June 6, 1933. M. H. STRATTON ET AL 1,912,865

WIRE TYING TOOL

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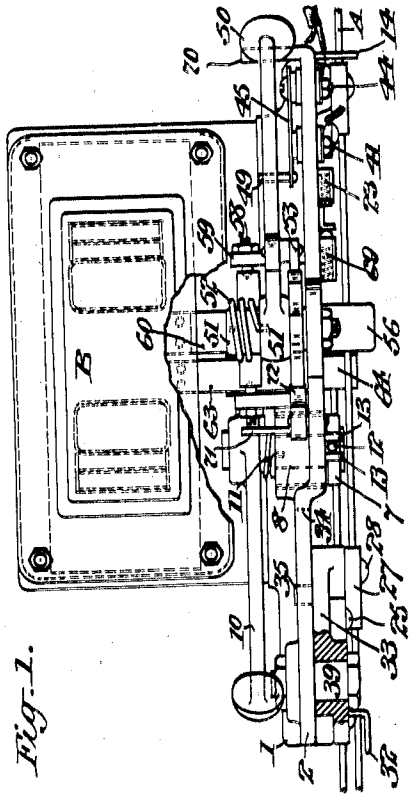


Fig. 1.

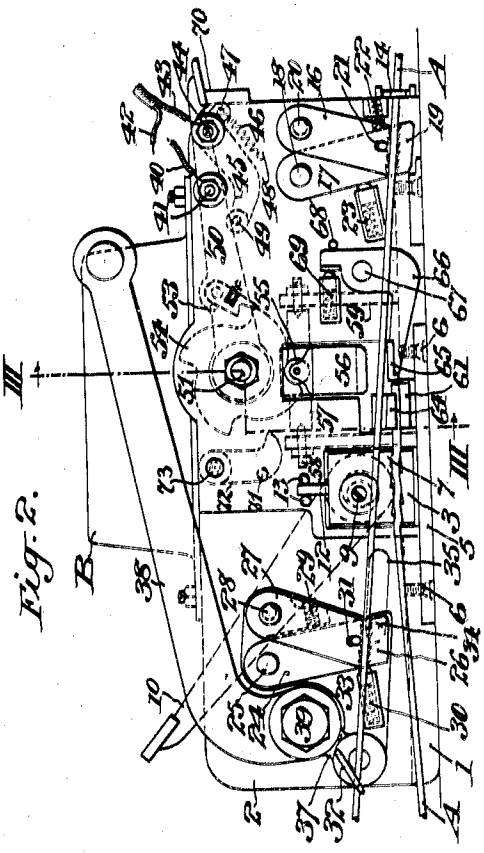


Fig. 2.

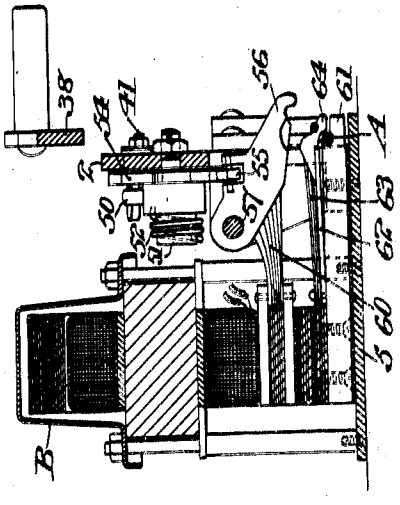


Fig. 3.

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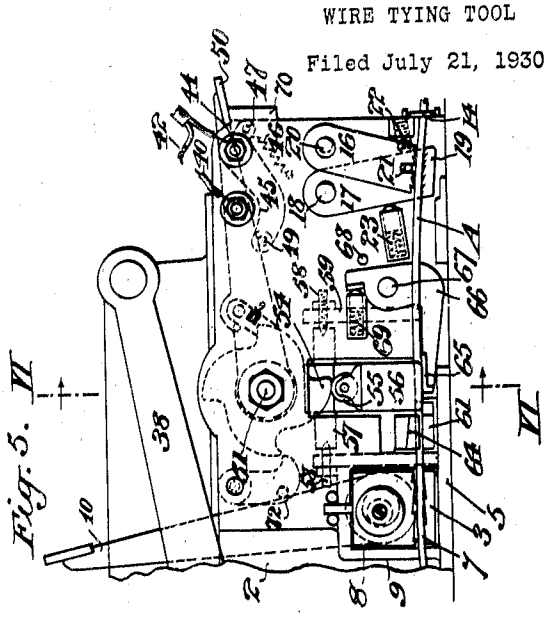


Fig. 5.

