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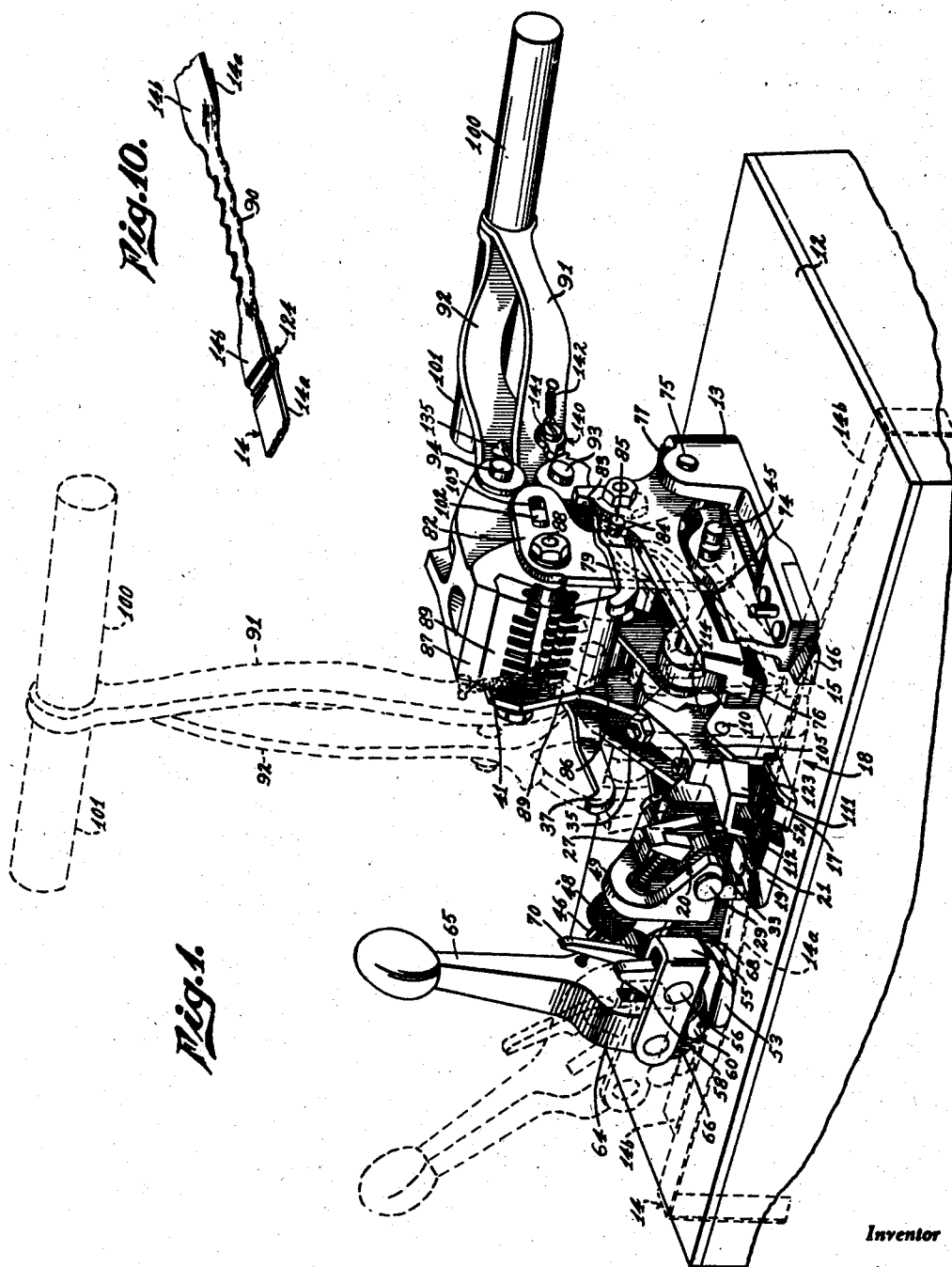
L. M. HARVEY

1,996,202

TYING MACHINE

Filed Jan. 10, 1934

5 Sheets-Sheet 1



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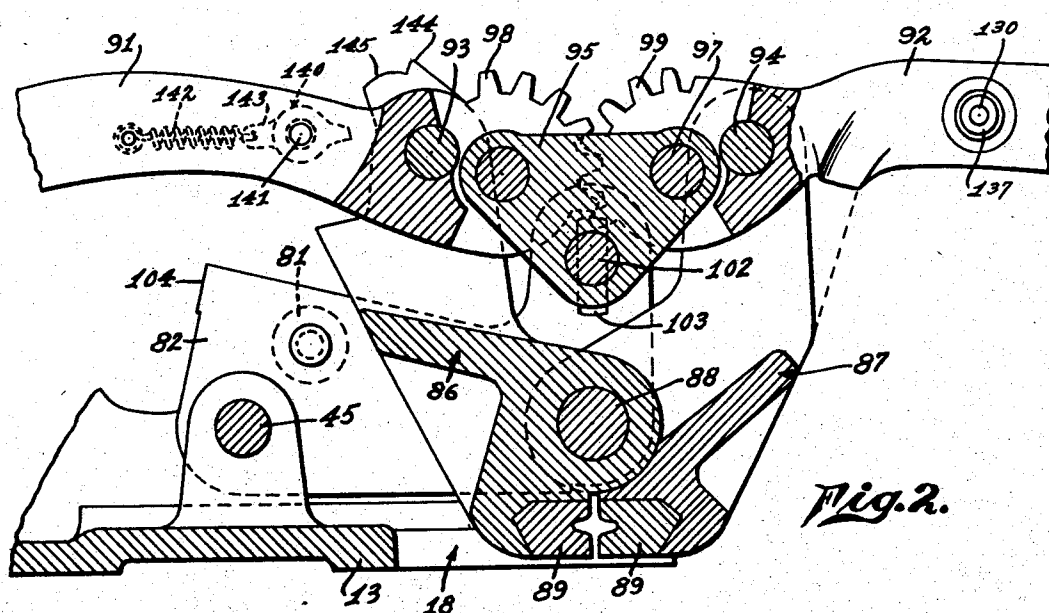
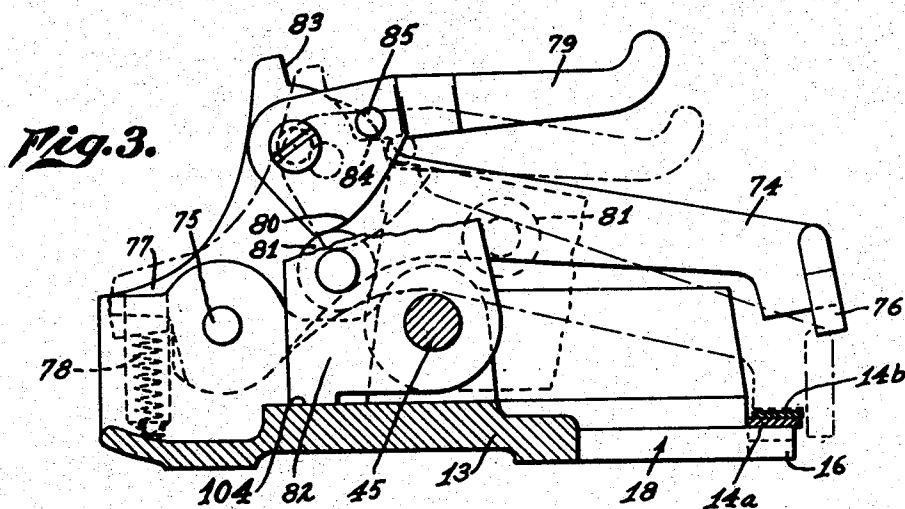
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5 Sheets-Sheet 2



