My device relates to mechanisms which are employed for joining two ends of wire and particularly to devices which are intended for doing this work in connection with a wire hoop or band which is applied to a box or bundle in order to reinforce and strengthen the same.

The object of my device is to provide a tool which may be employed for putting reinforcing wire hoops or bands about a box, or other like package, so as to reinforce the same and to do this in a more convenient manner than previous devices for this same purpose. A further object of my invention is to combine with the knot forming, or wire joining mechanism, a mechanism which will cut the wire close to the twist which forms the knot or joint between the ends of the wire, so as to prevent the possibility of wire ends projecting so as to do damage. Other objects of my invention will appear from a study of the following specification and the accompanying drawings.

In the accompanying drawings I have shown my invention in a form of construction which is that now most preferred by me.

Figure 1 is a top, or plan view of the machine by which the knot is formed and the cutting of the ends secured.

Figure 2 is a front side view of the same mechanism.

Figure 3 is a cross section taken adjacent to the wire cutting mechanism.

Figures 4 and 5 are sections taken at a like point in the mechanism, but showing slightly modified types of construction and manner of operation of the wire cutting mechanism.

Figure 6 is a front end view of a portion of the device showing the wire twisting and cutting mechanism.

This device is herein illustrated as it would be constructed for placing reinforcing wire bands or hoops about rectangular boxes or packages. It is evident, however, that the same may be modified, without departing from the principles of construction, so as to be applied to packages of a different outline. It will, however, be herein described as applied to rectangular packages.

A suitable base 1 is provided. This is shown as provided with a handle or knob 10, which may be engaged by hand in order to move the machine about and also to hold it securely while the levers are being operated, through which the wire twisting and the wire straining mechanisms are actuated. This frame is provided with a toe, as 11, which projects forwardly and is tapered towards its outer edge, so as to come to a sharp edge, as is clearly shown in Figures 3, 4, and 5. The portion 12, in which is mounted the operating parts, is raised above the general level of the base and is also composed of two parts, dividing along the line 13, one of these being an integral part of the base and the other, as 14, being removable secured thereto.

The line of division has been shown as placed to include the wheel 15 and the twister wheel 2 with the connecting idler wheel.

The front face of the raised portion 13, is provided with a slot 16, of such size as to freely pass the wire from which to form the band or hoop. At each end of the slot, narrow bars 17 are inserted, these being of steel or other wear-resistant material and each provided with a slot, similar to the slot 16, except that the width thereof is somewhat less. The slot in the body of the parts 12 and 14, is made sufficiently larger in vertical extent than the wires, so that the ends of the wire which overlap and are presented side by side, may be permitted to twist within the slot. The two steel bars 17 have slots which are sufficiently narrow to prevent twisting of the wires at this point. These bars 17 thus serve as wire holding means to prevent twisting and may be replaced by any other suitable wire holding mechanism.

Embedded within the meeting faces of the projections 12 and 14 of the frame, is a twisting wheel 2, which wheel is provided with a slot, as 20, adapted to receive the two wires, as is clearly shown in Figure 3, and having the bottom of the slot of such width that the wires may not twist therein. It is evident that, with the wires held against twisting by the bars 17 and also by the twister wheel 2, if said twister wheel be revolved, that portion of the wires extending between the twister wheel and the bars 17 will be twisted so as to join the two ends of the wire together and thus form a securely holding knot. The use of such a knot as this is common in the art and I claim nothing upon the use of this type of wire joint or knot, or the specific twister mechanism.

In the type of construction illustrated, an idler pinion 21 is shown as interposed between the twister pinion 2 and the main drive-
ing gear, or segment, 15. This driving gear, or segment 15 is secured to a shaft, as 22, which has secured thereto an operating lever arm, as 23, by which it may be turned in its bearings 24 and 25. A swinging or oscillating movement of the lever 23 through a half circle, or 180°, will suffice to give the twister wheel 2 enough turns to thoroughly join together the two ends of the wire. As herein illustrated the half turn of the wheel 15 is sufficient to give three full turns to the twister wheel.

