

July 26, 1938.

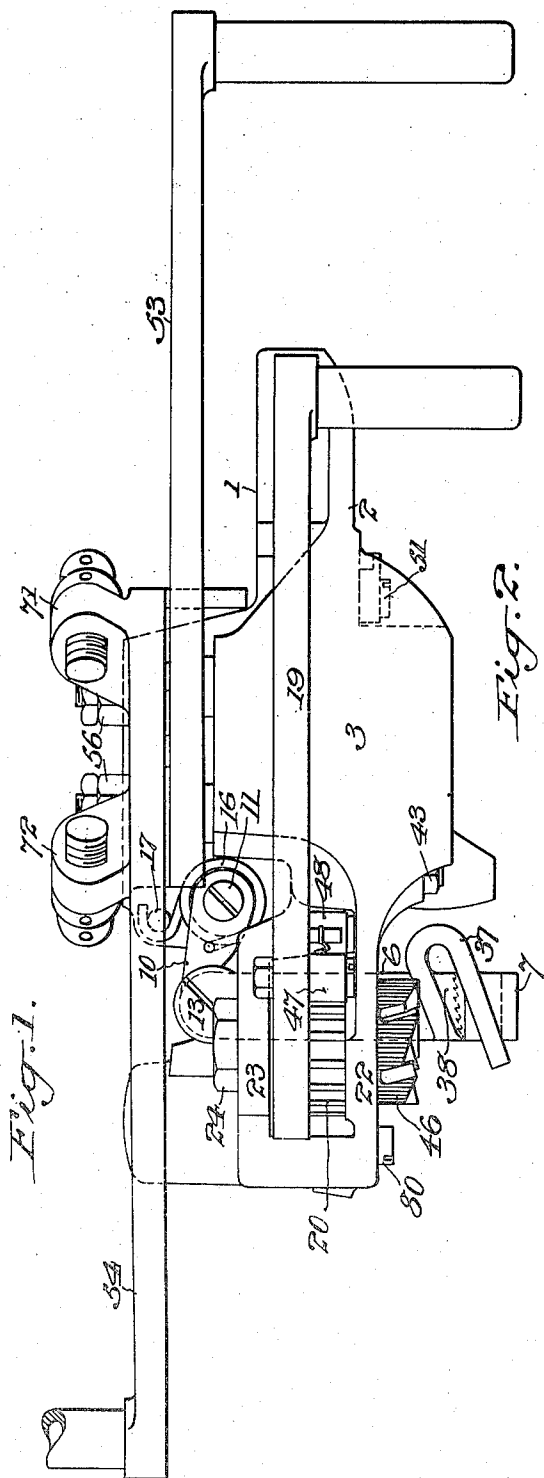
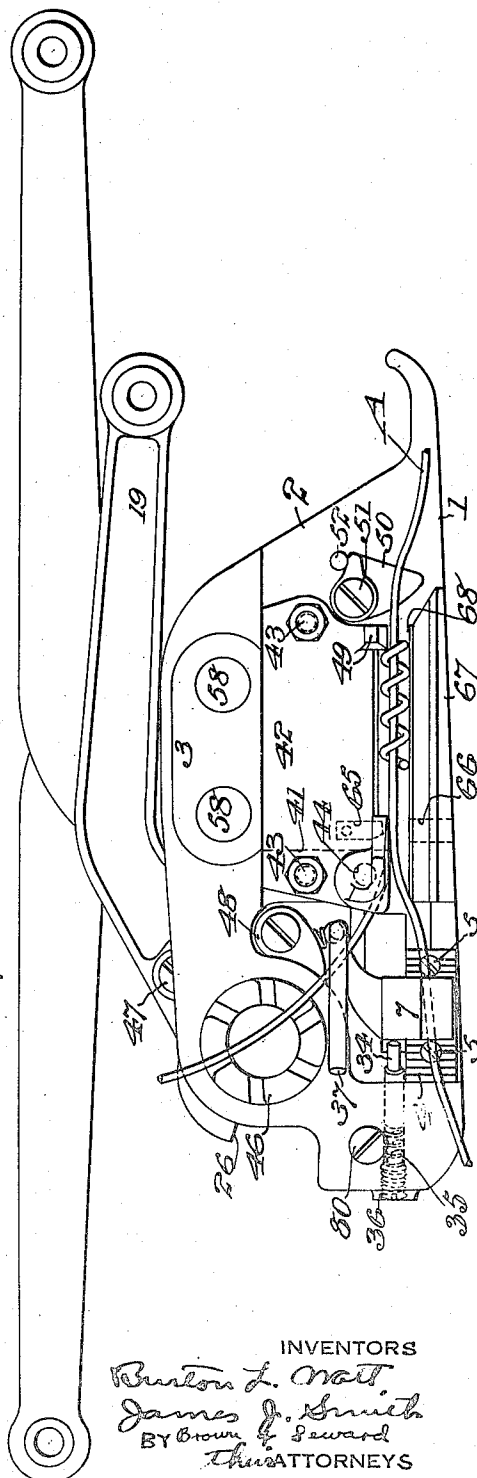
B. L. WATT ET AL

2,124,991

WIRE STRAPPING TOOL

Filed Feb. 23, 1938

4 Sheets-Sheet 1



INVENTORS
Burton L. Watt
James J. Smith
 BY *Crown & Seward*
 Their ATTORNEYS

July 26, 1938.

