MACHINE FOR PLACING RIPPING WIRES IN CAN TOPS

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This invention relates to a machine for securing ripping wires in can tops or covers of the type disclosed in the co-pending application for U. S. Letters Patent of James D. Evans, filed February 9, 1925, Serial No. 7,934.

As fully disclosed in the said co-pending application, the can tops are of the usual sanitary type with a groove adapted to receive a ripping wire and with an inwardly disposed expansive portion permitting one edge of the said groove to be so folded as to secure the said wire in position without stretching the remaining portions of the can top.

The can tops are formed by suitable means forming no part of the present invention, before being placed in the machine which forms the subject of the present application.

One object of the present invention is to construct a practical and efficient machine which will be capable of assembling the can top elements at a high rate of speed, thereby obtaining a low quantity production cost.

Another object of the invention is to produce a machine which will automatically assemble the can top elements, requiring the services of but a single attendant, whose duties will be merely to keep the machine supplied with the pre-formed can tops, replenish from time to time the supply of ripping wire and the supply of solder which is employed to secure one end of the wire in place and to hermetically seal the can tops at the place where the ripping wire passes through, and to remove the assembled tops from a suitable receptacle or stacker into which the finished tops are automatically delivered by the machine, thus minimizing the cost of labor in connection with the production of the can tops.

The machine is adapted to automatically feed the pre-formed covers, one after another, from a supply stack into a series of chucks which are carried by a movable table, each chuck being moved in intermittent steps into a number of positions or stations, wherein the machine is adapted to automatically punch a hole in the cover, in the base of the wire-receiving groove, measure and cut a length of wire from a continuous supply thereof, thread the measured length of wire through the punched hole, lay the portion of the wire extending above the cover in the wire-receiving groove, secure the wire in place by expanding the inner wall of the groove under and around the wire, form the portion of the wire extending below the cover into a loop, anchor the tail end of the wire in the groove, and hermetically seal the hole with solder, deflect and bend the loop into the concaved side of the cover and finally eject the finished cover into a stacker, from which the covers are removed from time to time by the attendant.

The machine is adapted to assemble and deliver the covers at an approximate speed of 60 covers per minute.

The construction and operation of the machine will hereinafter be disclosed in detail, reference being had to the accompanying drawings, of which:

Fig. 1 is a plan view of the machine, illustrating twelve stations A to L inclusive, into which each single cover is successively moved before being delivered from the machine;

Fig. 2 is a sectional plan view of the base of the machine taken on the line below the movable table, as indicated at 2—3 on Fig. 3;

Fig. 3 is a sectional elevation taken on the line 3—5, Fig. 2, certain portions of the machine, located above the base, being eliminated;

Fig. 4 is a sectional plan view taken on the line 4—4, Fig. 3;

Fig. 5 is a fragmentary sectional elevation taken on the line 5—5, Fig. 2;

Fig. 6 is a fragmentary sectional elevation taken on the line 6—6, Fig. 4;

Fig. 7 is a fragmentary elevation showing the power control mechanism;

Fig. 8 is a fragmentary plan view of the mechanism shown in Fig. 7;

Fig. 9 is a fragmentary side elevation of the mechanism shown in Figs. 7 and 8;

Fig. 10 is a fragmentary plan view, similar to Fig. 8, but showing certain elements in different positions;

Fig. 11 is a fragmentary plan view of the
movable table showing one of the chucks in the open position;

Fig. 12 is a sectional elevation taken on the line 12—12, Fig. 11;

Fig. 13 is a fragmentary plan view of the machine, drawn on an enlarged scale and showing station A in detail, wherein the pre-formed covers are fed from the supply stack to the chucks carried by the movable table;

Fig. 14 is a sectional elevation taken on the line 14—14, Fig. 13;

Fig. 15 is a sectional elevation taken on the line 15—15, Fig. 13;

Fig. 16 is a sectional elevation taken on the line 16—16, Fig. 13;

Fig. 17 is a sectional elevation taken on the line 17—17, Fig. 13;

Fig. 18 is a fragmentary plan view of the machine, drawn on an enlarged scale and showing stations B and C in detail, wherein the can tops are placed into proper position in the chucks and the wire-receiving hole subsequently punched in the cover;

