edges 6 which are substantially flush with the upper edges of the slots 5 in the guides 3 and 3', as shown in Fig. 5. Said cutters include vertical portions 7 and horizontally and outwardly bent lugs 8, to which one of the ends of springs 9 and 9' are attached, while the other ends of said springs are attached to lugs 10 and 10' bent upwardly from the cover plate P, as shown in Fig. 1, so as to hold said cutters normally in inoperative position as shown in Fig. 5, shoulders 11 being formed on the rear edges of said cutters for engagement with the upper edge of the base plate B to limit the inward movement of the cutters.

Transversely aligned with the slots 5 of the guides 3 and 3' and the cutters C and C', the tensioning pinion T is rotatably mounted on the base B rearwardly of the front end thereof, as shown in Fig. 10. The bracket E has a pair of upwardly and forwardly bent portions 12 and 12' which rotatably engage the hub portions 13 and 13' of the pinion T, while the portion 1 of the base has a central inclined portion 14 and arcuately formed portions as at 15, also rotatably engaging the hub portions 13 and 13', respectively, of said pinion so that the tensioning pinion T is rotatably mounted between the forward portions of the base B and the bracket E. The teeth 16, 16, etc., of said pinion extend through a slot 17 formed in the bracket E between the portions 12 and 12' thereof, so as to operatively engage the gear G. Said pinion is provided with a radial slot 18, as shown in Fig. 12, in which the wire W is adapted to be seated during a twisting operation, and said slot normally registers with the slots 5 of the wire guides 3 and 3'.

The bracket E is rigidly secured to the

portion 1 of the base B by means of a pair of screws 20 and 20' and additionally by means of screws 21 and 21' which also serve to hold the cover plate P in position. The screws 21 and 21' extend through openings 22 and 22' respectively, in tongues 23 and 23' of the plate P, as shown in Fig. 22. Plate P is further secured to base B by means of screws 24 and 24' which extend through openings formed in said plate rearwardly of the bracket E.

Member E is integrally formed of metal and has a pair of vertically bent side portions 25 and 25' connected just above the base portions 26 and 26' thereof by means of a central transverse portion 27. The side portions 25, and 25' are substantially spaced apart and operatively support the operating member O externally thereof, and the gear G and operating discs D and D' therebetween.

The gear G is centrally mounted between the sides 25 and 25' and has attached to it the discs D and D' on opposite sides by means of pins or rivets 28, said gear and said discs being rotatably carried on a pin 29 which extends through apertures 30 and 30' in the sides 25 and 25' respectively, and which also extends through apertures 31 and 31' formed in the sides 32 and 32', respectively, of the operating member O, as shown in Fig. 20. The head 33 of said pin engages the side 32 of the member O, while a nut 34 is secured to the end of said pin externally of the side 32' of said member, as shown in Fig. 15.

The disc D' is provided with a pair of shoulders 35, 35', at diametrically opposite points on the periphery thereof, which are adapted to be engaged alternately by a plunger 36 which is slidably held on the central portion of a handle H formed on the operating member O, as shown in Fig. 6. Said handle is of channel cross section, with the sides 32 and 32' bent downwardly when in normal position, connected by a web 37, and a bracket 38 is attached to the web 37 in the channel of the handle, by means of one or more screws 39 at the outer end of the bracket, while at the inner end thereof a lug 39' formed thereon is bent upwardly over the end of the web 37. Said bracket has a recess 40 therein with a spring 41 supported therein so as to normally urge the plunger 36 outwardly into contact with the periphery of the disc D'.

Thus, when the several elements of the machine are in the positions shown in Figs. 2 and 6, the handle, upon being moved in a counter-clockwise direction over an arc of substantially 180 degrees, will cause the plunger 36 to move over the eccentric peripheral portions 42 or 43 of the disc D' until the extended end of plunger 36 drops behind the shoulder 35 on the forward side, whereupon an ensuing backward movement of the handle will effect the rotation of the gear G and the resultant rotation of the pin-

ion T. Said gear G is adapted to be rotated for one-half of a revolution at each operation, and the ratio between the gear G and pinion T is such that said pinion will be rotated for about three complete revolutions at each operation of the machine.