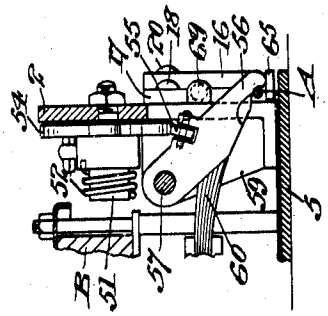


Fig. 6.

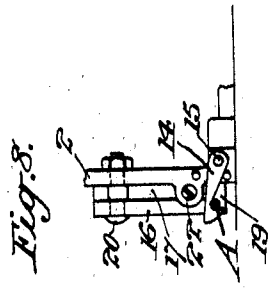


Fig. 8.

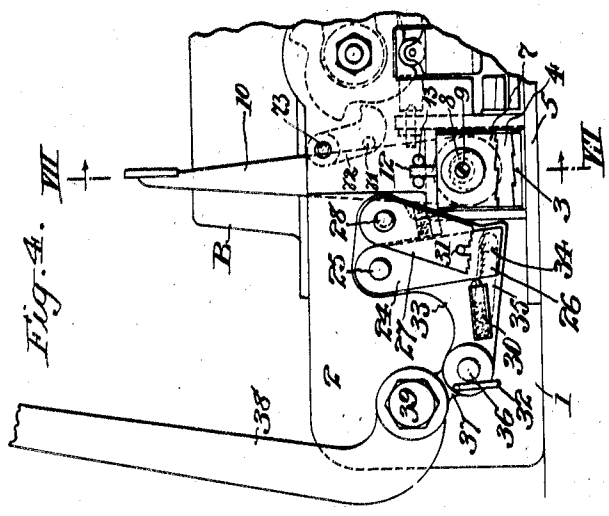


Fig. 4.

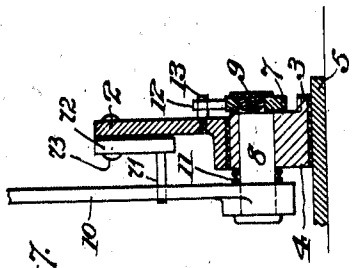


Fig. 7.

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UNITED STATES PATENT OFFICE

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WIRE TYING TOOL

Application filed July 21, 1930. Serial No. 469,592.

This invention relates to a wire tying tool designed for tensioning and fastening wire ties or the like around bundles.

It has for an object to provide such a device that includes means for electrically severing a portion from a supply of wire to constitute a tie and for electrically welding the ends of the said tie.

Another object consists in providing such a device in which the fastening ties may be formed consecutively from a spool or other suitable supply of wire without the necessity of preforming the wire as by coiling the end, or the like.

A further object consists in providing such a device that embodies various improvements in the form, construction and arrangement of the several parts, whereby its designed function is more rapidly and efficiently performed than with previous devices of this structure, and whereby strength, rapidity, ease of operation and durability are attained to a high degree.

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

Fig. 1 represents a top plan view of the tool, partly broken away.

Fig. 2 represents a side elevation of the same.

Fig. 3 represents a section taken in the plane of the lines III—III of Fig. 2 looking in the direction of the arrows.

Fig. 4 represents a detail side elevation, showing certain parts in positions different from their positions in Fig. 2.

Fig. 5 represents a detail side elevation, showing certain other parts in positions different from their positions in Fig. 2.

Fig. 6 represents a detail section taken in the plane of the line VI—VI of Fig. 5, looking in the direction of the arrows.

Fig. 7 represents a detail section taken in the plane of the line VII—VII of Fig. 4, looking in the direction of the arrows.

Fig. 8 represents a detail elevation showing a locking device for the wire tie.

The subject matter of this invention is of the same general nature as that disclosed in United States Patent No. 1,776,868, dated September 30, 1930, and it is calculated to tension, sever, and fasten wire ties; but it differs strikingly in the provision of means for forming the fastening ties from ordinary wire that has not been preformed in any respect; in the use of electricity for severing and fastening the wire ties; and in various features of construction.

The tool has a main body or frame which includes a base denoted generally by 1 and an uprising portion denoted generally by 2. The various operative parts are supported or carried by the said frame.