Fig. 19 is a sectional elevation taken on the line 19—19, Fig. 18;

Fig. 20 is a sectional elevation taken on the line 20—20, Fig. 18;

Fig. 21 is a sectional elevation taken on the line 21—21, Fig. 20;

Fig. 22 is an enlarged sectional elevation showing the punch in detail;

Fig. 23 is a sectional elevation taken on the line 23—23, Fig. 22;

Fig. 24 is an inverted plan view of the punch drawn on an enlarged scale;

Fig. 25 is a fragmentary plan view illustrating a wire-receiving hole after having been punched in a can top;

Fig. 26 is a fragmentary plan view of the machine, drawn on an enlarged scale and illustrating station E in detail, wherein the length of ripping wire is drawn from a reel, measured, cut and threaded into the wire-receiving hole in the cover;

Fig. 27 is a front elevation of the mechanism shown in Fig. 26;

Fig. 28 is a sectional elevation taken on the line 28—28, Fig. 27;

Fig. 29 is a sectional elevation taken on the line 29—29, Fig. 27;

Fig. 30 is a sectional plan view taken on the line 30—30, Fig. 27;

Fig. 31 is a sectional elevation taken on the line 31—31, Fig. 26;

Fig. 32 is a sectional elevation taken on the line 32—32, Fig. 26;

Fig. 33 is a detail elevation showing the wire reel in section;

Fig. 34 is a sectional elevation of the wire-cleaning device;

Fig. 35 is a sectional elevation of the wire shearing and threading mechanism;

Fig. 36 is a sectional plan view taken on the line 36—36, Fig. 35;

Fig. 37 is a sectional plan view taken on the line 37—37, Fig. 35;

Fig. 38 is a sectional plan view taken on the line 38—38, Fig. 28;

Fig. 39 is a fragmentary plan view of the machine, drawn on an enlarged scale and illustrating station G in detail, wherein the wire is laid in the wire-receiving groove and the inner wall of the said groove expanded around the wire to secure the same in place;

Fig. 40 is a side elevation of the mechanism shown in Fig. 39, the base of the machine and the movable table being shown in section;

Fig. 41 is a sectional elevation taken on the line 41—41, Fig. 39;

Fig. 42 is a front elevation of the mechanism shown in Fig. 40;

Fig. 43 is a sectional plan view taken on the line 43—43, Fig. 40;

Fig. 44 is a sectional plan view taken on the line 44—44, Fig. 41;

Fig. 45 is an enlarged sectional elevation of the mechanism which lays the ripping wire in the groove in the cover;

Fig. 46 is a sectional plan view taken on the line 46—46, Fig. 45;

Fig. 47 is an inverted plan view of the wire-laying shoe;

Figs. 48, 49 and 50 illustrate various operations of the wire-laying shoe;

Fig. 51 is a front elevation of the means by which the wire-laying shoe is laterally adjusted with respect to the cover;

Fig. 52 is an enlarged sectional elevation of the mechanism, which expands the wall of the wire-receiving groove to secure the wire therein;

Fig. 53 is a side elevation of a portion of the mechanism shown in Fig. 52, showing the wall of the groove fully expanded;

Fig. 54 is a sectional elevation taken on the line 54—54, Fig. 52;

Fig. 55 is a fragmentary plan view of the machine, drawn on an enlarged scale and illustrating stations H and I in detail, wherein at station H the portion of the wire extending below the cover is formed into a loop and at station I the end of the wire is twisted in a manner to complete the loop;

Fig. 56 is a sectional elevation taken on the line 56—56, Fig. 55;

Fig. 57 is a sectional plan view taken on the line 57—57, Fig. 56;

Fig. 58 is an enlarged sectional elevation showing the loop-forming mechanism in detail;

Figs. 59 and 60 are front elevations of the loop-forming head respectively, illustrating the start and finish of the formation of the loop;

Figs. 61 and 62 are detail views of the intermittent gears which effect the loop-forming operation;

