

Dec. 23, 1952

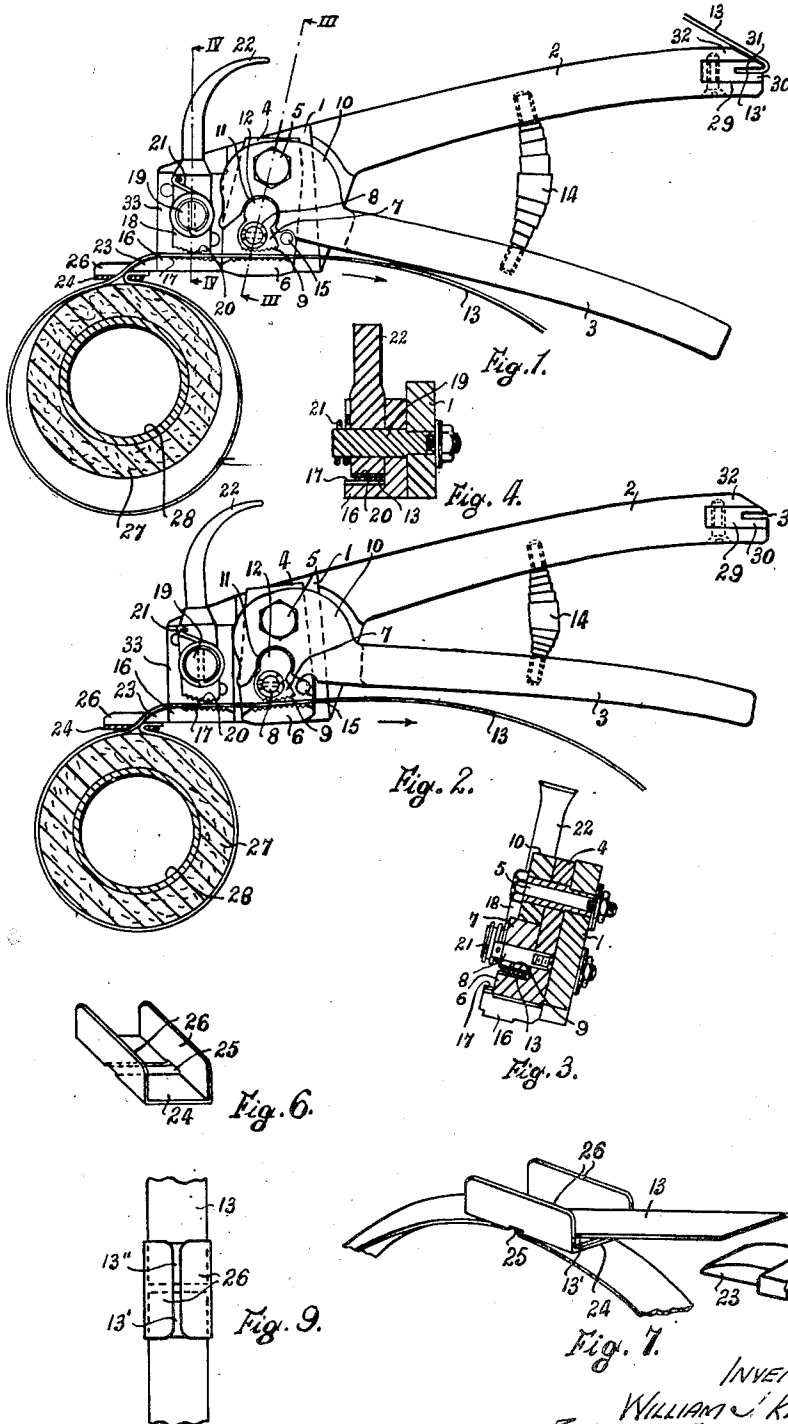
W. J. KEEBLE

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APPARATUS FOR TENSIONING AND JOINING THE ENDS OF METAL
BINDING STRAPPING, WIRE, AND THE LIKE AROUND A BODY