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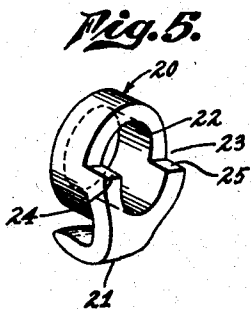
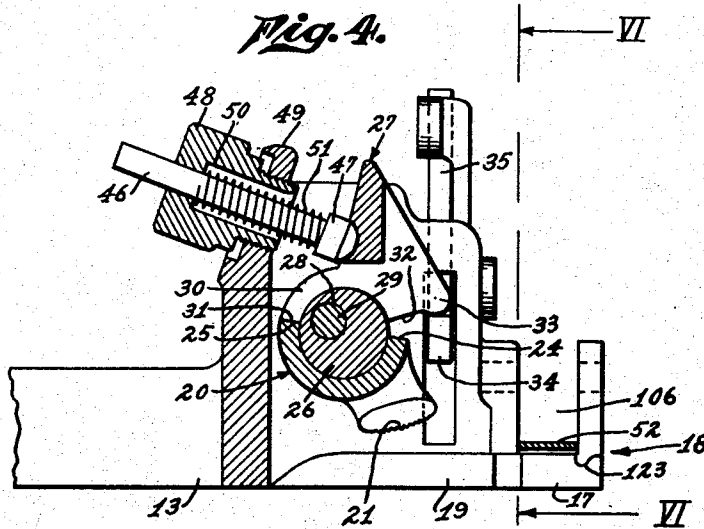
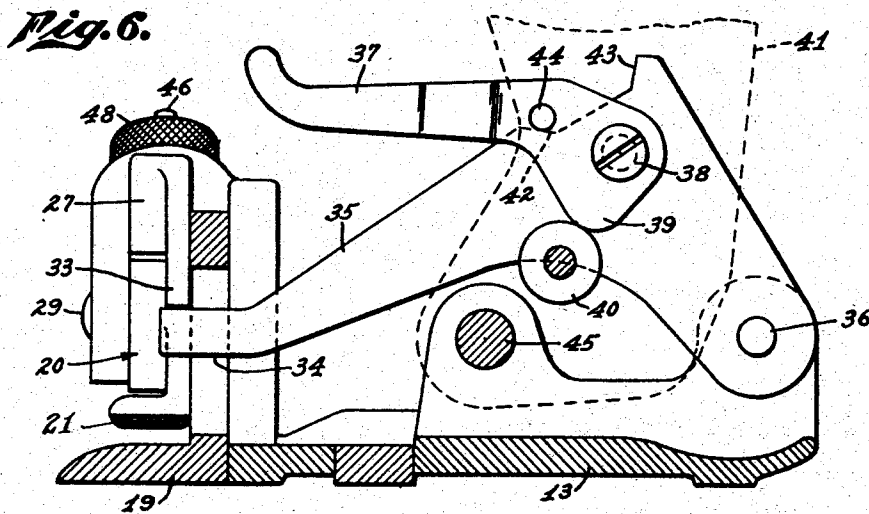
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TYING MACHINE