Fig. 63 is a sectional elevation taken on the line 63—63 of Fig. 55;
Fig. 64 is a sectional plan view on the line 64—64, Fig. 63;

Fig. 65 is a sectional plan view taken on the line 65—65, Fig. 63;

Fig. 65a illustrates in detail a portion of the mechanism shown in Fig. 65;

Fig. 66 is an enlarged elevation partly in section illustrating the loop-twisting mechanism;

Fig. 67 is a sectional elevation taken on the line 67—67, Fig. 66;

Fig. 68 is a view similar to Fig. 67, illustrating the start of the loop-twisting operation;

Fig. 69 is a fragmentary plan view of the mechanism shown in Figs. 66 and 67;

Fig. 70 is a sectional elevation taken immediately above the movable table and illustrating the chucks with can tops therein at stations II and I;

Fig. 71 is a fragmentary plan view of the machine illustrating stations J, K and L in detail. At station J, the wire-receiving hole is hermetically sealed by the application of solder which also anchors the tail end of the wire in place, and where, at station K, the formed loop is deflected and bent into the concaved side of the cover, and where, at station L, the finished covers are ejected from the machine and placed in the stacker provided for the reception of the finished tops;

Fig. 72 is a sectional elevation taken on the line 72—72, Fig. 71;

Fig. 73 is a front elevation of the mechanism shown in Figs. 71 and 72;

Fig. 74 is a sectional plan view taken on the line 74—74, Fig. 73;

Fig. 75 is a sectional elevation taken on the line 75—75, Fig. 74, illustrating the soldering mechanism located at station J;

Fig. 76 is a sectional elevation taken on the line 76—76, Fig. 75;

Fig. 77 is a sectional plan view taken on the line 77—77, Fig. 75;

Fig. 78 is a sectional elevation taken on the line 78—78, Fig. 71, illustrating the mechanism located at station K by which the previously formed loop is deflected and subsequently bent into a position within the concaved side of the cover;

Fig. 79 is a sectional plan view taken on the line 79—79, Fig. 78;

Figs. 80 and 81 are fragmentary elevations partly in section and drawn on an enlarged scale illustrating the loop deflecting and bending operations;

Fig. 82 is a detached perspective view of a detail of the mechanism shown in Fig. 73;

Fig. 83 is a front elevation of a detail shown in Fig. 74.

Fig. 84 is a fragmentary plan view of the movable table illustrating the chucks located respectively at stations I and J, and means for pre-heating the cover located at station I, and the means for flowing the solder at station J;

Fig. 85 is an electric diagram showing the means for controlling the flow of current to the electro-magnet located at station L, which lifts the finished covers out of the chucks;

Figs. 86 to 96 inclusive illustrate the various operations through which a pre-formed can top passes while having the rippling wire applied thereto.

Referring to the drawings, and particularly to Figs. 1 to 10 thereof, the machine comprises a rigid base structure 1 composed of a substantially circular casting having horizontally extending webs or shelves 2 and 3 formed integral therewith, the webs 2 and 3 being integrally connected by vertically extending webs 4. At the upper edge of the circular casting 1 is formed a laterally extending flange 5, the outer edge of which is provided with a vertically extending peripheral flange 6. At spaced intervals around the machine are provided laterally extending lugs 7, formed integral with the flange 6, which are adapted to support posts 8, 8, to the upper ends of which is secured a horizontally extending stationary table 9. The table 9, posts 8 and lugs 7 are rigidly secured together by means of bolts 10 having suitable heads which are countersunk in the said table, the opposite ends of the bolts being provided with nuts 11, by which these elements are rigidly held in position. This structure forms a rigid support for the operating elements of the machine.

The web 3 and table 9 at the center of the machine are respectively provided with vertically extending circular bosses 12 and 13, see Fig. 14, in which is rigidly mounted a hollow post 14 having a laterally extending flange 14a which rests on the upper side of the boss 12.

Rotatably mounted on the hollow post 14, between the upper edge of the main casting and the bottom of the stationary table 9, is a movable table 15. The table 15 is provided with a hub 16, having a suitable bushing 17 adapted to rotate with the table and around the hollow post 14. A suitable thrust bearing 18 is provided between the lower side of the hub 16 of the table and the upper side of the lateral flange 14a of the post 14, by which the friction, due to the weight of the table, is minimized.