B. L. WATT ET AL

2,124,991

WIRE STRAPPING TOOL

Filed Feb. 23, 1938

4 Sheets-Sheet 2

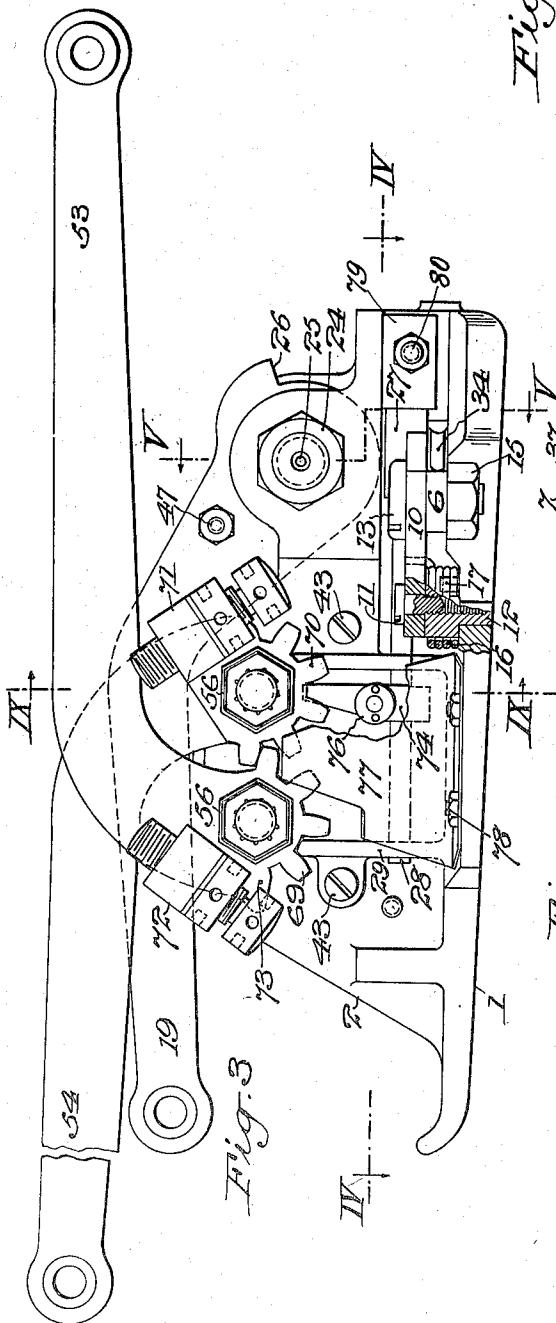


Fig. 3.

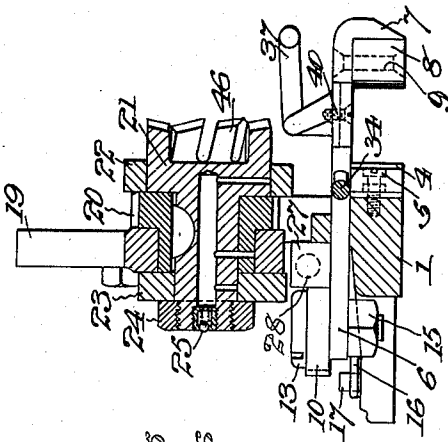
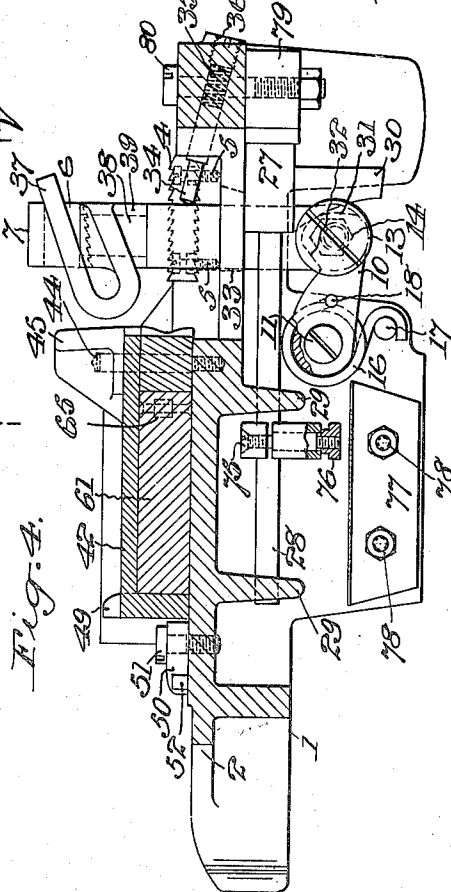


Fig. 4.



INVENTORS
Burton L. Watt
James J. Smith
 BY *Brown & Seward*
 Attorneys

July 26, 1938.