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5 Sheets-Sheet 3



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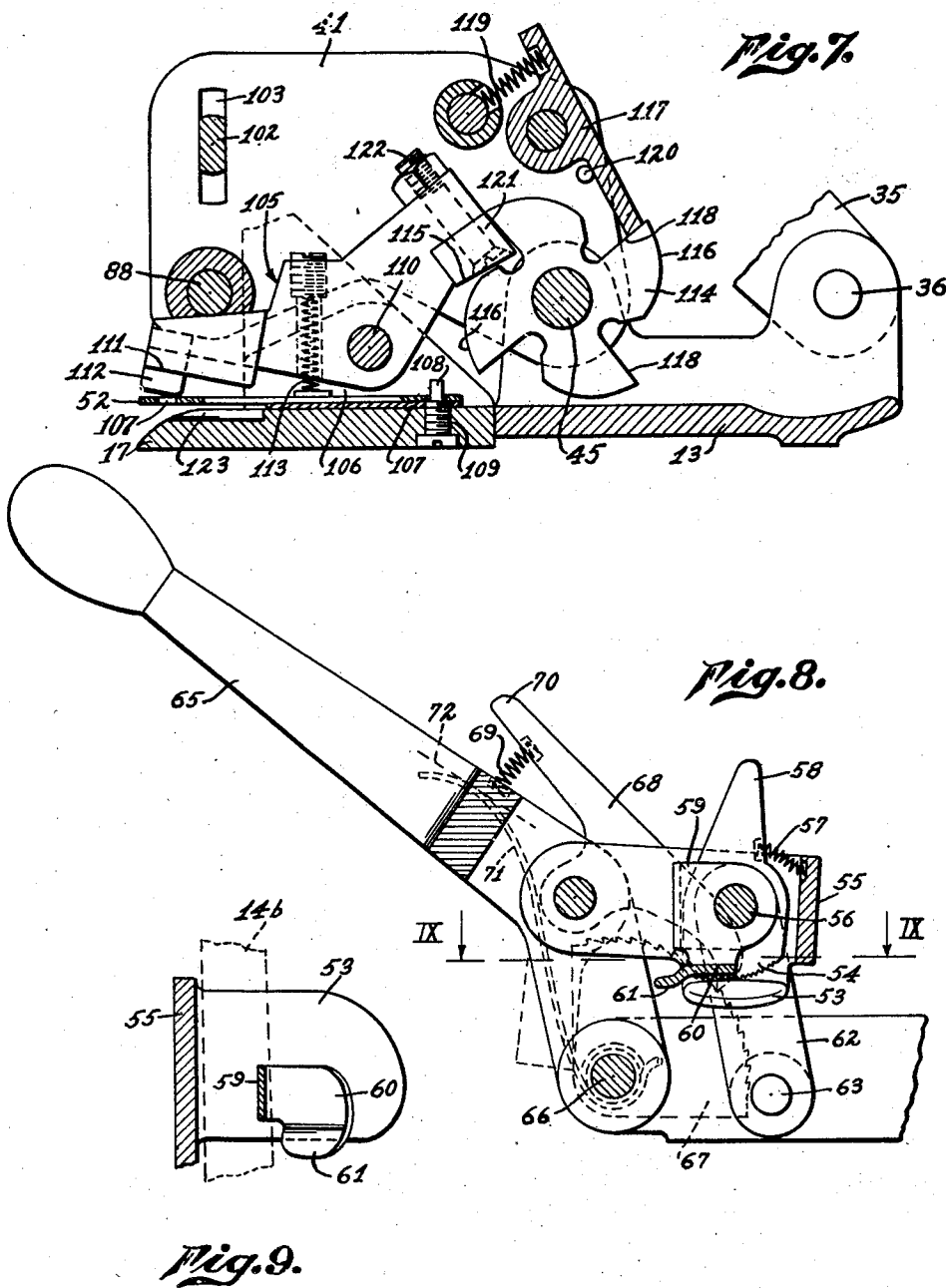
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TYING MACHINE

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5 Sheets-Sheet 4



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TYING MACHINE

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5 Sheets-Sheet 5

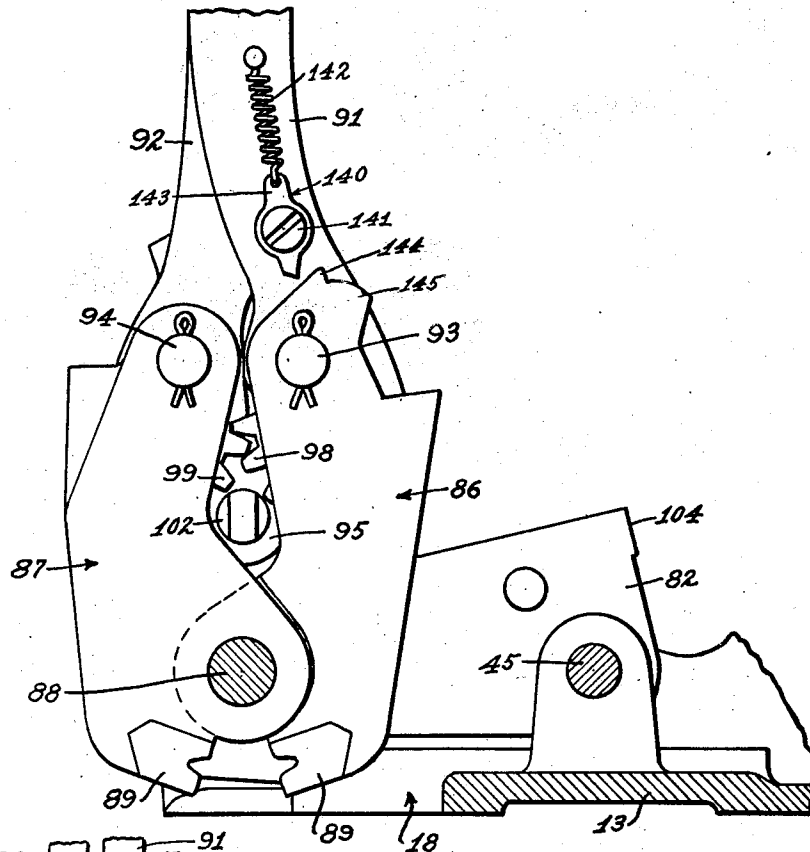


Fig. 11.

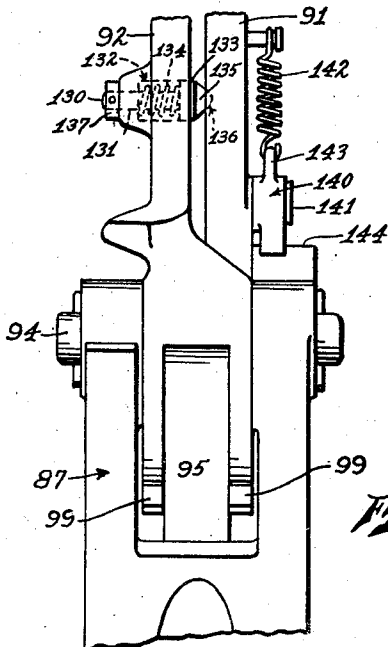


Fig. 12.