The movable table 15 carries a series of chucks 19 which, in the present instance, are twelve in number. Each chuck is adapted to receive a pre-formed can top at station A, and the table 15 is adapted to be moved in intermittent steps at 30° each, to bring each of the chucks 19 into operative alignment with each of the stations A to L inclusive, in continuous succession.

For the purpose of moving the table 15,
as above noted, the said table on its underside is provided with a ring 29, the said ring being provided with a series of twelve indentations 21, which are adapted to be successively engaged by a pawl 22 pivotally mounted at 23 to the outer end of an oscillating arm 24. The arm 24 is provided with a hub 25 which is pivotally mounted on and encircles the hub 16 of the motor of the table 15, and rests on the upper side of the thrust bearing 18. The hub 25 is suitably bushes as at 26, and a wear plate 27 is provided between the upper side of said hub and the under side of the table 15, which is shown as illustrated at 28 to movably maintain the arm 24 in its correct operating plane.

A spring 29, having one end secured to the arm 24, as at 30, and its opposite end secured to the pawl 22, as at 31, tends to resiliently maintain the free end of the pawl 22 in the indentations 21 of the ring 20. The arm 24 is adapted to be oscillated by the following mechanism.

One end of a link 32 is pivotally attached to the arm 24 at 33, the opposite end of said link being pivotally attached, at 34, to one end of a horizontally disposed lever 35, which is pivoted at 36 to the rigid base 1. The lower end of the pivot pin 36 is mounted in a boss 37 formed on the web 3, the upper end of said pin being mounted in a bracket 38 which is secured to the said web 3. Intermediate its opposite ends the lever 35 is provided with a cam roller 39, which is rotatably mounted on a stud 40 secured in the arm 35. The cam roller 40 is adapted to rotate a cam groove 41 formed in a cam disk 42, which is secured to the upper side of a circular cam plate 43. The cam plate 43 is provided with a hub 44 keyed to the upper end of a vertically disposed shaft 45, which is rotatably mounted in bearings 46 and 46a formed respectively in the webs 2 and 3.

Adjacent the bearing 46 a bevel gear 47 is secured to the shaft 45 and meshes with a bevel pinion 48 secured to a horizontally disposed rotatable shaft 49. The shaft 49 is rotatably mounted in bearings 50 and 51 formed integral with the base 1 and web 2 respectively. Loosely mounted on the shaft 49 is a gear wheel 52 which meshes with a pinion 53 secured to a second horizontally extending shaft 54, which is rotatably mounted in bearings 55 and 56 formed on the base 1 and web 2. The outer end of the shaft 54 is rotatably mounted in a bearing 57 formed integral with a bracket 58, which is secured to the side of the base 1 by means of bolts 59.

Intermediate the bearings 55 and 57 a suitable sprocket wheel 60 is loosely mounted on the shaft 54 and is adapted to drive a series of clutch disks (not shown), which are confined within the casing of a clutch 61. A second series of disks (not shown) are confined within the clutch casing 61 and co-operate with the series of disks which are driven by the sprocket wheel 60, the second series of clutch disks being operatively connected to the shaft 54.

The construction of the clutch 61 forms no part of the present invention and merely serves as a means by which power is applied to the shaft 54 from the sprocket wheel 60. This clutch is of the ordinary type of disk clutch employed in automobile power transmission, wherein the clutch disks are held in operative engagement by means of a spring located within the clutch casing and are released by means of a suitable lever, which, in the present instance, is indicated at 62.

The lever 62 is secured to one end of a shaft 63 which is mounted in bearings 64 formed on the bracket 58. The shaft 63 is provided with arms 65 having projections 66 which engage a collar 67 formed on the outer end of a sleeve 68, the opposite end of which enters the clutch casing 61 for the purpose of disengaging the disks of the clutch and thereby releasing the shaft 54 from the source of power supplied by the sprocket wheel 60. The sprocket wheel 60 is operatively connected by means of a sprocket chain 69 with a second sprocket wheel 70 secured to the armature shaft 71 of an electric motor 72. The motor 72 is mounted on a platform 73, which is hung from the web 2 by means of hanger bolts 74, 74.