On the opposite side of the gear G from the operating disc D' the locking disc D is provided, which has a pair of peripheral notches 44 diametrically opposite each other and engaged by a locking dog 45 which is pivoted at 46 on a pin secured to the side 25 of member E, as shown in Figs. 6 and 11. Said member 45 has a rearwardly and upwardly bent arm 47 to which is attached one end of a spring 48, the other end of said spring being attached to a lug 49 bent outwardly from the lower extremity of a toggle releasing member I, which is pivotally mounted on a screw 51 secured in a lug 52 formed on the plate P.

The form and arrangement of the notches 44 on the locking disc D and the notch engaging end of the dog 45 are such that the rotation of gear G and discs D and D' in a counter-clockwise direction, as seen in Fig. 6, will be prevented so that the members may be readily rotated in a clockwise direction. Also, said notches and dog are so formed that the gear G may be rotated in a clockwise direction during a twisting operation for a distance slightly beyond normal position, so as to provide an over-twist of the wire, and upon the completion of the over-twisting operation, during which operation the cutting of the wires is also effected, the gear G will be restored to normal position and the slot 18 in pinion T will also be restored to normal position after the over-twisting operation, and in registration with the slots 5 of the guides 3 and 3'.

Thus, the spring 48 serves a double purpose, namely to hold the dog 45 in engagement with the disc D and also to hold the member L in the normal position shown in Fig. 2 with the upper arm 53 thereof extended upwardly and forwardly at an angle, and the lower arm 54 thereof extended forwardly in a slot 55 formed in the base B. The dog 45 thus serves to lock the gear G and disc D' against movement while the handle H is being moved forwardly in a tensioning operation, but permits the movement of said members in a clockwise direction as seen in Fig. 6 when said handle is moved rearwardly during a twisting operation.

Now, by reference to Fig. 3, it will be noted that the tensioning arms A and A' are pivotally mounted at their rear ends on screws or pins 56 and 56' which are secured in the base B at points equally spaced on a transverse line from the longitudinal center of the base B, and substantially rearwardly of said base.

The tensioning member F, which is clearly shown in Fig. 13, is integrally formed of sheet

metal with a short flat bottom portion 57, and side portions 58 and 58' bent upwardly at right angles therefrom. The front edges of the sides 58 and 58' are inclined at 59 and the rear edges thereof are inclined at 60, for purposes hereinafter described. The bottom 57 of said member is extended rearwardly from the sides and is provided with transversely opposite semi-circular bearing portions 61 and 61' which are adapted to engage semi-circular recesses 62 and 62', respectively, in the inner ends of the toggle members *t* and *t'*. Said toggle members have semi-circular bearing portions 63 and 63' thereon which are adapted to engage correspondingly formed recesses 64 and 64' formed in the inner sides of the arms A and A', respectively, forwardly of the pivots 56 and 56'.

The sides 58 and 58' of the member F are spaced apart to correspond to and are slidable externally of the sides 25 and 25' of member E, while the bottom portion 57 of the tensioning member F is slidable beneath the portion 27 of member E. Thus, as the member F is moved rearwardly over the base B the toggles *t* and *t'* operate to spread the arms A and A' apart and extend them, as shown in Fig. 3, for the purpose of placing the wire W in tension preparatory to a twisting operation by means of the pinion T. Said member F is moved rearwardly so that the centers of the portions 61 and 61' thereof are rearwardly of a line cutting the centers of the portions 63 and 63' of the toggles. The arms A and A' are thus held in their spread position by the toggle device until released, as hereinafter described.