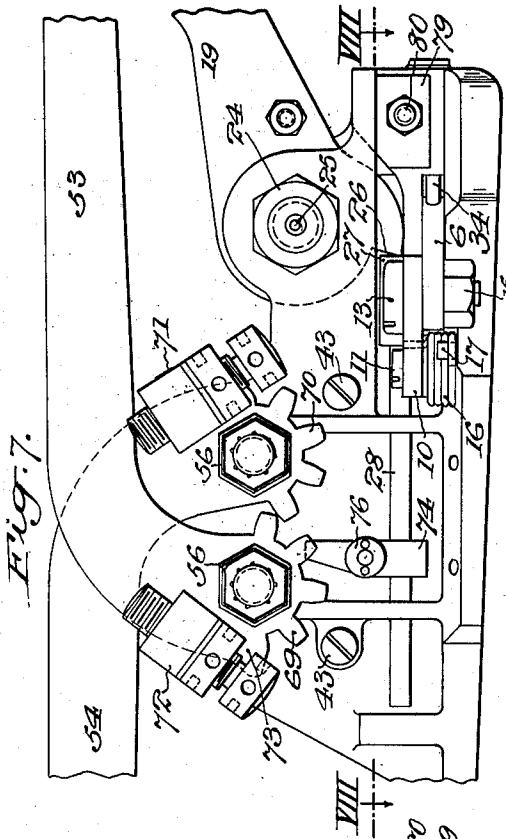
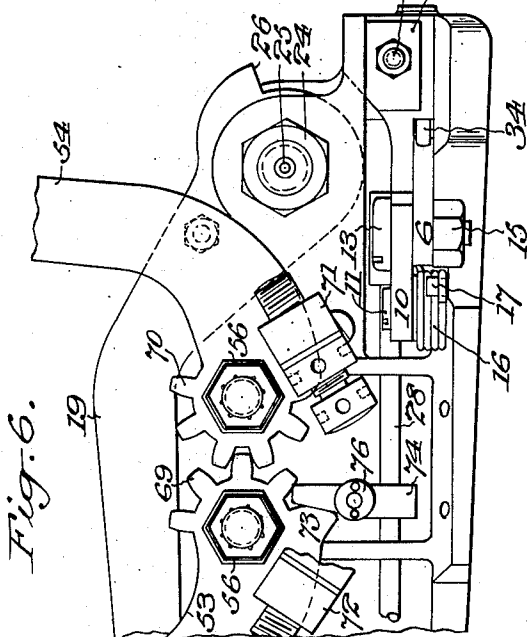
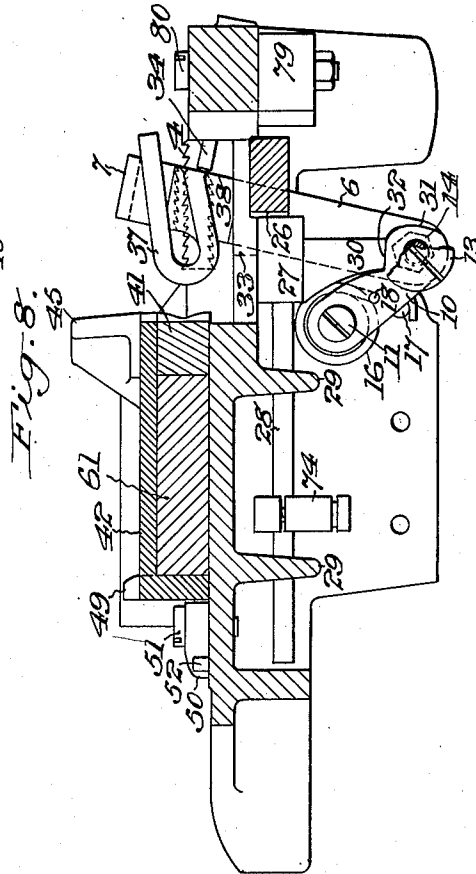
B. L. WATT ET AL

2,124,991

WIRE STRAPPING TOOL

Filed Feb. 23, 1938

4 Sheets-Sheet 3



INVENTORS
Burton L. Watt
James J. Smith
 BY *Brown & Seward*
 THEIR ATTORNEYS

July 26, 1938.

B. L. WATT ET AL

2,124,991

WIRE STRAPPING TOOL

Filed Feb. 23, 1938

4 Sheets-Sheet 4

Fig. 9.

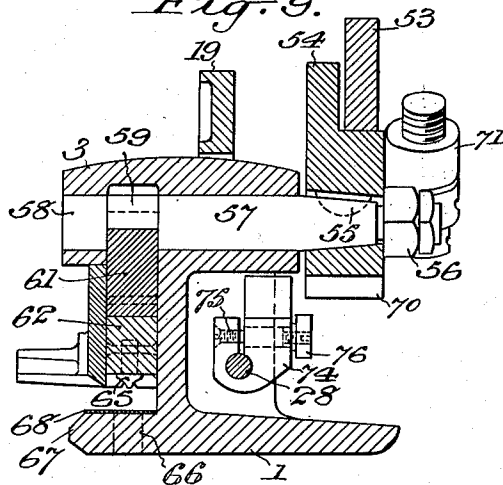


Fig. 10.