One group of mechanism is designed to grip the wire at a point adjacent its free end in order to hold it during tensioning, severing and welding. This group includes a pair of jaws, one of which is marked 3. This jaw 3 (see Fig. 7) is formed integral with a bearing 4 that is supported by and insulated from a plate 5 which is fastened in the under side of the base 1, as by screws 6. The said bearing is housed in a rectangular opening formed in the uprising portion 2 of the frame and is also insulated therefrom. The other jaw is marked 7 and is eccentrically mounted on a shaft 8 which is journaled in the bearing 4. The jaw 7 is held on the shaft 8 by a screw and washer which are collectively indicated by 9. A lever 10 is fixed to the opposite end of shaft 8 and a torsion spring 11 is interposed between the hub of the lever and the bearing 4 in order yieldingly to hold the lever in the position shown in Fig. 2 and also to hold jaws 3 and 7 in alignment. A guide rod 12 projects from jaw 7 and is calculated to ride between a pair of pins 13 which are set in insulating bushings and project from the uprising portion 2 of the frame.

It will be seen from the foregoing description that, when the lever 10 is in the position shown in Figs. 4 and 7, the jaws are separated so that the end of the wire may be inserted therebetween, and project slightly therebeyond as indicated in Fig. 2. The movement of the lever 10 to the position shown in Fig. 2 will serve to grip the end of the wire firmly between the jaws.

With the parts in this position the wire tie, which is marked A, is firmly gripped at a

point adjacent its free end, and the next step of tensioning may proceed. In order to accomplish this step, the wire must be passed around the bundle and brought back to the tool, as is generally indicated in Fig. 2. It will be understood that the tool is rested on the bundle either just before or just after the wire is passed therearound, so that the gripping of the free end of the wire and the tensioning now to be described may readily be effected.

The body of the wire which has been passed around the bundle is first slipped under the locking hook 14 (see Figs. 2 and 8) which is pivoted to the side of the frame as indicated at 15 and adapted to rest in engagement with the wire under the force of gravity in order to hold the wire in line with the gripping members which will now be described.

There are two sets of said gripping members, the first set being denoted by 16 and 17. The member 17 is pivoted at 18 to the frame portion 2 and has a laterally protruding jaw 19 formed at its lower end. The member 16 is pivoted at 20 to the frame portion 2 and its lower end forms a jaw fitted to mate with jaw 19. The said members 16 and 17 are united by a pin and slot construction 21 which permits a slight relative vertical motion in order to accomplish the opening and closing of the jaws. The pivot 20 is eccentric to allow for adjustment of the member 16. An adjustable stop 22, carried by the frame portion 2 abuts member 17 to limit its movement in one direction and a yielding stop 23, likewise carried by frame portion 2, abuts the other side of member 17 to yieldingly limit its movement in the opposite direction. It will be seen that, when the member 17 moves toward stop 23 there will be a slight opening of the jaws, and vice versa.

The other set of gripping members is similar to that just described and will be briefly indicated. Member 24 is pivoted at 25 on a part to be hereinafter described and has jaw 26 formed at its lower end. Member 27 is eccentrically pivoted at 28 on the same part as member 24 and its lower end cooperates with jaw 26. The adjustable stop for member 24 is marked 29 and the yielding stop is marked 30. The pin and slot connection between the members is marked 31.

After the wire has been wrapped around the bundle and passed under hook 14, it is slipped between the jaws of the two sets of gripping members just described, which is readily accomplished by moving jaws 17 and 24 against the tension of their yielding stops 23 and 30. The wire is then rested in guide 32 which is carried on a part to be hereinafter described, and is drawn hand tight around the bundle. It will be seen that this hand tightening of the wire is readily permitted by the two sets of gripping members 16, 17, 24, 27, because the tightening movement tends to swing the members 17 and 24 against their yielding stops 23 and 30 which has the effect of slightly opening the jaws of said members.

However, immediately this hand tightening force is released and the wire tends to slacken, movement of that part of the wire which is engaged by the said sets of gripping members is in a contrary direction and permits the members 17 and 24 to be actuated by the yielding stops 23 and 30 so as to bring about a slight movement that at once seizes the wire and prevents any substantial slackening thereof.