Filed Jan. 16, 1950

2 SHEETS—SHEET 1



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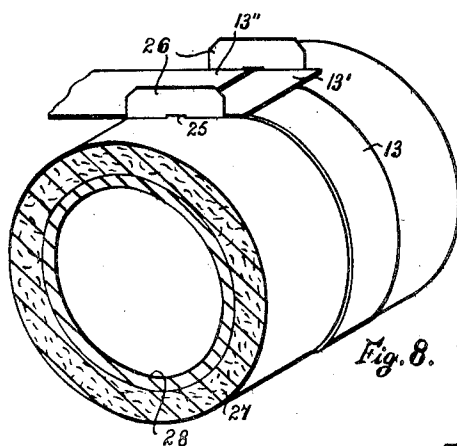
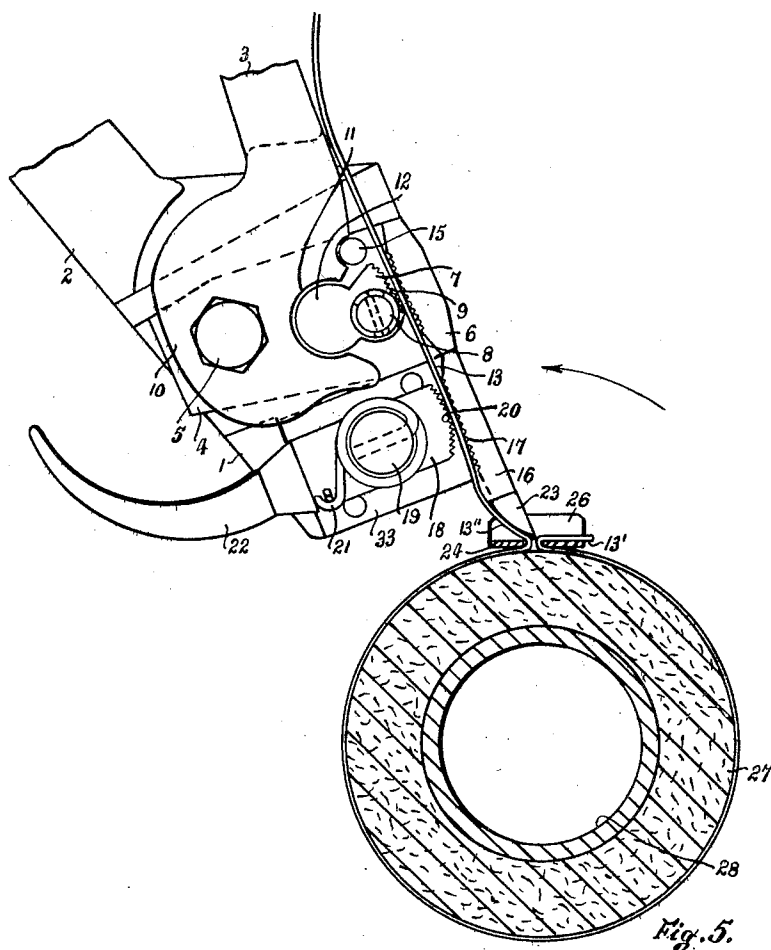
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2 SHEETS—SHEET 2



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UNITED STATES PATENT OFFICE

2,622,460

APPARATUS FOR TENSIONING AND JOINING
THE ENDS OF METAL BINDING STRAP-
PING, WIRE, AND THE LIKE AROUND A
BODYWilliam John Keeble, New Malden, England, as-
signor to Packers Supply Company Limited,
New Malden, England, a British companyApplication January 16, 1950, Serial No. 138,716
In Great Britain February 1, 1949

2 Claims. (Cl. 81—9.3)

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It is well known to apply metal binding strapping, wire and the like about objects and bodies such as barrels, bales, crates and the like, making use of machines which serve to anchor one end of the strapping or wire and to draw upon the other end while overlapping the anchored end, to tension the strapping or wire about the object or body, the overlapping ends after tensioning being joined in various ways, e. g. by the application of deformable sealing members to the two overlapped ends and deformation thereof together with parts of the overlapped ends, by jointing of the overlapped ends directly to one another or again in the case of wire by twisting the overlapped ends together.

Machines of this kind as hitherto constructed have included a main support, carrying means to anchor one end of the strapping or wire and further means for moving the other end of the strapping or wire through the machine to tension it and a platform formed at least in part by parts of the anchoring means and suitable to form a stable base permitting the machine to be rested upon the body or object to be bound. With these machines both ends of the strapping or wire extend over the platform and parts of the anchoring and tensioning means when the machine is in use so that when the binding operation is completed the platform and those parts of the anchoring and tensioning means must be removed from between the tensioned and joined strapping or wire and the surface of the bound body, an operation sometimes involving difficulty and inevitably attended by some slackening of the tension on the strapping or wire.