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UNITED STATES PATENT OFFICE

1,996,202

TYING MACHINE

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Application January 10, 1934, Serial No. 706,059

7 Claims. (Cl. 81—9.1)

This application is a continuation in part of my co-pending application, Serial No. 680,641, filed July 15, 1933.

This invention relates to a tying machine, and more particularly to a portable manually operable machine for tensioning and then tying the tensioned band about boxes, bundles or other objects.

This invention will be illustrated and described in its preferred embodiment for applying flat bands to boxes, but it is to be understood that many of the novel features of the invention are applicable to round wire tying machines, and that with slight modifications of the gripping and tying means, the machine may be adapted to apply round wire bands.

It is an object of this invention to provide a light, portable machine which may be handily moved from one box to another, but if desired may be mounted relatively stationary and the boxes moved to the machine.

A further object is to hingedly mount the tying means upon the machine frame for movement to and from the tying position, and for utilizing this motion for actuating the band cutter and crimper, latch release and the means for actuating the first gripper to its open position.

A further object is to provide a simple and effective means for actuating the tying means, and also for maintaining the tying means located centrally over the tie during the tying operation.

A further object is to provide the tying means with a device which will require the tying cycle to be completed before these means may be returned to their full open position for releasing the tied band.

A further object is to provide the two actuating handles with a detent latch means, whereby these handles will be releasably locked together to act as one unit while swinging with the tying jaws to and from tying position, but which may be released at the start of the tying operation.

A further object is to provide means operable for preventing the discharge of the band from the tying jaws until the tie has been fully formed.

Other objects and advantages of the invention will become apparent as the nature of the same is more fully understood from the following description and accompanying drawings, wherein is set forth what is now considered to be a preferred embodiment. It should be understood, however, that this particular embodiment of the invention is chosen principally for the purpose of exempli-

fication, and that variations therefrom in details of construction or arrangement of the parts may accordingly be effected, and yet remain within the spirit and scope of the invention as the same is set forth in the appended claims.

In the drawings:

Figure 1 illustrates a perspective view of the tying machine of this invention.

Figure 2 illustrates on enlarged scale a fragmental sectional view of the tying means when actuated to the tying position.

Figure 3 illustrates a sectional view taken between the tying means and supporting hinge therefor, and having the major portion of the hinge broken away so as to more fully show the latching means and actuating mechanism therefor.

Figure 4 illustrates an enlarged fragmental sectional view of the first gripper.

Figure 5 illustrates a perspective view of the first gripper band gripping member.

Figure 6 illustrates a sectional view taken substantially in the plane of lines 6—6 of Fig. 4.

Figure 7 illustrates a sectional view of the invention taken between the band cutter and tying means and looking in the direction of the cutter.

Figure 8 illustrates partially in section a view of the band tensioning means.

Figure 9 illustrates a fragmental sectional view taken substantially in the plane of line 9—9 of Fig. 8.

Figure 10 illustrates in perspective a view of the crimped end of the finished tie.

Figure 11 illustrates a fragmental side view of the pawl and ratchet device for preventing the release of the band from the tying jaws until it has been completely tied.

Figure 12 illustrates a front view of Fig. 11 showing the latch means for the operating handles.

The preferred organization of the features of this invention is illustrated in the drawings as disclosing a portable tying machine which may be easily and readily moved from one article to be banded to another.

In Fig. 1 the machine is illustrated as being placed upon the cover of a box 12 at the location at which the band is to be tensioned and tied. The base or frame 13 of the machine may be of such size and shape as to be firmly and squarely mounted upon the box, and the base may be provided with appropriate bosses and bearings for operatively supporting the band gripping, tensioning, tying and cutting means thereon.

After the machine has been positioned at the

tying location, a band 14 of suitable length may be selected and the initial end 15 thereof positioned upon the band locating horn 16, which horn may be formed integral with or suitably mounted upon the base of the machine, as illustrated in Fig. 1. Next the band may be placed over the crimping anvil or die 17, which die may be mounted upon the frame or formed integral therewith, and positioned thereon in spaced relation from the band locating horn 16, to provide a band tying zone or space 18 into which the tying means may be moved.

This first end of the band, may be conveniently referred to as the initial lap 14a of the band and may be next placed over the first gripper anvil 19, which anvil may be formed upon the machine frame adjacent and in alignment with the crimping die, or may be formed of a separate piece (Fig. 6) and suitably fastened thereto.

Means may be provided for securely clamping the initial lap of the band upon anvil 19, which means may include a gripper dog 20 having a serrated gripping surface 21 arranged to cooperate with the anvil to securely clamp the band therebetween. The gripper dog may be provided with a transverse cylindrical bore 22 of relatively large diameter, and having a portion thereof cut away or stepped, as at 23, so as to form the stop shoulders 24 and 25. The bore 22 of the gripper dog may be nicely journaled upon the spindle 26 of the gripper dog control lever or driver 27, which lever may be provided with a transverse bore 28 of less diameter and extending through the spindle thereof in eccentric relation thereto for pivotally mounting the said lever upon the machine frame, as by means of the pivot pin 29. The lever arm 30 of the gripper driver 27 may be of such size and shape as to fit into the cut-away section 23 of the gripper dog, and may be provided with stop shoulders 31 and 32, arranged to cooperate with the stop shoulders 24 and 25 thereof. It may be noted from Fig. 4, that when driver 27 is rotated with relation to the gripper dog until the stop shoulder 31 thereof is brought into engagement with the stop shoulder 25 of the gripper dog, that the stop shoulders 32 and 24 will have been moved apart for a predetermined distance.