The movement of the member F over the base B, as just described, is accomplished by means of the operating member O when the same is moved forwardly in a counter-clockwise direction, for the purpose of engaging the plunger 36 with the shoulder 35 of the driving disc D. For this purpose the member O is provided with arcuate portions 65 and 65' having their peripheries concentrically formed with respect to the axis of said member O. The lower extremities 66 of the portions 65 and 65' correspond and are adapted to engage the forward inclined edges 59 of the sides 58 and 58' of member F, as shown in Fig. 8.

It will be noted in this connection that the portions 65 and 65' of the operating member are dissimilar in one respect only, and that is in the extension of the portion 65 of the side 32 at 67 so that the periphery of the portion 65 will remain in engagement with the edge 59 of the side 58 on member F when the operating member O is moved forwardly to a maximum extent, as indicated by broken lines in Fig. 8, while the portion 66 in such case will be disengaged from the side 58' of member F. This prevents the accidental restoration of the device prior to the comple-

tion of a cutting operation, and it also prevents the breaking of the toggle joint hereinbefore described by accidental means.

Member O is provided on opposite sides with outwardly extended arcuately formed lugs 68 and 68' with transverse forward edges 69 which are adapted to engage the rear edges of the cutters C and C', respectively, when the handle H of operating member O is moved downwardly from the normal position shown in Fig. 2 to the position shown in Fig. 6, so that the cutting shoulders, or edges, 6 of said cutters will be swung downwardly for cutting the wire W at points outwardly of the guides 3 and 3'.

It will be understood that said cutters are resiliently held in normal position by means of the springs 9 and 9' and when the operating member O is moved to operate the cutters, said springs are thrown in tension and are so held during the continued downward movement of the handle. Just about the time the cutting operation is completed the disc D will have moved into position so that one of the notches 44 therein will be engaged by the dog 45 for locking the gear G and pinion T against further rotation.

Operating member O is provided rearwardly of the gear G with a pair of downwardly extending lugs 70 and 70' formed as continuations of the sides 32 and 32' respectively. The lug 70' serves to limit the downward movement of the member O by means of its engagement with the upper surface of plate P, while the lug 70 has an inwardly and right angularly bent end portion 71 (see Fig. 16) which, on the downward stroke of the handle H, engages the arm 53 of member L and moves said arm downwardly to the position shown in broken lines in Fig. 2, until the portion 71 of lug 70 moves beneath said arm 53, whereupon the portion 71 engages the lower side of arm 53 and rotates the member L in a clockwise direction so that the depending arm 54 thereon will move forwardly in the slot 55 of base B into forcible engagement with the rear edge 72 of member F, between the portions 61 and 61' thereof. Thus member F is forced forwardly and serving to break the toggle joint and restore the arms A and A' inwardly to their normal positions by means of the tension of a main spring S, which is attached at its ends 73 and 73', respectively, to upstanding lugs 74 and 74' formed on the arms A and A', respectively.

This restoration of the mechanism to normal position, it will be understood, is effected only after the cutting operation is completed, and the operation of the handle H upwardly subsequent to the breaking of the toggle joint and the restoration of the arms A and A' continues only until the normal position of the handle, shown in Fig. 2, is reached, at which position the cutters C and C' are also re-

stored to normal position by the tension of the springs 9 and 9'.

The arms A and A' while similar in operation, are slightly dissimilar in the arrangement at their forward ends for the purpose of providing sets of wire grips on the ends of said arms, whereby the opposite ends of a wire to be twisted around a package may be firmly gripped and held during the tensioning, twisting and cutting operations. The arm A is provided with a gripping dog *g* mounted on a pin 76 between the forward end 77 of the arm and a plate 78 which is attached at its rear end to said arm by means of a pair of screws or rivets 79. The plate 78 is bent upwardly at 80 and thence over the grip *g* at 81, so as to provide a recess between the arm A and plate 78 in which the member *g* is mounted.