Whilst such machines and the methods of using them are entirely practical in the binding of cases, bales and the like as used for merchandising they are unsuitable for use in tightly binding strapping or wire around bodies of less than a given size since in many cases it is not possible to accommodate the platform and other parts of the machine within the loop of strapping or wire of the size to be formed, whilst in other cases when such accommodation would be possible, the removal of the machine parts from within the loop after tensioning and joining involves such a degree of slackening of the tension on the strapping or wire as to render the binding operation useless.

The object of the present invention is a method of and means for tensioning metal strapping, or wire about a body and joining the ends thereof, without the need for removal of any parts of the tensioning means from between the body and

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the tensioned strapping or wire on completion of the tensioning and joining operation so that the full tension on the joined loop of strapping or wire is maintained.

5 As an example only, the improved method and means is well adapted for use in securing lagging or like material on pipes or tubes of even quite small diameter, tensioned and joined loops of one inch diameter and even less having
10 been satisfactorily produced.

The improved method according to the invention consists in disposing one end of the strapping or wire, in retained engagement with a connecting member, looping the strapping or
15 wire and passing the other end thereof through an aperture in the connecting member in the direction away from the loop and, with the looped part of the strapping or wire enveloping the body to be bound, tensioning the strapping or
20 wire by drawing the said other end through the aperture in the connecting member by means of a tensioning tool applied outside the loop of the strapping or wire and making abutting engagement, in reaction to the tension of the
25 strapping or wire, with the surface of the part of the strapping or wire being drawn through the aperture in the connecting member and at the point of its emergence therefrom, and after
30 "tensioning," moving the tool about said point of reaction abutting engagement as a fulcrum to bend the strapping or wire to form a hook making retaining engagement with the edge of the aperture in the connecting member.

The connecting member for use with flat metal
35 strapping may be in the form of a flat metal plate having a transverse slot of a width somewhat greater than double the thickness of the metal strapping to be used, the first end of the strapping being bent to form a hook which is
40 inserted in the slot in the connecting member and engaged over one of the longer edges thereof and the strapping then being looped and the other end passed through the same slot in the direction away from the loop.

45 The hook at the other end of the length of looped and tensioned strapping is formed, with the tension maintained, by folding or bending the strapping by movement of the tool, about the point or line of reaction abutting engagement between the tool and the strapping, in
50 the direction away from the first hook, so that the outer parts of the two end hooks in the finished condition of the tensioned and formed loop, extend in opposite directions along the
55 outer surface of the slotted plate which itself

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lies close to the periphery of the tensioned loop of strapping.

The connecting member may be provided with upstanding flanges at those edges at right angles to the transverse slot, suitable to be bent down over the outer parts of the hooks to protect them against accidental deformation and consequent disengagement from the connecting member.

The invention is illustrated by way of example in the accompanying drawings in which

Fig. 1 is a view in elevation of the tensioning tool in one position occupied during the operation of tensioning a length of strapping about a pipe.

Fig. 2 is a figure similar to Fig. 1 but with the parts of the tool in other positions occupied during the operation of tensioning.

Fig. 3 is a view in end section on the line III—III of Fig. 1, and

Fig. 4 is a view in end section on the line IV—IV of Fig. 1.

Fig. 5 is a view on a larger scale of a part of the tool and illustrating the method of forming the joint after tensioning.

Fig. 6 is a view in perspective showing a preferred form of the connecting member.

Fig. 7 is a view in perspective showing the connecting member and the manner of forming the loop prior to the tensioning operation.

Fig. 8 is a view in perspective of the connecting member and a loop after the tensioning and joining steps have been executed and

Fig. 9 is a view in plan of a finished joint.

In the case illustrated the tool for tensioning the wire or strapping is constructed for one-hand operation and comprises a support in the form of a flat plate 1 having a fixed handle lever 2 extending from one edge and having a pair of gripping members mounted for movement on said support 1 and operable with the aid of a second handle lever 3 movable relative to the first handle 2, to grip and move the strapping or wire in one direction with an intermittent or step by step motion as the handles 2 and 3 are moved towards and away from one another. One of the said pair of gripping members is formed by a plate 4 mounted for rocking movement about a pivot formed by a pin 5 fixed in the support, said plate 4 at its lower end being provided with an outward lateral projection 6 the upper surface of which is provided with serrations. Upon the rocking plate 4 above the lateral projection 6 is mounted a pawl 7 capable of limited pivotal movement about a pivot pin 8 carried on the rocking plate 4, and provided at its lower end with a serrated surface 9 at the side towards the lateral projection 6 on the rocking plate 4.