To facilitate the placing of the initial lap of the band within the first gripper, the gripping dog 20 may be releasably maintained in its retracted or open position by suitable gripper control means, which means is most clearly illustrated in Figs. 4, 5 and 6, wherein it may be observed that the gripper dog driver 27 is provided with a finger 33 adapted to ride upon the forward end 34 of the lever arm 35, which arm at the rear end thereof may be pivotally mounted upon the frame, as at 36. A forwardly extending trigger 37 may be pivotally mounted, as at 38, to the lever arm 35, and may be provided with a cam portion 39 adapted to ride upon the cam roller 40 operatively carried by the hinge member 41 indicated by broken lines in Fig. 6, as this hinge member lies just outside the plane of the sectional view of Fig. 6.

The lever arm 35 may be provided with stop shoulders 42 and 43 for limiting the travel of the stop pin 44 carried by the trigger and thereby the extent of swing of the trigger.

The hinge member 41 may be journaled upon shaft 45, and may be arranged to operatively carry the tying means, and said hinge means may be actuated about shaft 45 as a center to carry the tying means to or from the tying position.

During the swing of the hinge member while carrying the tying means from the tying position, the cam roller 40 also carried thereby will be brought into engagement with the cam surface 39 of the trigger, whereby the forward end 34 of the lever arm 35 will be lifted to the position, as illustrated in Figs. 4 and 6, to thereby rotate the gripper control lever 27 in a counter-clockwise direction as viewed in Fig. 4. The rotation of the gripper control lever will bring shoulder 31 thereof into engagement with shoulder 25 to rotate the gripper dog into its open position, as illustrated in Figs. 4 and 6.

Adjustable spring means may be provided for yieldingly maintaining the gripper control lever in operative engagement with the forward end 34 of the lever arm 35, which spring means may include a spring weighted plunger 46 having a semi-spherical head 47 bearing in a correspondingly shaped depression formed in the gripper control lever 27, while the opposite end of the plunger may be slidably mounted in a suitable adjusting thimble 48, which thimble may be screw-threaded through the upper portion of a suitable frame bracket, as at 49. The thimble may be counterbored, as at 50, to receive one end of a suitable spring 51, which spring may surround the plunger and act between the inner end of the counterbored section of the thimble and the head of the plunger to yieldingly urge the gripper control lever 27 to rotate in a clockwise direction, as viewed in Fig. 4.

After the initial lap 14a of the band has been placed within the first gripper, the gripping dog thereof may be released to rotate under the influence of the spring means for securely clamping the band therein. To release the gripper, the trigger 37 may be lifted until the cam surface 39 thereof will roll off the cam roller 40, thus removing the supporting means for the forward end 34 of the lever arm 35, whereupon due to the action of the spring means 51, the gripper control lever will rotate in a clockwise direction.

The gripper dog will follow the rotation of the control lever until the serrated gripping portion thereof will engage the band, whereupon further rotation of the gripper dog will be stopped until the stop shoulder 32 of the control lever will have engaged the corresponding shoulder 24 of the gripper dog, whereupon the gripper may be further rotated into gripping engagement with the band. It may be well to note from Fig. 4, that the movement of the control lever with relation to the gripper dog will cause, due to the eccentric mounting of these parts, the gripper dog to be thrust downwardly in the direction of the gripper anvil, and thus the band may be very tightly clamped in the gripper before or at about the same time that the stop shoulder 32 of the control lever will have reached the stop shoulder 24 of the gripper dog. This latter feature is of more importance during the releasing operation of the gripper, as it permits the serrations to be lifted substantially out of mesh with the indentations formed thereby in the band, and thus the rotation of the gripper dog may be made more easily as the serrations thereof do not have to cut through these indentations as would be the case were the eccentric connection not provided.

Now that the initial end 14a of the band has been securely gripped in the first gripper, the remaining portion thereof may be passed under the second or movable gripper anvil as may be observed in Fig. 1, and then placed around the

box 12 and to appear again as the final lap 14b, which final lap of the band may be successively placed over the initial end of the band, carried by the horn 16, over the stationary cutter blade 52, over the serrated gripping 21 of the first gripper, and finally over the second gripper anvil 53, and securely gripped thereon by means of a gripper dog 54.

The second gripper anvil 53 may be carried by the reciprocating frame 55 (note Fig. 8) of the tensioning means. The frame 55 may be formed in the shape of a U and the gripper dog 54 may be operatively mounted between the two sides of the frame by means of the pivot pin 56.

The gripper dog 54 may have a gripping surface eccentric to the center of rotation thereof, and also serrated whereby the greater the pull upon the band toward the right, as viewed in Figs. 1 and 8, the greater will be the gripping effect of the dog. A spring 57 may act between the gripper dog and frame to yieldingly maintain the gripping dog in gripping relation with the anvil. The gripper dog 54 may be provided with a thumb piece 58 for manually actuating the dog to its open position. However, if desired, means may be provided which will act to automatically swing the gripper dog to its open position, which means may include a U-shaped member 59 of such size as to straddle the gripper dog and to be journaled upon the pivot pin 56. The member 59 may be provided with a forwardly projecting portion 60 having a tapered cam surface 61 positioned to be engaged by the band during the placing of the same in the gripper for actuating the gripper to its open position. Simultaneously with the arrival of the band at its gripping position, it passes beyond the influence of the tapered cam surface 61, thus removing the means for supporting the gripper in its open position, whereupon the spring means 57 will be free to rotate the gripper dog 54 into its gripping engagement with the placed band.

The second gripper may be mounted for movement with relation to the frame for tensioning the band about the box, which movable mounting means may include a link 62 operatively connected at one end thereof to one end of the gripper frame 55 by means of the pivot pin 56, and at its other end to the machine frame as by a suitable pivot pin 63, while the other end of the gripper frame may be operatively connected to one of the legs 64 of the bifurcated tensioning lever 65. The tensioning lever 65 may be pivotally mounted upon the frame as by the pivot pin 66, and would normally be positioned as illustrated in full lines in Fig. 1 during the placing of the final lap 14b of the band therein, whereupon by swinging the tensioning lever toward its broken line position, as illustrated in the same figure, the band may be tightly tensioned about the box.