The tool includes means for finally tensioning the wire so as to increase its binding action beyond that obtainable by hand, which means (see Fig. 4) includes a slide 33 which constitutes the part to which the members 24 and 27 are pivoted as hereinabove mentioned. The said slide is guided in its movement by a pin 34 which projects therefrom and rides in a slot 35 that is formed in the frame member 2. One end of the slide is pivoted at 36 to a short arm 37 which carries the guide 32, above mentioned, and which is formed integral with a lever 38 that is mounted on a bolt 39 which pierces frame portion 2. It will be seen that, by moving the lever 38 from the upright position shown in Fig. 4 to the substantially horizontal position shown in Fig. 2, the slide 33 will be moved to the left and, as the wire is firmly gripped by the members 24 and 27, there will be a very pronounced tensioning of the wire. Owing to the direction of movement, this tensioning of the wire is permitted by members 16 and 17, for the reason hereinabove explained, but the last named members will immediately resist any slackening of the wire which would tend to release the tension. In order to produce a condition of tension that firmly binds the bundle, the lever 38 may be repeatedly operated in the manner just described. Each time that it is moved to the upright position shown in Fig. 4, the slide 33 will be moved backwardly on the wire a distance and, each time the lever is moved to the substantially horizontal position shown in Fig. 2, the members 24 and 27 will obtain a new grip on the wire and the slide 33 will be moved to the left in Fig. 2 so as to increase the tension. It will be understood that when the members 24 and 27 release the wire, the latter is held against slackening by the members 16 and 17. By thus oscillating the lever 38, the wire may be, step by step, tightened or tensioned around the bundle until the desired condition has been attained.

Following the final tensioning of the tie, it is intended that the electric severing and welding shall take place. The mechanism for accomplishing this includes a transformer which is denoted generally by B and is

mounted upon the base portion 1 of the tool from which the primary winding is insulated. No further description of the transformer is required because any well known or approved form may be employed. The primary circuit of the transformer is connected by a wire 40 with a binding post 41 that is supported by and insulated from the frame portion 2; and by another wire 42 with a source of electric energy, not shown. A third wire 43 connects the last named source with another binding post 44 that is likewise supported by and insulated from frame member 2.

A switch 45 is pivoted on binding post 44 and is arranged to be urged by retractile coil spring 46 toward binding post 41. The said spring has one end fast to an ear 47 that is integral with switch 45, and the other end fixed to a pin 48 on frame portion 2. The free end of the switch has a stud 49 projecting laterally therefrom for the purpose of contacting with a lever 50 which is pivoted on a shaft 51 that is carried in frame portion 2. A torsion spring 52, which has its ends engaging the said shaft and the hub of the lever 50, tends to yieldingly hold the latter in the depressed position shown in Fig. 2. When the lever is in said position the switch 45 is held out of contact with binding post 41 by engagement of the lever with stud 49. When the lever 50 is elevated, switch 45 completes communication between binding posts 41 and 44 and thereby provides current to the transformer from the source of electric energy, not shown.

The lever 50 carries a pawl 53 which is fitted for engagement with a quadruple cam 54 that is mounted on shaft 51. Said cam engages a roller 55 that is mounted in the upper part of contact block 56 (see also Figs. 5 and 6). The said block is carried on a cross rod 57 that has its ends pivotally supported by trunnions 58 that are mounted in ears 59 which project rearwardly from frame portion 2. The said contact block is normally urged upwardly so that its roller 55 is in contact with cam 54 by means of a spring contact 60 that is mounted in and projects forwardly from the transformer.

When the lever 50 is elevated, its pawl 53 moves in an anti-clockwise direction with respect to cam 54 and, after it has traversed 90 degrees, it is brought into contact with one of the four abutments on the said cam. Movement of the lever in the opposite direction will thereupon turn the said cam 90 degrees and cause one of its protruding faces to act upon roller 55 and depress contact block 56, which forms one electrode of the secondary or welding circuit, to bring same in contact with the wire A.