With the operating lever 23 in either extreme position, that is, in its extreme back position, as shown in Figure 1, or in its extreme forward position, which is not shown, the slot 20 in the twister wheel will be facing forward, or so as to match with the slot 16 of the projecting portions 12 and 14 of the frame. In this position the wires may be freely inserted and removed therefrom. The wires may be inserted preparatory to forming the joint, when the lever arm 23 is back and may be removed after forming the joint when the lever arm 23 is in its extreme forward position.

The head of lever 23 is provided with two stop lugs 70 and 71 which by engaging stops, as the adjustable bolt 72, carried by the frame, serve to stop the lever in position to insure that the notch in the twister wheel will match with the slot 16 in the frame so that the wires may be inserted and removed.

In putting the wire in place the end is placed between the holding dog 3 and the anvil 30. The holding dog 3 is mounted so as to have vertical movement within the guides and is normally held raised by the action of the spring 31 which engages with the upper end of the holding dog 3. The dog is depressed so as to hold the wire, by means of a cam 52 which is journaled in the frame and which is operated by means of a lever 33. When the wire is put in place the lever 33 is thrown into position to force the dog 3 downward and thus securely grip the wire. The wire extends from this point towards the right as shown in Figure 2, through the slot 16 and thence about the box or package to which the reinforcing band is to be applied. It is then passed into the slot 16 so as to lie alongside of the other end of the wire. It extends beyond the slot 16 a sufficient distance to be readily engaged by the tightening mechanism.

The tightening mechanism, as herein illustrated, consists of a shaft 4 which is journaled in bearings 40 carried by the frame. This shaft 4 is provided with a slot, as 41, in its outer end, into which slot the end 50 of the wire 5 is placed. If the shaft 4 be then turned, the wire end 50 will be bent, as shown in Figure 2, and the part thereof extending about the box or package, will be drawn up so as to make the same tight, and will hold it thus while the twister is operating to form the joint.

To do this the shaft 4 is provided with a handle 42, which is preferably provided with a ratchet mechanism for turning the same. The shaft is also provided with a holding dog, as 43, whereby the same is held, so that the operating lever 42 may be operated by a reciprocating or oscillating movement, as to take up as much of the wire as may be necessary in order to draw it tightly about the package. By placing this shaft 4 in a horizontal position, with its lower edge substantially in line with and close to one end of the slot in which the knot is formed, I produce a device which is more convenient in operation than if the axis of this twister shaft be vertical. For one thing it is more convenient to place the wire in the slot. In the second place it interferes less with the part of the wire which is adjacent the outer end thereof and which forms a permanent return part of the band; also it brings the part 51 of the wire which leads back through the slot 16 after having been passed around the package, into substantial alinement with the other part of the wire, so as to lay the two parts of the wire close alongside each other within the slot.

The vertical oscillating movement of the lever 42 does not tend to twist the tool upon the package and thus makes it unnecessary to provide any special holding dog to prevent sliding of the tool upon the box about a vertical axis, as is caused when the tightening shaft 4 is in a vertical position. This is a matter of considerable convenience in the handling of the tool. It eliminates a special holding dog to prevent such movement of the device with relation to the wire and also the necessity for releasing such a dog from the wire.

Mounted in suitable guides alongside of one end of the slot 16, being the end opposite which the holding dog 3 is placed, is a wire cutting tool 6. With this wire cutting tool 6 co-operates an anvil member, which may be a part of the bar 17, or independent thereof, as may be desired. This wire cutter 6 may be made in various types of construction, of which modifications are shown in Figures 3, 4, and 5. The mechanism for operating the same may also be varied, as has been shown in the same figures. As shown in Figure 3, this cutter 6 is mounted to slide in a vertical guide-way 61 and is connected with an operating lever 62, which lever is pivoted at 63.