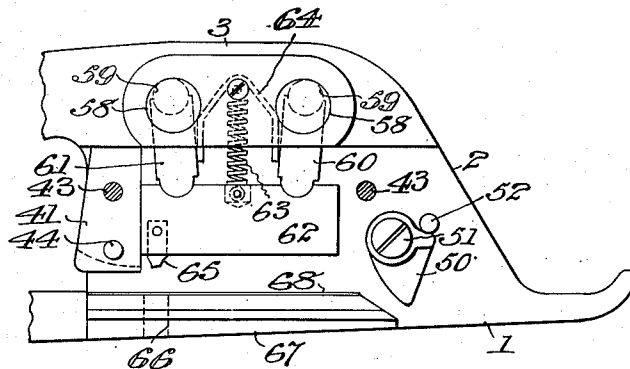


Fig. 11.

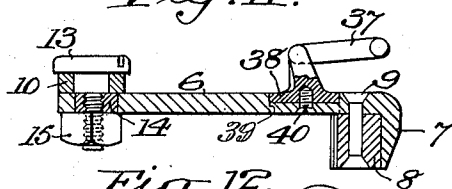
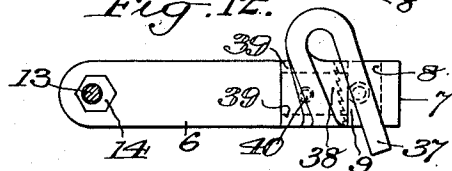


Fig. 12.



INVENTORS

Burton L. Watt
James D. Smith
BY Brown + Seward
their ATTORNEYS

UNITED STATES PATENT OFFICE

2,124,991

WIRE STRAPPING TOOL

Burton L. Watt, Marquette, Mich., and James J. Smith, Seattle, Wash., assignors to Griplock, Inc., New York, N. Y., a corporation of Delaware

Application February 23, 1938, Serial No. 191,892

8 Claims. (Cl. 140—93)

This invention relates to a wire strapping tool designed for tensioning and fastening wire straps or the like around packages. It is particularly adapted for use with straps in which one end is coiled back on the body of the strap and the knot or gripping formation is made by inserting the other end of the strap through the said coiled portion and then crushing or flattening the coiled portion so as to deform the contacting parts into an interlocking engagement.

The invention relates to a tool generally similar to that disclosed in the patent to Mark H. Stratton No. 1,776,868, dated September 30, 1930, and contemplates a number of improvements in various parts of the tool, including the form, construction and arrangement thereof, leading to desirable advances in operative efficiency, accuracy and durability. It is also an object to facilitate the production of the several parts as well as assembly and disassembly.

A practical embodiment of the invention is represented in the accompanying drawings in which

Fig. 1 represents a top plan view of the tool;

Fig. 2 represents a side elevation thereof, with the two ends of the wire strap associated therewith in position preliminary to tensioning and crushing or deformation to form the knot, with severing of the surplus wire;

Fig. 3 represents a side elevation the reverse of Fig. 2, with the wire strap omitted and with certain parts broken away and in section;

Fig. 4 represents a horizontal section taken in the plane of the line IV—IV of Fig. 3, looking in the direction of the arrows;

Fig. 5 represents a detail vertical section taken in the plane of the line V—V of Fig. 3, looking in the direction of the arrows.

Fig. 6 represents a detail side elevation showing the operative parts in one position;

Fig. 7 represents a similar view showing the said parts in another position;

Fig. 8 represents a horizontal section taken in the plane of the line VIII—VIII of Fig. 7, looking in the direction of the arrows, and showing the gripping jaws in their operative position, as distinguished from their inoperative position exhibited at Fig. 4;

Fig. 9 represents a vertical section taken in the plane of the line IX—IX of Fig. 3, looking in the direction of the arrows;

Fig. 10 represents a detail side view in which parts have been removed the better to show the severing and crushing elements;

Fig. 11 represents a detail longitudinal section of one gripping jaw and associated parts; and

Fig. 12 represents a plan view, partly in section, of the parts shown in Fig. 11.

The subject matter of this invention is intended to be used in cooperation with the straps hereinabove mentioned for the purpose of very securely binding or fastening a pile or stack of assembled articles, or a container in which articles have been placed, or the like. It comprehends mechanism for tensioning or tightening the strap around the package or container, thereafter deforming the same to establish the knot or fastening point, and also to sever the excess of the strap to accomplish a neat job. In Fig. 2 the strap is denoted generally by A and it will be understood that the broken portions of the strap near the bottom of the figure represent parts of the body of the strap that embraces a package or container upon which the tool rests. The spiral formed in the strap runs rearwardly upon the body thereof extending to the left in Fig. 2, while the free end of the strap is passed through the said spiral or coil alongside the body of the strap, and projects upwardly to the left. In the position of the parts just described, the first operation is to tension or tighten the strap, and that mechanism of the tool will now be described.