The pivot 8 of the pawl 7 is located so that the serrated surface 9 of the pawl may be moved into and out of engagement with the serrated upper surface of the lateral projection 6 on the rocking plate 4.

On the same pivotal axis 5 as the rocking plate on the support 1, is mounted a disc or block 10 having a projecting arm forming the second handle 3 and extending in the plane of the handle lever 2 of the support 1.

In the lower edge of the disc or block 10 is formed a notch 11 in which engages a nose 12 on the pawl 7.

The disc or block 10 is freely movable, within limits, about the pivot 5 relative to the rocking plate 4 and the arrangement is such that with a length of strapping 13 extending between the

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serrated surfaces 6 and 9 of the lateral projection and the pawl 7 respectively, movement of the handles 2 and 3 towards one another by one hand, against a compression return spring 14 disposed between the handles, first rocks the pawl 7 about its pivot 8 on the rocking plate 4 in the clockwise direction in Figs. 1 and 2, so that the strapping 13 is gripped between the serrated surfaces 6 and 9, and thereafter the pawl 7 and the rocking plate 4 are moved as one by the lever 3 in the counter-clockwise direction in Figs. 1 and 2 about the pivot pin 5 on the support 1, and the gripped strapping moved in the general direction of the arrows in Figs. 1 and 2. Movement of the handle levers 2 and 3 by the return spring 14 away from one another i. e. from the position of Fig. 2 to that of Fig. 1, first moves the pawl 7 on the rocking plate 4 counter-clockwise about its pivot 8, to release the grip on the strapping 13 and thereafter the pawl 7 and rocking plate 4 are free to make a return movement e. g. through the engagement of the second handle 3 with a pin 15 projecting from the rocking plate 4.

To prevent a return movement of the strapping 13 when released by the pawl 7, a one-way gripping device for the strapping is provided on the support 1 at the side of the rocking plate 4 away from the handle levers 2 and 3.

This one-way gripping device is formed by a lateral projection 16 at the lower edge of a plate 33 rigid with the support 1, in general alignment with the lateral projection 6 on the rocking plate 4 and having a serrated upper surface 17, a pawl 18 pivotally mounted on a pin 19 fixed on the support 1 above the lateral projection 16, the pawl 18 being also provided with a serrated lower surface 20. The pawl 18 is biased about its pivot 19 by a spring 21 in the direction to engage and grip strapping 13 extending between the lateral projection 16 and the biased pawl 18.

The disposition of the pivoted pawl 18 is such that it yields against its spring 21 to permit the strapping 13 to slide freely on the lateral projection 16 when the strapping is drawn in one direction by movement of the handle levers 2 and 3 on the tensioning means in the manner previously described, but is urged by the spring 21 into the position to engage and grip the strapping 13 to prevent movement thereof in the reverse direction when released from the grip of the parts 4 and 7 of the handle operated tensioning means.

A handle 22 is provided on the one-way gripping pawl 18 to enable it to be rocked to part it from the lateral projection 16 by hand to permit insertion and removal of the strapping 13, whilst the rocking plate 4 and the pawl 7 are normally held parted by the compression spring 14 between the handles 2 and 3.

In accordance with the present invention the tool is provided at one end i. e. the end away from the handle levers 2 and 3 with a projection 23 in general longitudinal alignment with the lateral projections 16 and 6 on the support 1 and on the rocking plate 4 respectively, said projections 23 being of longitudinally tapering form terminating in a blunt transverse edge. The upper surface of the projection 23 may conveniently merge into the upper surface 17 of the lateral projection 16 of the one-way gripping device, as clearly shown in Fig. 7, the said surface 17 being preferably of slightly convex form as shown in the longitudinal direction.

A connection member suitable for use in connecting the ends of the loop of tensioned flat metal strapping comprises a flat metal plate 24

(Fig. 6) having a transverse slot 25 located midway of the length of the plate and of a width somewhat greater than double the thickness of the metal strapping 13, and provided with up-standing edge flanges 26 at the edges of the plate 24 at right angles to the transverse slot, the flanges being preferably of a width slightly less than half the width of the body portion of the plate 24.