The severing and welding mechanism also includes an anvil 61, which forms the other electrode of the secondary or welding circuit, and which projects forwardly from the transformer B and is grooved to support the free end of the wire that extends beyond the gripping jaws 3, 7. A flat spring 62 also projects forwardly from the transformer secondary winding and is in electrical contact therewith by means of brush 63. The said spring has a nose 64 that lies directly above the end of anvil 61 and between the upper and lower portions of the wire. To the right (Fig. 2) of anvil 61 and nose 64 is a stop 65 that is formed on one end of a bell crank 66 which is pivoted at 67 in frame portion 2. A fixed stud 68 projecting from said portion 2 limits the movement of the bell crank in one direction and a yielding plunger 69, likewise carried by portion 2, permits a slight movement of the bell crank in the opposite direction so as to allow for a slight depression of stop 65. The stop 65 serves as an abutment to determine the position of the end of the wire A when it is first inserted between the jaws 3 and 7, the wire being urged to the left in Fig. 2 until its end abuts stop 65 before closing the jaws 3 and 7 to grip the wire, as hereinabove recited. The depressibility of the said stop enables it to be moved during the severing and welding of the wire, as will be hereinafter set forth.

From the foregoing description it will be clear that elevation of lever 50 will at first complete the primary circuit through the transformer by the closing of switch 45. When lever 50 has moved in this anti-clockwise direction through an angle of about ninety degrees, pawl 53 will be brought into engagement with an abutment on cam 54. The lever is then allowed to move in a clockwise direction under influence of spring 52 and thus actuates cam 54 so as to cause it to move over roller 55 and depress contact block 56, which constitutes an electrode of the secondary circuit. As the said contact block touches the wire which is resting on nose 64, the secondary circuit is completed and the wire is heated to such a degree at this point that the downward pressure of block 56 separates the portion passing around the bundle from the source of wire supply. As the block 56 continues its downward movement under influence of cam 54, the two ends of the wire tie are brought together and welded. The yielding construction of stop 65 permits this movement of the upper end of the wire into engagement with the lower end. At this juncture, roller 55 will be in contact with a high point on cam 54, and lever 50 will be resting on a stop 70 (Fig. 2) which is fixed on portion 2 of the frame. This clockwise movement of lever 50 to the position just described breaks the primary circuit by contact of the lever with pin 49 and consequent swinging of switch 45, and the parts are timed so that this circuit is broken immediately after the ends of the wire have been

brought together and welded, as above described. This position of the parts is represented in Fig. 5 of the drawings.

It should be stated that the spring 52 serves to actuate lever 50 and its associated parts with a predetermined definite steady pressure which will insure proper severing and welding of the wire ends irrespective of variables in electric current or wire composition. Thus, for instance, if the current is relatively weak, a longer period for severing and welding will be required and the movement of the contact block 56 will be somewhat slower because the resistance of the wire to severing will be increased in proportion to the weakness of the current that heats it to the condition permitting severing. On the other hand, if the current is relatively strong, the movement of the block 56 will be relatively rapid so that it will sooner come to the position where the current is shut off. Similar conditions will arise owing to variation in the composition or character of the wire, irrespective of variations in the strength of current, and will be similarly accommodated. Thus this construction of the device automatically governs the operation so as to secure proper welding.

After the weld has been completed, lever 10 is elevated from the position shown in Fig. 2 to the position shown in Fig. 4. The first result of this movement is to separate jaws 3 and 7 so as to release the wire, and continued movement of lever 10 causes it to engage stud 71 (Fig. 2) on dog 72 that is pivoted at 73 in portion 2 of the frame. This position of the parts is shown in Fig. 5. Further movement of lever 10 causes dog 72 to engage one of the high points on cam 54 and turn the latter a slight distance in a clockwise direction so as to permit roller 55 to enter a depression in the cam, as indicated in Fig. 2. This movement of the roller is compelled by spring contact 60 and it, of course, correspondingly elevates contact block 56, so that the tie is released and the tool may be withdrawn from the strap in condition for another operation. When lever 10 is moved to the position shown in Fig. 2, at the outset of another operation, it will be evident that dog 72 is permitted to move away from cam 54 under the influence of gravity.

The resilient nature of spring 62 that carries nose 64, enables it to hold the free end of the wire in the proper position while it is being clamped between jaws 3 and 7, and it also permits the ready withdrawal of the tool from the welded tie, by a lateral movement, after the operation has been completed. It should also be stated that shaft 51 is slightly eccentric to permit vertical adjustment in the portion 2 of the frame and thereby exactly predetermine the movement of contact block 56 so as to insure exact alinement of the ends of the wire during the welding operation.