Means may be provided to releasably lock the tensioning lever in its actuated position and thereby retain the tension in the band, which means may include a ratchet 67 (Fig. 8) mounted upon the machine frame, and a cooperating pawl 68 operatively carried by the tensioning lever and a spring means 69 for yieldingly urging the pawl into engagement with the ratchet. The pawl may be provided with a handle 70 for the convenience of releasing the pawl from the ratchet when it is desired to return the tensioning lever to its full line position, as illustrated in Fig. 1, for the next tensioning operation. A torsional spring 71 may be provided for yieldingly urging the tensioning lever to its starting posi-

tion, which spring means may be mounted upon the pivot pin 66 and having one end connected to the frame while the other end thereof may engage the tensioning lever, as at 72.

Means may be provided for latching the initial and final laps of the band onto the band locating horn 16, which latching means may include a latch lever 74 (Figs. 1 and 3) pivotally mounted upon the machine frame, as at 75, and having an angular offset section 76 at the forward end thereof, adapted to latch over the two laps of the band placed over the locating horn 16 as is clearly illustrated in Figs. 1 and 3, while the rear thereof may be provided with a finger 77, against the under side of which the spring means 78 may act to yieldingly urge the latch lever into band latching position. Means may be provided for normally retaining the latch lever in its retracted or open position and manually operable for releasing the latch lever as soon as the two laps of the band have been placed over the horn and automatically actuated during the return swing of the tying means to return the latch lever to its retracted position in substantially the same manner as the first gripper means is actuated to its open position. For these purposes a trigger 79 may be pivotally mounted upon the latch lever and provided with a cam surface 80 arranged to be engaged by a cam roller 81 carried by the hinge member 82, whereby during the swing of the hinge member 82 to carry the tying means to its retracted position, the cam roller 81 carried thereby will engage the trigger cam surface and thus lift the trigger and thereby the latch lever to its open position. To release the latch lever for movement into latching position over the bands, the trigger 79 may be manually lifted to swing the trigger cam surface 80 free of the cam roller 81, whereupon due to gravity and the action of the spring means 78 the latch lever will be moved into its latching position.

It is desirable but not necessary to manually release the latch lever as soon as the two laps of the band have been placed upon the horn as during the swing of the tying means into tying position, the cam roller 81 carried by the hinge member 82 will be carried out of engagement with the trigger cam surface, and thus the latch lever may be automatically closed before the tying operation, and even before the tension operation should the tying means be swung to tying position prior to the tensioning of the band.

In Fig. 3 the latch lever and hinge member 82 are illustrated in full lines in their retracted positions, while in broken lines these parts are illustrated in their closed positions. Note that the cam roller 81, when in its broken line position, is well away from the broken line position of the trigger cam surface.

The latch lever may be provided with stop shoulders 83 and 84, against which the pin 85 carried by the trigger may engage for limiting the swing thereof.

The band now having been latched and tensioned, the next operation will be the forming of a secure tie in the overlapping portions of the initial and final laps of the band at the tying zone 18.

The particular form of tie is not a feature of this invention, and may be of any suitable style, preferably as disclosed in my Patent No. 1,677,522, issued July 17, 1928.

The tying means may be operatively carried by the hinge members 41 and 82, previously referred to, which hinge members may be journaled upon 75

the shaft 45, whereby the tying means may be swung to and from the tying position.

The tying means may include, as illustrated in Figs. 1 and 2, a pair of tying jaws 86 and 87 pivotally interconnected by the pivot pin 88, and each jaw carrying one of a pair of cooperating tying dies 89 operable for forming a tie 90 in the placed band (note Fig. 10).

The free end of the tying jaw 86 may be bifurcated to receive between the bifurcations thereof, the actuating or operating lever 91, while the free end of the tying jaw 87 may be bifurcated to receive between the bifurcations thereof the actuating or operating lever 92. The operating lever 91 may be pivotally connected to the tying jaw 86, as by means of the pivot pin 93, while the operating lever 92 may be similarly connected to the tying jaw 87 by means of the pivot pin 94, and, as may be most clearly observed in Fig. 2, the inner ends of these actuating levers may be connected to the cross-head 95, as by means of suitable pivot pins 96 and 97. To insure the uniform actuation of the operating levers, a sectoral gear means 98 may be formed upon the inner end of the operating lever 91 concentric with the cross-head pivot pin 96 thereof, while a corresponding and meshing sectoral gear means 99 may be formed upon the inner end of the operating lever 92 concentric with the cross-head pivot pin 97, whereby the actuation of one lever will cause an equal but opposite motion of the other lever. The free end of the operating lever 91 may be provided with a handle 100, while the operating lever 92 may be provided with a handle 101 (note Fig. 1).

It is desirable to mount the tying means upon the hinge members 41 and 82 to permit the swinging thereof to and from the tying position, so as to move the said tying means out of the way during the band placing operation. The tying means may be pivotally mounted upon the hinge members 41 and 82 by means of the pivot pin 88, as is clearly shown in Fig. 1, and to maintain the tying jaws in correct tying alignment with the band the cross-head 95 thereof may be provided with a cross-head pin 102, which pin may project from each side of the cross-head and each end thereof nicely fit into the cross-head slots 103 formed in the hinge members.

The tying means may be normally maintained in the full line position, as illustrated in Fig. 1, during the band placing operation and either prior to or after the tension operation may be swung to the tying position, as illustrated in broken lines in this same figure. After the band has been sufficiently tensioned, the handles 100 and 101 may be actuated to close the tying dies upon the band to form the tie therein, such as illustrated in Fig. 10. The position which the different parts of the tying means will assume at the completion of the tie-forming operation is illustrated in Fig. 2.