The gripping member *g* is provided with a curved, forwardly extended arm 82 and a serrated arm 83 rearwardly of its pivot pin 76, so that one end of the wire *W* to be twisted may be bent around the curved end of the arm 82 in contact with the serrated portion 83, and in engagement with a pin 84 which is secured in the arm A and plate 78. A stretching of the wire *W* thence transversely through the guides 3 and 3' and pinion T will serve to effect a tight gripping of the end of said wire between the member *g* and the pin 84. The other end of the wire, as at *W'* is gripped and held on the arm A' by a substantially similar gripping member *g'* which is arranged in a slightly different manner, as follows:

The forward end of the arm A' has an upwardly bent lug 85 to which is attached an angle member having a correspondingly bent lug 86 attached to the lug 85 by means of a screw 87, and a horizontal lug 88 bent therefrom in the plane of the arm A' and forward extension thereof. The screw 87, as shown in Fig. 19, serves to pivotally support the gripping member *g'* in vertical position, and said member has a downwardly extending cam-like portion 89 with serrations 90 on the lower edge thereof, and an upwardly extended portion 91 to which an end 92 of a spring 93 is attached. The other end 94 of said spring is attached to a lug 95 which is bent upwardly from the forward portion of the arm A', as shown in Figs. 1 and 2. Said spring thus serves to hold the gripping member *g'* in a substantially vertical position, as shown in Fig. 19, with the lower edge 90 thereof engaging the upper surface of the portion 88 of arm A'. It will be noted that the member *g'* is supported at an angle of approximately 45 degrees for the purpose of conveniently forcing the end *W'* of a wire under the portion 89 of the gripping member and between said member and the portion 88 of the arm A', against the tension of the spring 93.

It will be seen by reference to Figs. 1 and 2, that the toggle mechanism is enclosed by means of the base B and plate P, and said plate P is held in position on the base B by means of the screws 24 and 24' and by means of a thin sheet metal strip 94 which overlies the plate P and has arcuately formed end portions 95 and 95', respectively, with slots 96 formed therein and adapted to engage annular grooves 97 in the pins 56 and 56' as shown in Figs. 1 and 17.

It will also be observed that the cover P is provided with spaced longitudinal slots 97 and 97' which permit the movement of the sides 58 and 58' and of member F rearwardly therein. Also, said cover is provided with transverse slots 98 and 98' through which the lugs 74 and 74', respectively, on the arms A and A' are extended, as shown in Fig. 1.

In operation, the machine is placed on a crate or box to be tied, and a wire is drawn under the box or crate, around the sides thereof and up over the top in overlapping relation, so that, as seen from the front of the machine, the wire from the right hand side of the box will pass under the beveled portion 99 on the forward end of arm A', as shown in Fig. 19, and thence through the slot 5 over the guide 3, thence through the slot 18 of pinion T, thence through slot 5 of guide 3, where the end of the wire will finally be threaded between the gripping device *g* on the arm A and the pin 84, as at *W* in Fig. 3. The other or left hand end of the wire will be threaded through the slot 5 of wire guide 3, slot 18 of pinion T, slot 5 of pinion 3', and thence forced under the gripping device *g* and between the serrated edge 90 thereof and the upper side of portion 88 of arm A'.

When the ends of the wire are so gripped and held in the machine as described, the operating member O is moved in a counterclockwise direction with the plunger 36 moving over one of the peripheral portions 42 or 43 of the driving disc D' until a position indicated by broken lines in Fig. 2 is reached, when the extended end of said plunger 36 will drop behind upon the notches 35 in said disc D'.

The initial movement of the member O in the direction stated will effect the engagement of the portions 66, 66 of the concentric ends 65 and 65' with the forward inclined portions 59, 59 on the member F, thus moving the member F rearwardly as the operating member O is moved forwardly until the extreme rearward position of the member F is reached, as shown in Fig. 3, for setting the toggle joint over center. The movement of the member F rearwardly by means of the toggle connection described, effects the spreading of the arms A and A' and the consequent tensioning of the wire by means of the gripping of the ends *W* and *W'* in the

devices g and g' , respectively. The ensuing rearward or clockwise movement of the operating member O for one-half of a revolution rotates the gear G, driving disc D' and locking disc D in a corresponding direction, and at the same time rotates the twisting pinion T in a reverse direction and for substantially three revolutions.