In the end of one of the handles of the tool, e. g. the handle 2 in the case illustrated, there may be formed a notch 29 into which is inserted and fixed, a hard metal block 30 having a transverse slot 31 at its outer end of a size to receive a short length at the end of a piece of the strapping, the outer side of the handle 2 and the block 30 being chamfered as shown at 32. By the insertion of the end 13' of a piece of strapping 13 into the slot 30 as shown in Fig. 1 and folding the strapping about the outer side of the handle, a hook can readily be formed at the end of the piece of strapping.

It will be noted as shown in the drawings that the gripping portion (lateral projection 6) of the first gripping member and the gripping portion (lateral projection 16) of the first part of the one-way gripping device and the projection 23 are all located on one side of a plane parallel to the axes of pivots 5, 8 and 19 and passing through the tool and that the second gripping member 7, the second part of the one-way gripping device (pawl 18), the levers 2 and 3 and the pivots are located on the opposite side of said plane. This provides a simple compact structure which can easily be operated manually with one hand.

The invention is shown in Figs. 1, 2 and 5 of the drawings as applied to the formation of tensioned loops of flat metal strapping about lagging material 27 wrapped around a pipe 28 of relatively small diameter.

The operation of forming and joining the ends of such tensioned loops is as follows:

The end 13' of a piece of strapping 13 is inserted in the slot 31 at the end of the handle 2 and the strapping folded about the chamfered end of the handle 2 in the manner previously described with reference to Fig. 1 to form a hook on the end of the piece of strapping 13.

The hook thus formed at the end of the strapping is hooked over one edge of the transverse slot 25 of a connecting member 24 in such manner that the bent extremity 13' of the strapping lies in the trough between the flanges 26 of the connecting member (Fig. 6). The strapping, is now looped and the other end, i. e. the end remote from the hooked end, passed through the slot 25 of the connecting member 24 from the side thereof remote from the flanges 26 and caused to project over the extremity 13' between the flanges 26.

Such looping of the strapping usually takes place simultaneously with encirclement of the pipe by the strapping but it will be understood that in the case of a pipe with an accessible free end the loop in the strapping may be formed first and then applied over the pipe end.

With the loop thus formed and surrounding the pipe, the portion of the strapping threaded through the connecting member 24 is now inserted into the tool between the parts 16 and 18 of the one-way gripping device and the parts 6 and 7 of the tensioning device and when so inserted the strapping between the connecting member 24 and the one-way gripping device 16, 18 extends over the end projection 23 on the tool.

The handles 2 and 3 of the tool are now caused to approach and recede from one another to cause the strapping 13 to be drawn step by step through the tool to first take up the slack in the loop and as this contraction of the loop takes place the end projection 23 is guided into a position in which it rests upon the outer surface of the part 13' of the preformed hook between the flanges 26 of the connecting member 24 and engages the underside surface of the part of the strapping 13 extending from the slot 25 in the connecting plate 24 towards the tool.

As tensioning proceeds the extremity of the end projection moves into abutting engagement with the strapping at a line on said undersurface at or close to the slot 25 in the connecting member as shown in Figs. 1 and 2 and is retained in such abutting engagement by the tension reaction. Movement of the handles 2 and 3 is continued until the required degree of tension on the strapping 13 is achieved, this tension being maintained by the one-way gripping device 16, 18 of the tool.

The tool is now swung as a whole about the fulcrum formed by the extremity of the end projection 23 in engagement with the strapping 13 at or very close to the slot 25 in the connecting member 24, in the manner indicated by the arrow in Fig. 5. The strapping 13 is thus bent about the edge of the slot 25 opposite that with which the first hook 13' was engaged, so that another end hook 13' is formed which serves with the first hook 13' to retain the loop of strapping as tensioned.

The one-way gripping device 16, 18 which serves to maintain connection between the strapping and the tool during the above described swinging movement, traverses a substantially circular arcuate path about said fulcrum so that substantially the full tension is maintained on the strapping during the operation of forming the second hook.

The tool may now be disengaged from the strapping and since no part of the tool has been located inside the loop, this involves no slackening of the tension in the loop.