It is desirable to provide means for releasably latching the two operating handles 91 and 92 together, which latching means are shown in detail in Fig. 12. This latch means may include a plunger 130, slidable in bore 131, formed in handle 92. The bore 131 may be counterbored, as at 132, to slidably receive the plunger head 133 and a compression spring 134 active between the inner end of the counterbore and that of the head to drive the rounded or pointed end 135 thereof into a registering depression 136 formed in handle 91, while the outer end of the plunger may be provided with a stop washer 137, suitably fastened

thereon, for preventing the plunger from being shoved by the spring away from the handle when the other actuating handle is moved out of engagement therewith.

The purpose of this detent or latch is to maintain the two operating handles locked together at all times, except during the tying operation, so that should the operator take hold of handle 101 of the operating lever 92 to swing the tying unit to tying position, this lever would not swing independently of the unit, and, likewise, should the operator attempt to swing the tying unit to its retracted position by means of handle 100 and lever 91 the detent would act to cause the tying device to swing as a unit instead of allowing the lever 91 to swing independently thereof. Thus, the detent adds greatly to the convenience and rapidity with which the machine may be operated.

It sometimes happens that the operator does not operate the tying jaws 86 and 87 to their full extent by means of levers 91 and 92 and thus fails to completely and securely form the tie. To prevent such careless operation, a cycling means may be provided which will function to prevent the tying jaws from being opened sufficiently to release the band once the tying operation has been inaugurated until the tie has been completely and tightly formed. This cycling means may include a pawl 140 pivotally mounted upon the operating lever 91, as by means of the headed screw 141. A spring 142 may act between the upper end 143 of the pawl and the handle, while the upper end of jaw 87 may be provided with a ratchet tooth 144 positioned to be engaged in latching relation by pawl 140 at about the point at which the tying jaws close in upon the band, thus preventing the release of the band from the machine until the tie has been effectively formed. The pawl automatically releases when it swings past the release tooth 145, at which time the tie will have been effectively formed. This release of the pawl is effected by means of spring 142 which will act to swing the tooth engaging end of the pawl in a direction similar to that shown in Fig. 11, whereby the ratchet engaging end thereof will ride over the two teeth 144 and 145 during the return swing of the operating handle. It will be remembered that the two operating handles are geared together so that the control of one lever controls the action of both. Thus, the cycling pawl may be mounted upon either one of the operating levers, or, if desired, such a pawl may be mounted upon both. A greater number of ratchet teeth 144 may be provided, if desired.

Upon the completion of the tie forming operation, the handles may be returned to their broken line position, as illustrated in Fig. 1, and then the entire tying means swung to the open or retracted position, as illustrated in full lines therein. The hinge member 82 may be provided with a stop shoulder 104 adapted to engage the machine frame (Fig. 3) when the tying means has reached its fully retracted position to prevent further rearward motion thereof.

It is during the rearward swing of the tying means that the cam rollers 40 and 81 carried by the hinge members engage the latch and gripper means for actuating these parts to their open or retracted positions.

This rearward swing of the tying means may also be utilized for actuating the band cutting and crimping means. The band cutting and crimping means are clearly illustrated in Figs. 1 and 7, and may include the stationary cutter 75

blade or tongue 52 and a movable cutter blade 105. The stationary cutter blade 52 may be formed of a flat strip of tool steel of relatively thin section, and may be relatively loosely mounted in the cutter groove 106 formed in the frame, and each end of the stationary cutter blade may be provided with a locating hole 107, through which the point 108 of the screw 109 may project for correctly locating and retaining the stationary blade within the frame groove. As may be observed from Figs. 1 and 7, the stationary blade 52 is symmetrical in all respects and, therefore, may be turned end for end or side for side in order to make possible the utilization of each of the four cutting edges thereof, whereby a single blade may have a long life. As may be noted in Fig. 7, the forward end of the stationary cutter blade overlies the crimping anvil or die 17 sufficiently for the initial lap 14a of the band to be inserted therebetween. Thus, the relatively thin stationary cutter blade will be solidly braced during the cutting operation.

The movable cutter blade 105 may be pivotally mounted in the frame cutter groove 106, as by means of the pivot pin 110, and upon the forward end thereof may be formed the shearing edge 111 adapted to cooperate with the stationary blade for severing the final lap of the band adjacent the tie formed therein. In order to positively retain the forward end of the stationary blade in cutting relation with the shearing edge 111 of the movable blade, the movable blade at the forward end thereof may be provided with a depending lug 112 arranged to engage the side of the stationary blade opposed to the cutting edge thereof prior to the engagement of the shearing blade 111 with the band. The lug 112 may be so proportioned as to latch over the placed laps of the band and to thereby also act to retain the band portions in correct severing and crimping positions.

The movable cutter 105 may carry a suitable spring means 113, which spring means may act to yieldingly retain the stationary cutter blade in its operative position and to permit the stationary blade to be slightly lifted during the placing of the initial lap of the band upon the crimping anvil.

The means for actuating the movable cutter blade may include a ratchet-cam wheel 114 operatively journaled upon the hinge shaft 45 and having preferably four ratchet-cam teeth. The ratchet-cam wheel may be positioned directly to the rear of the movable cutter blade and the movable blade may be so shaped as to operatively engage the wheel in such relation that the cam surface 115 of the blade may ride over the cam surface 116 of the wheel during the rotation thereof to cause the blade to rock about its pivot pin 110 and to thus swing the shearing edge 111 thereof across the stationary blade and thereby sever the final lap of the band placed over the stationary blade.

The ratchet-cam wheel 114 may be rotated a quarter of a turn during the swing of the tying means from its tying to its retracted position, by providing the hinge member 41 (Fig. 7) with a pawl 117 adapted to engage the ratchet face 118 of one of the ratchet teeth when the tying means is moved to the tying position, and thus to rotate the ratchet-cam wheel during the return swing of the tying means to its retracted position.

A spring means 119 may be provided for yieldingly urging the pawl 117 into operative engagement with the ratchet-cam wheel, and a stop pin

120 may be provided for limiting the swing of the pawl under the influence of said spring means.