At the beginning of the reverse movement of the operating member O, the locking dog 45 is disengaged from one of the notches 44 in the disc D, and said dog rides upon the concentric periphery of the disc D until the other of said notches is brought into registration with the dog for relocking the disc against further movement. When substantially one-half of a revolution of the gear G is effected the portions 68 and 68' of the operating member engage the rear edges of the cutters C and C', respectively, and serve to cut the opposite ends of the wire during the continued rotation of the gear in a clockwise direction and the continued downward movement of the operating member O. At about the time the lug 70 engages the arm 53 of the member L, the cutting operation is completed, and the locking dog 45 follows into the other of the notches 44 in the disc D.

The movement of the member O is continued downwardly until stopped in its movement by the engagement of member 71 with the plate P. This further and final movement of member O serves to effect the movement of the lug 71 by and to a position beneath the arm 53 of member L, so that due to the tension of the springs 9 and 9' connected with the cutters which cause the cutters to bend against the portions 68 and 68' on the operating member O, the operating member O when released will move upwardly again until a normal position, indicated in Fig. 2, is reached. Thus the depending arm 54 of member L moves forwardly against the edge 72 of member F, and this action breaks the toggle joint by moving the members t and t' forwardly of the center, so that the tension of the main spring S is effective for restoring the arms A and A', pinion T and other associated parts to normal position and in readiness for another tying operation.

By reference to Fig. 7, it will be noted that the mechanism described will twist the wire W at two different points, namely, 100 and 101, for substantially three complete turns, and said twisted portions at the completion of a tying operation will be separated by the parallel transverse portions of the wire portions W and W' which are seated in the slot 18 of the pinion T. The cutter C serves to cut the innermost end of the wire, while the cutter C' cuts the outermost end, thus completing a neat tie and severing the portion of wire around the package from the reel of wire from which the tie is made.

The over-twisting of the wire in the final

movement of the operating member O and pinion T serves to provide a net of three complete turns or twists of wire, and to compensate for the natural tendency to un-twist due to the tension of the wire after the same has been released from the machine.

In the consideration of this invention, it will be observed that I have provided a neat, compact, simple, economical and efficient machine for neatly tying packages, capable of being made in different sizes according to the requirements of use, and especially designed to be stamped out of sheet metal and formed of a minimum number of parts, free from complicated connections and easily maintained.

What I claim is:

1. A wire tying machine comprising in combination wire tensioning, twisting and cutting means, operating means movable in one direction to actuate the tensioning means and movable in a reverse direction to actuate both the twisting and cutting means, and means apart from the operating means for holding the tensioning means operative during the cutting operation, said operating means including a reciprocable member connected with the tensioning means.

2. A wire tying machine comprising a pair of tensioning members for engagement with opposite portions of the wire, a reciprocable member intermediate said tensioning members, a toggle connection therebetween, an operating device, twisting means operably connected therewith, said operating means being operable when moved in a given direction for operating said tensioning members, and when moved in an opposite direction for operating said twisting means.

3. A wire tying machine comprising a pair of tensioning members for engagement with opposite portions of the wire, a reciprocable member intermediate said tensioning members, a toggle connection therebetween, an operating device, twisting means operably connected therewith, said operating means being effective when moved in a given direction for operating said tensioning members, and when moved in an opposite direction for operating said twisting means, and means effective on the movement of the operating member again in the first direction to normal position for restoring said tensioning members and said reciprocable member to normal position subsequent to the twisting operation.

4. A wire tying machine comprising a pair of tensioning members for engagement with opposite portions of the wire, a reciprocable member intermediate said tensioning members, a toggle connection therebetween, an operating device, twisting means operably connected therewith, said operating means being effective when moved in a given direction for operating said tensioning members, and when moved in an opposite direction to

an extent beyond normal position for operating said twisting means, means for restoring said tensioning members and said reciprocable member to normal position, on the movement of the operating member in the first direction to normal position, and cutting means operable at the completion of a twisting operation prior to such restoration and by said operating mechanism, for the purpose described.