A main body or frame of the tool has a base 1, from which there uprises an integral web 2 that supports a broad head 3 which provides housing and bearings for several of the elements.

The gripping mechanism, that is calculated to seize the body of the wire strap at a point adjacent the coiled end during the tensioning operation, includes a serrated jaw 4 (Figs. 1, 4 and 8) that is secured to the side of the base 1 by screws 5, 5. As clearly shown in Figs. 4 and 8, the said jaw is serrated on both sides so that it may be reversed to prolong its life against wear.

The said jaw 4 is, of course, fixed and it is adapted for cooperation with a complementary movable jaw 6 which is elongated and mounted to slide in a portion of the web 2 which uprises from the tool base. The construction of the said movable jaw 6 is well shown in Figs. 11 and 12, from which it will be seen that it is integrally formed with a depending end 7 serving as a rigid abutment for a serrated gripping element 8 that is fastened to the body of the jaw 6 by a rivet 9.

It will be clear that the jaw 6 is intended for sliding movement into and out of cooperative

relationship with jaw 4, and this movement is accomplished by connecting the inner extremity of the jaw 6 to an arm 10 that is secured by a screw 11 to a pivot 12 (Fig. 3) which is set into the base 1. The connection between jaw 6 and arm 10 consists of a screw 13 (Fig. 11) that is threaded through an adjusting nut 14 set into jaw 6, and is held in place by an ordinary nut 15. The adjusting nut 14 is hexagonal in form (Fig. 12) and the threaded hole therein through which screw 13 passes is eccentrically located therein. It will readily be seen that, by lifting nut 14 out of jaw 6 and turning it a slight distance in one direction or the other, the effective length of jaw 6 may be varied so as to adjust the cooperative relationship of the serrated gripping elements to accommodate wires of differing gauge or to compensate for wear or other variation in any of the replaceable associated parts. A coil spring 16 surrounds pivot 12, and has one end engaging a pin 17 on base 1, while the other end enters a hole in arm 10, as indicated at 18. The torsion of this spring tends to urge or slide jaw 6 so as to separate its serrated gripping element from jaw 4, as positioned in Fig. 4, so that positive actuation is required for moving the said elements into relative gripping position, as shown in Fig. 8.

This last named movement of jaw 6 is accomplished by operating a hand lever 19 (Fig. 3) that is mounted on the hub of a ratchet wheel 20 (Fig. 5) that is keyed to a tensioning hub 21 which is journaled in extensions 22, 23 formed integral with and connecting base 1 and head 3. The tensioning hub 21 is secured in position by a nut 24 threaded on to one end thereof. Suitable lubricating means, with appropriate ducts, is denoted generally by 25.

The hub of hand lever 19 has an abutment 26 formed thereon fitted for engagement with the end 27 of a sliding rod 28 that is mounted in flanges 29, 29 projecting laterally from web 2. The said end 27 of rod 28 carries a lug 30 that has a curved face fitted for engagement with the projecting end of arm 10, which is formed at this point with a curve of varying radius, as indicated at 31 (Fig. 8) so as to yield with a camming action to the pressure of lug 30 as rod 28 is moved to the left (Figs. 4 and 8) under the influence of lever 19. This movement will retract jaw 6 from the position shown in Fig. 4 to that shown in Fig. 8, which latter is its operative position; and it should be noted that the free end of arm 10 is also formed with a flat slanting portion indicated at 32 which mates with the flat end of lug 30 in order to hold the parts in the position indicated in Fig. 8.

The slot 33 formed in web 2 for the slidable mounting of jaw 6 is somewhat wider than the jaw, and the latter is yieldingly held against the left hand side of said slot (Figs. 4 and 8) by a plunger 34 that is backed by an expansion coil spring 35 which is housed in the tool frame just above one end of the base 1 and kept in position by a screw 36. It will be observed by reference to Fig. 4, particularly, that this plunger 34 is set at an angle to the longitudinal axis of the base so as to cause it to lie substantially normal to the jaw 6 when the latter is in its operative position represented in Fig. 8. The effect of this plunger is to cause the jaws to grip the wire A at a point as near as is practicable to the coiled end thereof, and the normal or right angle relationship of the plunger and jaw 6, when the latter is in its operative position,

increases the efficiency of the parts during the gripping operation.

By reference to Fig. 2 it will be observed that the free end of the wire strap A passes through a hook 37 which is carried on jaw 6 (Figs. 4, 8, 11, 12). This hook 37 is secured to jaw 6 by providing it with a yoke formation that fits in a recess in the top of the jaw, as indicated at 38, and also providing it with downwardly extending flanges 39, 39 that embrace the sides of the jaw 6. A screw 40 fastens the said parts together.

In passing to the said hook 37 from the body of the wire strap, the said end thereof passes around and engages a curved grooved shoe 41 (Figs. 8 and 10) which is held in place against web 2 of the tool frame by a face plate 42 that is fastened to the said web by bolts 43, 43 (Fig. 2). One bolt 43 and a pin 44 traverse the shoe 41 in order to fix it firmly in position; and the face plate 42 has formed integral therewith a tapered guide 45 that facilitates the leading of the wire strap to engagement with the shoe 41, by a lateral movement, when the tool and strap are brought into operative relationship.