For all of the devices shown I have illustrated the operating mechanism as consisting of a cam 7 which is mounted upon a projecting end of the shaft 22, which shaft carries the gear 15 through which the twister wheel 2 is turned. As the device is shown in Figure 3 the lever 62 is provided with a notch, as 69, adapted to receive the toe of the cam.
when the twisting lever has reached its extreme forward position. This toe of the cam engages the portion 64 of the lever 62 so as to depress the cutter 6, just prior to the termination of the turning movement of the twister wheel and said toe enters the recess 63 when the twister wheel entirely finishes its movement. This results in the depression of the cutter 6 so as to cut the surplus portion of the wire which extends to the tightening member or shaft 4, just prior to finishing the twist and when the twist is finished the cam lies in the recess 63, whereby the lever 62 is raised, through the action of the spring 66, thus permitting the free removal of the wire from the slot 16 and the other parts which have been employed in forming the joint. The tool at this point is pushed backward, thus releasing the band.

The device shown in Figure 4 is essentially the same as that shown in Figure 3. The chief difference is that the lever has been made as a straight bar and has the cutting tool 66 fixedly secured thereto. The construction of the tool and the manner of joining it to the lever 67 is shown in end view in Figure 6.

In Figure 5 is shown a slight modification in which the cutter operating lever 68, is in the form of a bell crank lever pivoted at 69 and actuated in a similar manner by the cam 7. The cutter 66 is in this case also fixed directly on the end of the lever 68, instead of being secured thereto by a sliding connection as shown in Figure 3.

In all of these cases the cutter is so placed that it cuts only one of the two adjacent wire sections. The end 51 of the wire band, being the end which is passed about the package, lies outside of that end which is held by the dog 3 and it is this end 51 which it is desired to cut and it is desired to cut this as close as may be to the bar 17, by which it has been held against turning. In consequence the cutter is so mounted that it will cut one of these wires without cutting the other, as has been clearly shown in Figures 3, 4, and 5.

By providing means for cutting this end of the wire, a much more uniform job may be secured than which the cutting of this end of the wire is done by a hand tool used by the operator after the twisting tool has been removed. Where this work is done by a separate tool after twisting, it may produce a satisfactory result if the operator be careful each time, but the operator cannot be depended upon to be sufficiently careful in securing the best results.

In consequence of this the wire is apt to be cut at irregular distances from the twist, which is likely to produce a projecting end, liable to catch objects with which it comes in contact and thus to do damage. It is particularly dangerous in its liability to cut the hands of the men handling the packages, and to damage other goods, such as sacks of flour, etc. With an automatic cutter as herein shown, the cutting will at all times be done at the same point, so that the short end left will be close up against the other wire and so that it will not have projecting ends of sufficient lengths to seriously damage other freight, etc. Furthermore, it saves the time of one operation required when this is done by hand and thus increases the output.

What I claim as my invention is:

1. A wire loop forming device comprising a wire end clamp, a bar alongside of said wire clamp having a wire receiving notch adapted to prevent two wires placed therein from twisting, a like holding bar separated from the first and also forming one blade of a wire cutter, a complementary wire cutting blade having a cutting edge adapted to engage and cut only one of two wires placed in the notch of the holding bar, and a twister engaging the wires between said holding bars.

2. In a wire tying machine the combination of a frame having a smooth bottom and provided with a dog; a separated pair of wire holding members having slots for holding two portions of a wire against a turning movement; a cutter carried by said frame; one of said wire holding members making face contact with said dog and the other wire cutter; a wire tensioning means also carried by said frame; a wire twisting means; an operating lever; and connections whereby when said lever is operated said two portions of said wire will first be twisted together and then one of said portions cut in two at the end of the twisted section.

3. In a wire tying machine the combination of a frame provided with a dog and members provided with slots for holding two portions of a wire in parallel contact; a cutter carried by said frame against a face of one slotted member; a wire tensioning means also carried by said frame; a gear train comprising a slotted wire twisting member; an operating lever; and connections between said cutter and said lever, and between said gear train and said lever, whereby when said lever is operated said two portions of said wire will first be twisted together and then one of said portions cut in two, at the end of the twisted section.