On the end of the shaft 63, opposite to that occupied by the lever 62, is fixed a lever 75, to the free end of which is secured one end of a spring 76, the opposite end of said spring being secured to a bracket 77 fastened to the base 1. The purpose of this mechanism is to rotate the shaft 63 and thereby move the collar 67 and sleeve 68 outwardly with respect to the clutch casing 61 to disengage the clutch disks.

To normally prevent the disengagement of the disk of the clutch 61 by the spring 76 and lever 75, a plunger 78 is slidably mounted in a housing 79 and is connected by a link 80 with the clutch handle 62. The plunger 78 is provided with a shoulder 78a which is adapted to be engaged by a latch plunger 81 operable in a direction perpendicular to the direction of operation of the plunger 78. The latch plunger is operatively connected to a longitudinally movable core 82 slidably mounted within the coil of a solenoid 83.

Energization of the coil of the solenoid 83 will raise the latch plunger 81 and thereby release the plunger 78, whereupon the spring 76 will act to rock the shaft 63, the arms 66 thereon engaging the collar 67 on the sleeve 68, thereby sliding the sleeve outwardly from the clutch 61 and thereby release the disks of said clutch against the action of the spring within the clutch casing, which normally holds the clutch disks in operative engagement with each other.
As above noted the gear 52 is loosely mounted on the shaft 49 and is adapted to be operatively connected to the said shaft by means of an overload release clutch 85 (see Fig. 4). The overload clutch 85 comprises a collar 86, rigidly secured to the shaft 49, provided with a plurality of laterally projecting arms 87. In each of the arms 87 is slidably mounted a plunger 88 having a conical end 89 adapted to be projected into a countersunk cavity 90 formed in the periphery of the hub 91 of the gear 52. A spring 92 tends at all times to maintain the conical end of the plunger 88 in the cavity 90, but should an excessive load be applied to the shaft 49 the plungers 88 will be forced radially outward from the cavities 90, thereby releasing the gear 52 from the shaft 49. Each of the plungers 88 is provided with a transverse groove 93 into which a locking plunger 94 is adapted to be moved by a spring 95 when the driving plungers 88 are moved to their inoperative positions, thus the gear 52 will rotate freely until such time as the shaft 49 is relieved of the excess load and the locking plungers 94 are manually withdrawn from the grooves in the driving plungers 88, thereby permitting those plungers to be reseated in the cavities 90 formed in the hub 91 of the gear 52.

Through the mechanism just described, the cam plate 43 is continually rotated whereby the cam disk 42 thereon effects an oscillation of the arm 24, movement of which in one direction causes the pawl 22 to enter one of the recesses 21 in the ring 20, causing a rotation of the said ring and the movable table 15 through an angle of 30°, and thereby simultaneously moving the twelve cover carrying chuckers from their respective occupied positions at the various stations A to L, each into operative alignment with the next successive station of the series A to L inclusive.

At the end of the travel of the arm 24 in this forward direction, the table 15 is indexed and locked in its indexed position and at the same time the pawl 22 is released from the occupied notch 21 in the ring 20, thereby permitting the arm 24 to be moved in the opposite direction to complete the cycle of oscillation.

The indexing and locking mechanism is clearly illustrated in Figs. 2, 5, 10 and 14, and comprises a bolt 100 which is rectangular in cross section. The forward end of the bolt 100 is tapered or wedge-shape as clearly illustrated in Fig. 2, and is adapted to enter one of the notches 101 of a second series of notches which are formed in the ring 20 and alternate with the notches 21 formed in said ring.

The bolt 100 is slidably mounted in a bracket 102 secured to the inside of the main housing or base 1. The bolt 100 is provided with a stem 103 which is slidably mounted in an adjustable bushing 104 threaded into a plate 105 secured to the outer end of the bracket 102. A spring 106 is confined between the outer end of the rectangular portion of the bolt 100 and the inner end of the adjustable bushing 104, and tends to normally maintain the wedge-shape end of the bolt 100 in one of the tapering notches 101 in the ring 20, by means of which the table 15 is indexed and locked in position.