To operate the tensioning mechanism, the parts are placed in the position shown in Fig. 2 with the extremity of the wire strap entering between teeth 46 (see also Fig. 5) formed on tensioning hub 21. Thereupon the lever arm 19 is manually operated so as to cause abutment 26 to engage end 27 of rod 28 and move the gripping jaw 6 into cooperative engagement with jaw 4 to firmly seize the body of the wire strap as hereinabove described for holding the coiled end thereof against movement. As previously explained, the jaws are held in this operative position by engagement of the slanting end of lug 30 with a corresponding formation on arm 10. This movement of the jaw 6 from the position shown in Fig. 4 to the position shown in Fig. 8 causes the hook 37 to pull upon the end of the wire strap A and tend to urge it into contact with the teeth 46 on tensioning hub 21. The operator oscillates lever 19 to slowly rotate the tensioning hub 21 by means of the ratchet wheel 20 keyed thereto, which ratchet wheel is operated by pawls 47 and 48 (Fig. 2), the former of which is an actuating pawl and the latter a retaining pawl; said pawls being mounted in a conventional way on the hub of hand lever 19 and on the web 2 respectively. This movement of the tensioning hub 21, which is in clockwise direction as illustrated in Fig. 2, is continued until the wire strap has been tightened to the desired degree and is ready for knotting and severing of the excess end.

With reference to the tensioning mechanism that has been hereinabove detailed, it should be noted that the construction of the jaw 6 has been substantially improved, particularly in respect to the integral depending end 7 that braces the gripping element 8. Again, the angular relationship of plunger 34 to jaw 6, when in operative position, has been bettered; as is also the fact with respect to the shape of the end of arm 10 that engages and cooperates with lug 30. Further, the formation of the hook 37, particularly with respect to the parts engaging the jaw 6, tends to eliminate breakage and, in case of breakage, to facilitate replacement. Finally, the shoe 41 constitutes a substantial advance because the comparatively large radius of its curve does not bring about such a sharp bend in the contacting part of the wire strap, as did the small diameter roller heretofore used in

its place; and also because the longitudinal curve of its grooved surface, against which the wire strap passes, is formed with a varying radius instead of with a fixed radius as in the case of a roller. Experience has demonstrated that the improvements just cataloged substantially increase the tension which may, in operation, be placed upon the strap, while decreasing to a large extent breakage heretofore experienced in the tool parts and in the strap itself.

In practice it is customary to pass the wire strap A loosely around the package or the like, and slip the plain end of the wire through the coil formed on the other end thereof. Thereupon the tool is moved laterally on the package into the position of parts represented in Fig. 2. The slanting side of guide 45, which is well shown in Fig. 4, is calculated to lead the coiled portion of the wire strip into its correct position, and a tapered stop 49 (Figs. 2 and 4), formed integral with the plate 42, cooperates with the said guide to this result. After the tool has thus laterally been placed in correct position with respect to the wire strap, it is pulled to the left (Fig. 2) until the coiled end of the strap abuts stop 49 so as to insure that the coiled portion and end of the strap to be severed are in exactly the correct position for the crushing or knotting and severing step. Another guide 50 is pivoted by a screw 51 in the web 2 and held in position by a stop 52. This guide serves to assist in keeping the wire and tool in correct alignment at that point.

Following the tensioning of the wire strap, hereinabove described, the next step in order, as already indicated, is to crush or knot the coil and adjacent portions of the strap, as well as to sever the excess end of the strap which has been engaged by the tensioning hub 21 during the tightening operation.

The mechanism for crushing or knotting and severing will now be described.

A pair of similar crushing levers 53, 54 (Fig. 3) have their inner ends downwardly curved and secured to a pair of identical shafts by keys 55 and nuts 56. As the said shafts are alike, it is deemed sufficient to describe one, which consists of an elongated bearing portion 57, a short bearing portion 58, and an intermediate eccentric portion 59. The long bearing portion is well fitted to withstand the crushing effort, while the eccentric portion fits the concavity formed in the upper end of one of two thrust bars which are also identical and are denoted by 60, 61. The lower end of the said thrust bars are convexed to fit concavities in the top of a crushing block 62 that is located between web 2 and face plate 42 (see also Fig. 4) and adapted to slide upwardly and downwardly therebetween. As shown in Fig. 4, the face plate 42 is L-shaped in cross section so that its end and the shoe 41 serve to complete the enclosure for the crushing block 62 and definitely guide its upward and downward movements. The crushing block 62 is held in engagement with the thrust bars by a retractile coil spring 63, one end of which is fastened to the crushing block and the other end to the head 3 of the tool, as well shown in Fig. 10. A spacing leaf spring 64 is suspended from the fastening point of spring 63 in the head 3 and has its free ends engaging the sides of thrust bars 60, 61, in order to yieldingly urge them apart and thus hold them steadily in position during operation.