4. In a wire tying machine the combination of a wire clamping means; a wire twisting means comprising a rotating slotted pinion and a pair of stationary slotted members; a movable member cooperating with an edge of one of said slotted members to form a wire cutter; an operating lever; and connections by which the operation of said lever actuates said twisting means and said movable member.

5. In a wire tying machine, the combination of a frame having a smooth bottom; means comprising a pinion having a single
slot for twisting two parts of the wire together; a stationary slotted member preventing said parts from being twisted; means for tensioning said wire before said parts are twisted; means coating with said slotted member for cutting one of said parts at the end of the twisting operation; and an operating lever for actuating both of said twisting and cutting means.

6. In a wire tying machine, the combination of means for twisting two parts of a wire together; means comprising a slotted member preventing such parts from being twisted and aiding in retaining said wire in place during the twisting operation; means for tensioning said wire before said parts are twisted; means coating with an edge of said slotted member for cutting one of said parts after the twisting operation has started; and a single operating lever for actuating said twisting and said cutting means.

7. In a wire tying machine, the combination of a wire holding means; a wire twisting means; a pair of slotted members limiting the length of the twisted portion of said wire; a wire cutting means acting complementarily with one of said slotted members; and a single operating lever for successively actuating said wire twisting and said wire cutting means.

8. In a machine adapted to twist together parallel disposed bights of wire with their ends pointing in opposite directions, the combination of means for holding said bights substantially parallel to and over the surface of the bundle being wired, including separated slotted means for preventing portions of said bights from being twisted together; a slotted twisting means located between said separated means adapted to twist together while still substantially parallel to said surface another portion of said bights; means coating with one of said separated means to cut one of said bights after the beginning of the twisting operation; and an operating lever for actuating said twisting and cutting means.

9. A wire hoop making device comprising means for holding a wire end alongside of the body of the wire which is to form the other end of the hoop including two separated means for holding said hoop ends to prevent their being twisted; a twister engaging both wires between said holding means to twist them; a cutter bar acting complementarily with one of said holding means to cut one wire at substantially one end of the twisted section; means comprising an oscillating lever for actuating said cutter to cut said wire at the end of the twist forming movement; and stops to limit the movements of said lever.

10. In a wire tying machine, the combination of a frame provided with a dog and members provided with slots for holding two portions of a wire in parallel contact; a cutter carried by said frame against the face of one slotted member; a wire tensioning means also carried by said frame; a gear train comprising a slotted wire twisting member; an oscillating operating lever; connections between said cutter and said lever and between said gear train and said lever, whereby when said lever is operated said two portions of said wire will first be twisted together and then one of said portions cut in two at the end of the twisted section; and means to limit the oscillations of said lever.

11. In a wire tying tool, two separated slotted jaws adapted for the reception of two parallel disposed wires and to prevent their twisting; slotted rotating means for engaging and twisting said wires intermediate of said jaws; a movable member cooperating with one of said wire holding jaws to form a wire cutter, the cutting jaws of said wire cutter being limited to cut only one of said wires; and a single lever for operating said twisting means and said movable member.

12. In a portable wire twisting machine the combination of a frame having a smooth bottom; a wire twisting means comprising a pair of slotted stationary members spaced apart; a slotted rotating twisting member located between said slotted members; a cutter member acting complementarily with one of said slotted members; a main operating lever adapted to be swung in opposite directions; connections by which said lever operates said twisting member and said cutter member; a stop to limit the movements of said lever; and a rear extension of said frame to steady the same when said lever is operated.

13. In a portable wire twisting machine the combination of a twisting means comprising a pair of spaced slotted members and a rotating slotted pinion disposed between them and adapted to twist together a pair of wires; a cutter member coating with one of said slotted members and having its cutting edge limited to cut only one of said wires; a single operating lever for actuating said pinion and said cutter member; and stops limiting the movements of said lever.

Signed at Seattle, King County, Washington, this 15th day of January, 1920.

GEORGE WOOD.