It is believed that the operation of the tool will be clear from the foregoing description, but it may briefly be said that the tool is placed on the bundle; the free end of the wire is inserted between jaws 3 and 7 and between anvil 61 and nose 64 until it abuts stop 65; the said jaws are then operated to grip the end of the wire; the body of the wire is passed around the bundle, slipped under lock 14, slipped into gripping members 16, 17, 24, 27, and laid in guide 32; the wire is finally tensioned by reciprocating lever 38; and the wire is then severed and welded as hereinabove described; after which the tool may be removed, by a lateral movement, from the completed tie, and the operation repeated in connection with another tie.

When, in the claims, we refer to a wire or tie, we do not intend to be limited as to the cross-sectional shape thereof; and, furthermore, when we refer to a bundle, we intend to include not only an individual package or container or the like, but a bundle made up of a group of articles or a group of containers, or a group of articles or containers in a still larger container. In other words, we intend to use the word bundle in its broadest reasonable interpretation.

It will also be understood that various changes may be resorted to in the form, construction and arrangement 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. A device of the character described comprising, means for consecutively severing a metallic tie from a source of supply by the electrical application of heat, and uniting the ends of the tie around a bundle by electric welding.

2. A device of the character described comprising, electric means for severing a metallic tie from a source of supply and securing the tie around a bundle by welding, said means including a plurality of contact members, mechanism for bringing said contact members and the tie into engagement with each other and for bringing two portions of the tie together, and means actuated by the movement of the last named mechanism for supplying an electric current to said contact members.

3. A device of the character described comprising, means for gripping an end of a wire, welding means including a movable contact member, mechanism for actuating said contact member in one direction, means operated by the release of the gripping means for engaging said mechanism and moving it

to such a position as to permit movement of the contact member in the reverse direction, and means for moving said contact member in the reverse direction.

4. In a device of the character described, a plurality of mechanisms adapted to grip a tie, said mechanisms being arranged to permit movement of the tie therethrough in one direction and inhibit its movement in the other direction, and means for bodily moving one of said mechanisms for tensioning the tie.

5. In a device of the character described, a plurality of mechanisms adapted to grip a tie, said mechanisms being arranged to permit movement of the tie therethrough in one direction and inhibit its movement in the other direction, and means for bodily reciprocating one of said mechanisms for tensioning the tie.

6. In a device of the character described, welding means including a movable contact member, mechanism movable in a rotary direction for actuating said contact member, and a torsion spring engaging said mechanism to urge it in a rotary direction.

7. A device of the character described comprising, electric means for severing a metallic tie from a source of supply and uniting the ends of the tie around a bundle by welding, and mechanism actuating said means to function in a substantially continuous operation.

8. A device of the character described comprising, electric means for severing a metallic tie from a source of supply and uniting the ends of the tie around a bundle by welding, and mechanism actuating said means to perform said functions consecutively and in the order stated in a substantially continuous operation.

9. A device of the character described comprising, means for gripping an end of the wire, means for tensioning the wire around a bundle, electric means for severing that portion of the wire which surrounds the bundle from the remainder thereof, means for bringing the ends of the wire tie thus formed together, and electric means for uniting said ends by welding; said means for severing, bringing together, and welding being arranged to perform said functions in a substantially continuous operation.

10. A device of the character described comprising, means for gripping an end of the wire, means for tensioning the wire around a bundle, electric means for severing that portion of the wire which surrounds the bundle from the remainder thereof, means for bringing the ends of the wire tie thus formed together, and electric means for uniting said ends by welding; said means for severing, bringing together, and welding being arranged to perform said functions consecutively and in the order stated in a substantially continuous operation.

11. A device of the character described comprising, electric means for severing a metallic tie from a source of supply and securing the tie around a bundle by welding, said means including a plurality of contact members, mechanism for bringing said contact members and the tie into and out of engagement with each other and for bringing two portions of the tie together, and means actuated by the movement of the last named mechanism for supplying an electric current to and cutting it off from said contact members.

12. In a device of the character described, electric tie severing and welding means including a movable contact member, and means for actuating said contact member with sustained pressure, whereby the proper duration of the welding operation will be automatically attained through resistance of the tie to the severing operation irrespective of variables in electric current or wire composition.

13. In a device of the character described, electric tie severing and welding means including a movable contact member, and means for actuating said contact member with predetermined sustained pressure, whereby the proper duration of the welding operation will be automatically attained through resistance of the tie to the severing operation irrespective of variables in electric current or wire composition.

In testimony, that we claim the foregoing as our joint invention, we have signed our names this 18th day of July, 1930.

MARK H. STRATTON.
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