It will be observed that the thrust bars 60, 61

are comparatively short, and that the crushing block 62 is comparatively high and massive. This construction lends itself to positiveness and rigidity in action by eliminating any tendency of the thrust bars to weave or yield.

The crushing block 62 has a cutter 65 pinned, or otherwise suitably secured therein, for cooperation with a hole 66 formed in the anvil 67, which anvil constitutes an extension of the cast steel tool base 1, and supports the coil and adjacent parts of the wire strap A during the operation of the tool, as indicated in Fig. 2. This anvil 67 is made of substantial thickness and is preferably heat treated in order to eliminate springing or yielding under the influence of the heavy stresses generated during the operation of the tool. To this same end the head 3 of the tool is preferably composed of heat treated cast steel so that it may rigidly support the shafts that actuate the thrust bars 60, 61. As an added provision for durability, the upper surface of the anvil is preferably provided with a thin layer or coating 68 of any well known or approved composition having very great wear resistance. A material known on the market as Stellite has been found suitable for this purpose, and it may be added that such coatings or layers can be satisfactorily applied by spraying or welding processes understood in the art.

The hand levers 53 and 54 have their inner ends formed to constitute intermeshing gears 69, 70 (Figs. 3, 6, 7) so as to require the said levers to operate in unison and, in effect, to compound the crushing effect exerted thereby. Adjustable stops, 71, 72, of conventional construction, are secured to the said levers 53, 54 near the said gear formations to limit the movement of the said levers when they are approaching the position indicated in Fig. 6. The said stops may be adjusted to take up wear in the parts.

In order to operate the crushing block 62 for forming the knot, and the cutter 65 for severing the surplus end of the wire, which latter is held in position under the cutter by guide 41, heretofore described, the operator seizes levers 53, 54 and moves them from the position indicated in Figs. 3 and 7 toward the position indicated in Fig. 6 until the stops 71, 72 abut. This movement of the said levers operates the shafts having the eccentric portions engaging the thrust bars 60, 61 and thereby depresses the crushing block 62 for the purpose of crushing the coiled portion of the wire strap A to form the knot, and also operating the cutter carried by the crushing block. This actuation of the crushing block flattens the coil of the wire and corrugates the portions of the strap lying therein, as explained in the above mentioned patent to Mark H. Stratton, No. 1,776,868, thereby knotting or fastening the strap in its tensioned condition about the package or the like. The said movement of the crushing block simultaneously causes the cutter 65 to sever the free surplus end of the strap at a point adjacent the coil; the parts being so formed and arranged with respect to each other that this severing occurs just prior to the completion of the crushing or knotting action but not until the last named action has interlocked the ends of the strap sufficiently to prevent slippage.

The actuation of the levers 53, 54, which has just been set forth, also serves to move gripping jaw 6 from its cooperative relation with jaw 4 and thereby release the strap from the said

jaws. This release is accomplished by dog 73 (Fig. 6) formed on the lever 53 adjacent its geared portion, which dog is in position to contact a trigger 74 that is adjustably mounted on rod 28 in order to move said rod to the right (Figs. 6 and 8), and thereby restore it and its associated parts to the position shown in Fig. 4. This movement of the rod 28 by contact of dog 73 with trigger 74 causes lug 30 to slide off the flat surface 32 on arm 10, whereupon the curved surface 31 at the end of arm 10 cooperates with the curved surface of lug 30 under the influence of spring 16 to finish the movement of rod 28 to the right in Figs. 6 and 8, and simultaneously to slide movable jaw 6 from its operative position in Fig. 8 to its inoperative position in Fig. 4. The fact that surface 31 is, as previously described, a curve of varying radius, instead of the arc of a circle, facilitates and accentuates the rapidity of this separation of the gripping jaw 6 from the fixed jaw 4.

The trigger 74 is adjusted on the shaft 28 at such a point that the release of the gripping jaws occurs simultaneously with the completion of the crushing operation. It is of some importance that the timing of these parts be as just described because, for instance, if the gripping jaws 4 and 6 were released too early in the cycle of operations there might be an insufficient crushing or knotting of the strap. On the other hand, an adjustment of the trigger 74 too far in the other direction might be sufficient to prevent entirely the release of the gripping jaws, and hence defeat the operation of the tool. To permit adjustment, the trigger is formed in two parts, as clearly shown in Fig. 4, which parts are held together by a screw 75 and nut 76, which latter is provided with holes for actuation by a spanner or the like, as indicated in Fig. 3. The trigger 74 is intended to be adjusted in proper position by a foreman or the like and, in order to hinder untimely adjustment by the operator handling the tool, a guard or shield 77 is fastened to the base 1 by bolts 78, 78; which guard also eliminates the danger of injury to the operator's fingers when the rod 28 is snapped back to the position shown in Fig. 4 under the influence of arm 10, as hereinabove described.

A stop 79 (Figs. 3 and 4) serves to limit the last named movement of the rod 28, said stop being held in position by bolt 80 which traverses the tool frame. If desired, the said stop may be made adjustable by providing it with an elongated slot for reception of the said bolt.