The cam surface 115 of the movable cutter blade 105 may be made removable by providing a separate cam block 121 appropriately mounted upon the rear end of the blade as by suitable screw means 122. The cam block 121 and the ratchet-cam wheel may both be made of steel and hardened, but even so there may be some wear between these parts which may be compensated for by providing shims of suitable thickness between the cam block and movable blade. Also, by this arrangement the action of the cutter blade may be nicely adjusted with relation to the crimping die.

A band crimping means may be provided to crimp the cut end of the final lap 14b of the band into a depression formed in the initial lap thereof, whereby the cut end will be lodged below the normal surface of the band and, therefore, will not catch upon other boxes when piled one upon another, or will not cut or scratch the hands of the person handling the strapped boxes.

To crimp the cut end of the tie, the crimping anvil 17 may be provided with a crimping groove 123 (Figs. 2 and 7) positioned directly below the shearing edge 111 of the movable cutter blade, and the movable cutter blade given sufficient movement to drive the cut end of the final lap of the band together with the adjacent portion of the initial lap thereof into the crimping groove 123, and thus crimping the band as illustrated in Fig. 10, as at 124.

The operation of the machine may be briefly summarized as follows: First, the machine may be positioned upon the object to be tied, at the location at which the band is to be placed therearound; second, the placing of the band, which operation may be briefly re-stated as follows: the initial end thereof placed upon the band locating horn 16, thence between the crimping anvil 17 and the stationary cutter blade 52, then over the first gripper anvil 19, whereupon by means of the gripper trigger 37 the first gripper may be released into clamping engagement with this initial lap of the band. The band may next be passed under the second or movable gripper anvil 53 about the object to return to the machine as the final lap 14b, which lap may be first placed over the initial lap resting upon the locating horn 16, whereupon by means of the latch trigger 79, the latch lever 74 may be released to latch the two laps of the band thereon, whereupon the final lap 14b may be placed over the stationary cutter blade, first gripper and then slid into the second gripper, which will automatically open and then grip the band as previously described; third, the tensioning means, which includes the second gripper, may be actuated from its retracted position, as illustrated in full lines in Fig. 1, to its broken line position, to effect the tensioning of the band about the object. The pawl 68 cooperates with the ratchet 67 to retain the tensioning lever at that point to which this lever is swung during the tensioning operation; fourth, the tying means may be swung into its tying position and by means of the handles 100 and 101 actuated to securely tie the overlapping portions of the placed band. Thereafter, the tying means may be opened and swung back to its retracted position, whereupon the cutter pawl 117 will engage and rotate the ratchet-cam wheel 114 to actuate the movable cutter blade, first to sever the surplus portion of

the final lap of the band from the tie adjacent the end thereof, and, second, to force the cut end of the band into engagement with the adjacent portion of the initial lap of the band, and together forcing these portions of the band into the crimping groove or die 123, and to thus crimp the cut end into the depression formed in the initial lap thereof so that the cut edge of the band will lie below the normal plane of the top surface of the band. Fifth, during the swing of the tying means from the tying to its retracted position, the cam rollers 40 and 81 will engage their respective triggers to retract the first gripper and latching lever, whereupon the machine may be removed for the next tie.

It may be noted especially in Fig. 7 that during the swing of the tying means to its tying position the movable cutter lever 105 will act as a pawl to prevent rotation of the ratch-cam wheel 114 in the counter-clockwise direction, as viewed in this figure.

From the above description, it will be appreciated that the tying operation may be accomplished easily, quickly and effectively.

Having fully described the invention, it is to be understood that the invention is not to be limited to the details herein set forth, but it is of the full scope of the appended claims.

I claim:

1. In a tying machine, a frame, a cutter tongue mounted upon the frame, a movable cutter blade operatively mounted upon the frame in shearing relation to the cutter tongue, a crimping die mounted upon the frame below the cutter tongue, and means for actuating the movable cutter blade across the cutting edge of the cutter tongue and thereafter for actuating the movable cutter into crimping relation with the crimping die.

2. In a tying machine, a frame, a hinge means journaled thereon, a band tying means carried by the hinge for movement to and from the tying position, a ratchet wheel operatively journaled upon the frame, a pawl carried by the hinge means, and engageable with the ratchet wheel for rotating the same during the movement of the tying means from the tying position, and a movable cutter blade having an arm engageable with the ratchet wheel for locking the same against rotation during the movement of the tying means to its tying position, and said arm being arranged to be actuated by the ratchet

wheel during the rotation thereof for actuating the cutter blade to sever the band.

3. In a tying machine, a frame, a hinge means journaled thereon, a band tying means carried by the hinge for movement to and from the tying position, a band receiving anvil carried by the frame, a latch means operable for latching the band upon the anvil, a trigger means operatively carried by the latch means, a cam means carried by the hinge for engaging the trigger during the movement of the tying means from the tying position for releasably retaining the latch means open, and said trigger means being operable for disengagement with the cam for thereby releasing the latch for movement into its latching position.

4. In a tying machine, a pair of pivotally connected tying jaws, an operating lever pivotally connected to the free end of each jaw, and a cycling means operatively associated with said levers and jaws and operable for preventing the actuation of the jaws to release the band in which the tie is being formed until after the completion of the tying operation.

5. In a tying machine, a pair of pivotally connected tying jaws, an operating lever pivotally connected to the free end of each jaw, means for interconnecting said levers, and a cycling means operatively associated with said levers and jaws and operable for requiring the full actuation thereof to form a secure tie before the tie may be released therefrom.

6. In a tying machine, a pair of pivotally connected tying jaws, an operating lever pivotally connected to the free end of each jaw, a gear means carried by the adjacent end of each lever and the gear means of one lever operatively meshing with the gear means of the other lever, a crosshead operatively connecting the operating levers, and a cycling means operatively associated with said levers and jaws and operable for requiring the full actuation thereof to form a secure tie before the tie may be released therefrom.

7. In a tying machine, a pair of pivotally connected tying jaws, an operating lever pivotally connected to the free end of each jaw, and a latch means operatively associated with the levers for releasably latching said levers together when said jaws have been actuated to their open position.

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