The strapping may now be sheared at a selected point spaced from the slot 25 in the connecting member 24 in any convenient manner, and the edge flanges 26 hammered or otherwise folded down towards one another and over the hook ends 13' and 13'' as shown in Fig. 9.

Whilst in the above described embodiment of the invention the first mentioned end of the strapping is provided with a hook for engagement with the connecting member, it will be understood that other methods of connection of the first engaged end of the strapping with the connecting member may be employed and in some cases lengths of strapping with an integral or permanently attached connecting member at one end may be employed.

I claim:

1. A tool for use in tensioning metal strapping or wire about a body and joining the ends thereof by an apertured connecting member through which the strapping or wire is passed, said tool comprising a support, a first gripping member pivotally mounted on said support at a point intermediate the ends thereof, and having a gripping portion, a second gripping member pivotally mounted on said first gripping member, a lever projecting beyond one end of the support and operatively connected with said second gripping member and adapted when moved in one direc-

tion, first to move said second gripping member and grip strapping or wire extending between said first and said second gripping members and thereafter to move said first and said second gripping members and the gripped strapping or wire together relative to the said support, and when moved in the other direction first to move the second gripping member relative to the first gripping member to release the grip on the strapping or wire extending between the said first and the said second gripping members and thereafter to move the said first and the said second gripping members relative to the said support and the strapping or wire, a one-way gripping device, including a first part fixed with regard to the said support and provided with a gripping portion, and a second part mounted on the support intermediate the ends thereof and movable with respect to the said support and adapted to allow strapping or wire to pass freely through it in the direction in which the strapping or wire is moved by the said first and second gripping members, but to hold it against movement in the reverse direction, and an end abutment formed by an outward extension of the support at the end thereof remote from said lever, adapted to making abutting engagement between the said apertured connecting member and a part of the strapping or wire extending through and from the aperture in the said connecting member to the tool, in opposition to the direction of movement imparted by the said lever to said first and second gripping members to tension the strapping or wire, the end abutment, the gripping portion of the first gripping member and the gripping portion of the first part of the one-way gripping device being disposed on one side of a plane parallel to the axes about which the gripping members are pivotally mounted and passing through the tool, and the second gripping member, the lever, and the second part of the one-way gripping device and the pivoting axes being disposed on the opposite side of said plane.

2. A tool for use in tensioning metal strapping or wire about a body and joining the ends thereof by an apertured connecting member through which the strapping or wire is passed, said tool comprising a support, a first hand lever rigid with said support and extending beyond one end thereof, a first pivot carried by the support at a point intermediate the ends thereof, a first gripping member pivotally mounted on said pivot and having a gripping portion, a second pivot mounted on said first gripping member and having its axis parallel to the axis of the first pivot, a second gripping member pivotally mounted on said second pivot, a second hand lever also extending beyond the said one end of the support and pivotally mounted on said first pivot for movement in a plane containing the first lever and operatively connected with said second gripping member and adapted when moved in one direction, first to move said second gripping mem-

ber and grip strapping or wire extending between said first and said second gripping members and thereafter to move said first and said second gripping members and the gripped strapping or wire together relative to the said support, and when moved in the other direction first to move the second gripping member relative to the first gripping member to release the grip on the strapping or wire extending between the said first and the said second gripping members and thereafter to move the said first and the said second gripping members relative to the said support and the strapping or wire, means to bias said first and said second hand levers away from one another, a one-way gripping device including a first part fixed with regard to the said support and having a gripping portion and a second part mounted on the support intermediate the ends thereof and movable with respect to the said support, and adapted to allow strapping or wire to pass freely through it in the direction in which the strapping or wire is moved by the said first and second gripping members, but to hold it against movement in the reverse direction, and an end abutment formed by an outward extension of the support at the end thereof remote from said first hand lever and said second hand lever and adapted to make abutting engagement between the said apertured connecting member and a part of the strapping or wire extending through and from the aperture in the said connecting member to the tool, in opposition to the direction of movement imposed upon said part of the strapping or wire by the said first and second gripping members upon relative movement of the said first and the said second hand levers to tension the strapping or wire, the end abutment, the gripping portion of the first gripping member and the gripping portion of the first part of the one-way gripping device being disposed on one side of a plane parallel to the axes about which the gripping members are pivotally mounted and passing through the tool, and the second gripping member, the levers, and the second part of the one-way gripping device and the pivoting axes being disposed on the opposite side of said plane.

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