Notable features of improvement in the crushing and severing mechanism are to be found in the enlargement of crushing block 62 and the shortening of thrust bars 60, 61; in the thickening and heat treating of the anvil 67; in the provision of the hardened surface 68; in the increase in bulk and heat treatment of the tool frame, particularly at the points where the shafts actuated by levers 53, 54 are mounted; in the provision of a single stop for positioning the coiled end of the wire strap and the use of an edge of the guide for the free end of the strap to cooperate with said stop when the tool and strap are associated by lateral movement; in the provision of a guard for trigger 74; and in the particular curvature, with changing radius, of the edge 31 of the arm 10.

In view of the fact that the operation of the several parts has been indicated in connection with the description of their mechanical con-

struction and arrangement, and of the further fact that the operation of the tool as a whole is similar to that set forth in the above named patent to Mark H. Stratton, No. 1,776,868, it is deemed unnecessary here to rehearse the operation in detail.

It will be understood that various changes may be resorted to in the form, construction, arrangement, material and composition of the several parts without departing from the spirit and scope of our invention; and hence we do not intend to be limited to the details herein shown and described except as they may be included in the claims.

What we claim is:

1. In a device of the character described, in combination with a strap having a coiled end which is intended to be crushed for securing the strap around a package, mechanism for tensioning the said strap around a package preliminary to said crushing including, a movable gripping jaw and means for moving said jaw in both directions of its length, said means including a plurality of elements having surfaces fitted for mutual contact, at least one of said surfaces being normally urged against the other and being formed on a curve of varying radius.

2. In a device of the character described, in combination with a strap having a coiled end which is intended to be crushed for securing the strap around a package, mechanism for tensioning the said strap around a package preliminary to said crushing including, a movable gripping jaw, a hook carried by said jaw and fitted for engagement with a portion of the wire strap for urging it in one direction, and a guide for leading the strap to said hook, said guide being in the form of a curved shoe having its curve of varying radius.

3. In a device of the character described, in combination with a strap having a coiled end which is intended to be crushed for securing the strap around a package, mechanism for tensioning the said strap around a package preliminary to said crushing including, a movable gripping jaw, a hook carried by said jaw and fitted for engagement with a portion of the wire strap for urging it in one direction, and a guide for leading the strap to said hook, said guide being in the form of a grooved curved shoe having its curve of varying radius.

4. In a device of the character described, in combination with a strap having a coiled end which is intended to be crushed for securing the strap around a package, mechanism for tensioning the said strap around a package preliminary to said crushing including, a movable gripping jaw, a hook carried by said jaw and fitted for engagement with a portion of the wire strap for urging it in one direction, and a guide for leading the strap to said hook, said guide being in the form of a grooved curved shoe having its curve of relatively large and varying radius.

5. In a device of the character described, in combination with a strap having a coiled end which is intended to be crushed for securing the strap around a package, mechanism for tensioning the said strap around a package preliminary to said crushing including, a movable gripping jaw, adjustable means for causing said movement in correct timing with other parts of the device, and a shield for hindering access to and misadjustment of said adjustable means.

6. In a device of the character described, in combination with a strap having a coiled end

which is intended to be crushed for securing the strap around a package, mechanism for crushing said coiled end and severing the surplus of the strap including, a thickened support for said strap, a stop for holding the coiled portion of the strap in proper longitudinal position with respect to the crushing and severing means, and a guide for holding the surplus portion of the strap in correct position with respect to the severing means, the adjacent sides of said stop and said guide also serving to generally position the strap with respect to the crushing and severing means by a relative lateral movement of the device and the strap after the latter has been wrapped around a package.

7. In a device of the character described, in combination with a strap having a coiled end which is intended to be crushed for securing the strap around a package, mechanism for tensioning the said strap around a package preliminary to said crushing including, a movable elongated gripping jaw provided with an integral angular extension, a gripping element fixed to said jaw and abutting said extension in order to be backed thereby for resisting breakage in operation, a hook carried by said jaw and fitted for engagement with a portion of the wire strap for urging it in one direction, said hook having integral projections engaging said jaw to prevent movement thereon in the direction of pull of the wire strap, and means for moving said jaw in the direction of its length and for urging

it in the direction of its width for bringing it into and out of operative position, said means for urging the jaw in the direction of its width bearing upon the jaw at an acute angle when the jaw is in one position and substantially at a right angle when the jaw is in another position.

8. In a device of the character described, in combination with a strap having a coiled end which is intended to be crushed for securing the strap around a package, mechanism for crushing said coiled end and severing the surplus of the strap including, a support for said strap provided with a perforation for cooperation with the severing means, a reciprocable crushing block fitted for cooperation with said support and a plurality of thrust bars for actuating said block, the said support being thickened and having its upper surface treated for wear resistance, and the effective length of said thrust bars being not substantially greater than the dimension of the crushing block in the direction of its movement, whereby the block may be actuated under great power without springing or other defect in operation of the thrust bars and the support may withstand without failure or injury both the power operation of the thrust block and the surface wear incident to the crushing operation so that the strap may be secured around a package against chance of loosening.

BURTON L. WATT.
JAMES J. SMITH.