5. A wire tying machine including an actuating mechanism, wire twisting means operable thereby, an operating member associated with said actuating mechanism, a pair of wire tensioning members arranged to grip and hold the opposite ends of a strand of wire in twisting position, a slide operable by said operating member, toggles connecting said slide with said tensioning members, said operating member connecting said actuating mechanism and said tensioning members and movable in a given direction to spread said tensioning members, and movable in a reverse direction to operate said twisting means.

6. A wire tying machine including an actuating mechanism, wire twisting means operable thereby, an operating member associated with said actuating mechanism, a pair of wire tensioning members arranged to grip and hold the opposite ends of a strand of wire in twisting position, a slide operable by said operating member, toggles connecting said slide with said tensioning members, said operating member connecting said actuating mechanism and said tensioning members and movable in a given direction to spread said tensioning members, and movable in a reverse direction to operate said twisting means, and cutting means for opposite portions of said wire, operable by said operating member at the completion of the twisting operation.

7. A wire tying machine including an actuating mechanism, a wire twisting means operable thereby, an operating member associated with said actuating mechanism, a pair of wire tensioning members arranged to grip and hold the opposite ends of a strand of wire in twisting position, said operating member connecting said actuating mechanism and said tensioning members and movable in a given direction to spread said tensioning members, and movable in a reverse direction to operate said twisting means while the tension means is effective, a slide operable by said operating member, a toggle device connecting said slide with said tensioning means and cutting means for opposite portions of said wire, operable by said operating member at the completion of the twisting operation, and means also operable by said operating member at the completion of the cutting operation for restoring said tensioning members to normal position.

8. A wire tying machine including a base, a pair of arms pivotally mounted on opposite

sides of said base, a slide centrally mounted and reciprocable centrally between said arms, a toggle connection between said arms and said slide for spreading said arms when said slide is moved in a given direction, and for retracting the same to normal position when the same is moved in an opposite direction, wire gripping devices mounted on the free ends of said arms for holding the opposite ends of the wire when said arms are operated, an actuating mechanism mounted intermediate said arms and adapted to engage said slide for spreading and retracting the arms, and a twisting mechanism operably connected with said actuating mechanism for twisting the intermediate portion of said wire while said arms are spread apart.

9. A wire tying machine including a base, a pair of arms pivotally mounted on opposite sides of said base, a slide centrally mounted and reciprocable centrally between said arms, a toggle connection between said arms and said slide for spreading said arms when said slide is moved in a given direction, and for retracting the same to normal position when the same is moved in an opposite direction, wire gripping devices mounted on the free ends of said arms for holding the opposite ends of the wire when said arms are operated, an actuating mechanism mounted intermediate said arms and adapted to engage said slide for expanding and retracting the arms, a twisting mechanism operably connected with said actuating mechanism for twisting the intermediate portion of said wire while said arms are spread apart, and a pair of cutters mounted intermediate said arms and on said base, and operable by said actuating mechanism for cutting the opposite portions of said wire at the completion of a twisting operation.

10. A wire tying machine including a base, an actuating member rotatably mounted thereon, a driving member and a locking member attached to its opposite sides, an operating arm having yieldable means engaging said driving member, a yieldable dog engaging said locking member, a pinion operably connected with said actuating member and rotatably mounted on said base, said pinion having a radial slot formed therein for the reception of two portions of wire to be twisted together, a pair of outwardly movable arms pivotally attached to said base rearwardly of said actuating member for gripping and holding the ends of said wire during a tensioning and twisting operation, and means actuated by said operating member for spreading said arms apart when said actuating member is moved in a given direction, and for twisting said wire and cutting the same at the completion of the twisting operation, when said actuating member is moved in a reverse direction.

11. A wire tying machine comprising a tensioning device including a base, a pair of

pivotally held tensioning arms, spring means for normally holding said arms in retracted position, a reciprocable member on said base intermediate said arms, toggle members connecting said reciprocable member with said arms, and an actuating mechanism including an arm having means thereon engaging portions of said reciprocable member for extending said arms during a tensioning operation, said toggle connections being arranged to hold said arms in extended position when said actuating means is disengaged from said reciprocable member.

12. A wire tying machine comprising a tensioning device including a base, a pair of arms pivotally mounted at their rear ends on said base, a slide reciprocably mounted intermediate said arms on said base, toggle connections between said slide and said arms, means for resiliently connecting said arms, gripping devices mounted on the free ends of said arms for holding a wire to be placed in tension, and an operating member arranged for engagement with and for retracting said slide in a tensioning operation when the operating member is moved in a given direction, and means for holding said slide retracted while the operating member is moved in a reversed direction.

13. A wire tying machine including a base, tensioning arms mounted on said base, an actuating mechanism rotatably mounted on said base, rotatable twisting means operably engaging said actuating mechanism, a longitudinally reciprocable slide, a toggle device connecting said slide and said arms, cutting means operable at completion of the twisting operation, and means associated with said slide and operable at the completion of the cutting operation for restoring the mechanism to normal.

14. In a package tying tool, a pair of wire engaging heads adapted to be moved apart to tension a wire, a spring opposing such movement, a slide, means connecting the slide with said heads, an actuating lever arranged to move the slide in the direction to separate the heads and to move the connecting means past dead center position whereby the heads are held in separated position against the action of the spring, and means carried by the lever for moving said slide to permit the spring to return the heads to adjacent position.

15. In a package tying tool, a pair of wire engaging heads adapted to be moved apart to tension a wire, a slide movable backwardly to separate said heads, an actuating lever, means operative upon forward movement of said lever from normal position for moving said slide backwardly to locked position, means operative by the backward movement of the lever through normal position for twisting and cutting the wire and means operated on the subsequent forward movement

of the lever to normal position for unlocking the slide.

16. In a package tying tool, a gear, a notched disc secured to said gear, an actuating lever, a pawl carried by said lever and engaging said disc, a second notched disc secured to said gear, the notches of the second disc being opposed to those of the first disc and a pawl engaging said second disc.

17. In a package tying tool, a frame, a gear journaled on said frame, an actuating lever for said gear, a disc having two diametrically disposed notches secured to said gear, a pawl carried by the lever and engaging the disc, a second ratchet wheel having two diametrically disposed notches secured to said gear, said notches being opposed to the teeth on the first disc, and a pawl pivoted to the frame and engaging said second disc, whereby the gear is given a unidirectional movement by reciprocation of the actuating lever.

18. A wire tying machine comprising a pair of wire tensioning arms, a slide retractible for spreading said arms apart, rotatable wire twisting means, and wire cutting means, a single operating member for operating the wire tensioning, twisting and cutting means, means associated with said operating member for tensioning the wire and for moving and locking said slide in the initial movement thereof, means whereby a continuing forward movement of the operating member will render the twisting means operative and a succeeding rearward movement of the operating member to normal position will twist the wire, means operative on a continuing rearward movement of the operating member beyond normal position will cut the wire, and means for restoring all of said means to normal position by a succeeding forward movement of the operating member.

19. A wire tying machine comprising in combination, wire tensioning, twisting and cutting means, operating means movable forwardly to actuate the tensioning means and movable backwardly to normal position to actuate the twisting means and backwardly beyond normal position to actuate the cutting means, and means independent of the operating means for holding the tensioning means operative during the cutting operation.

20. A wire tying machine comprising in combination, wire tensioning, twisting and cutting means, operating means movable forwardly to actuate the tensioning means and movable backwardly to normal position to actuate the twisting means and backwardly beyond normal position to actuate the cutting means, and means independent of the operating means for holding the tensioning means operative during the cutting operation, said operating means being finally movable forwardly to normal position for releasing the tensioning means.

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