The bolt 100 is provided with a depending stud 107 which projects through a slot 108 formed in the under side of the bracket 102. On the lower end of the stud 107 is rotationally mounted a roller 109 which is adapted to be engaged by an arm 110 secured to a vertically extending shaft 111 which is rotationally mounted in bearings 112 formed on the bracket 102.

Secured to the shaft 111 is an arm 113 which is connected by a link 114 to the free end of a lever 115 pivoted on the above mentioned vertical pivot pin 36. Intermediate its ends the lever 115 is provided with a cam roller 116 which is rotationally mounted on a stud 117 secured in the said lever. The cam roller 116 is adapted to operate in a cam groove 118 formed in a cam disk 119 secured to the under side of the cam plate 43. On the shaft 111 is also secured an arm 120 having a roller or projection 121 which is adapted to enter a notch 122 formed in the pawl 22.

Rotation of the cam plate 43 effects oscillation of the arm 24 and a consequent 30° movement of the table 15 as above noted. At the end of the forward stroke of the arm 24 the roller 121 on the arm 120 lies within the notch 122 formed in the pawl 22, and as the cam 119 rotates to release the bolt 100, permitting it to be moved into one of the notches 101 in the ring 20 by the spring 106, the said arm 120 moves the pawl 22 out of the occupied notch 21 in the ring 20, thereby releasing the said pawl from the ring 20, as shown in Fig. 10, whereupon the arm 24 is moved in an opposite direction to bring the pawl 22 into co-operative engagement with the next notch 21 in the ring 20.

To prevent the pawl 22, on the return stroke of the arm 24, from entering the indexing notches 101, which lie intermediate the notches 21 in the ring 20, the ring 20 is provided with a series of plates 123 which bridge over the notches 101 and are adapted to be engaged by a roller 124 which is rotationally mounted on the pawl 22, when the said pawl is released from the arm 120 by the return stroke of the arm 24. Continued backward movement of the arm 24 causes the pawl 22 to enter the next successive notch 21 in the ring 20 as above noted. By this means the locking and indexing of the table 20 are synchronized with the releasing of the pawl 22 from the ring, whereby the movement of
the table is positively and accurately controlled at all times.

Rotatably mounted within the hollow post 14, and axially aligned therewith, is a continuously rotating shaft 125, the axis of which being suitably bushed at 126 and 127, Fig. 14, to provide suitable bearings for the shaft 125. Secured to the upper end of the shaft 125 and resting on the upper end of the post 14 is a beveled gear wheel 128, by means of which power is supplied to the various operating elements located at the different stations of the series A to L to which each can top is successively moved.

Power is supplied to the shaft 125 by means of a gear wheel 129 secured to the lower end of said shaft immediately below the boss 12 on the web 3. The gear wheel 129 meshes with a gear 130 which is rigidly secured to the continuously rotating shaft 45 between the bevel gear 47 thereon and the under side of the bearing 46a.

Intermediate the boss 13 on the fixed table 9, and the under side of the gear 128, and surrounding the hollow post 14, is a collar 131 which is provided with a plurality of radially extending bearings 132, which are adapted to rotatably support, in part, horizontally disposed shafts which supply power to the various stations of the machine. Each of these horizontal drive shafts is provided with a bevel pinion which meshes with the common driving bevel gear 128, as will be fully disclosed hereinafter in connection with the description of the operation of each of the various operating stations.

As above noted the movable table 15 is provided with a series of cover receiving chucks 19, one of which is shown in detail in Figs. 11 and 12, and comprises a fixed jaw 135 and a movable jaw 136. The fixed and movable jaws 135 and 136 of each chuck 19 are mounted within an opening 157 formed in the movable table 15, the opening 157 being provided with longitudinally extending shoulders 138, 139 on which the fixed jaw 135 rests and to which said jaw is rigidly secured by means of screws 139, 138. The movable jaw 136 is adapted to slide radially with respect to the center of the table 15 on the shoulders 138, 139, being maintained thereon by means of guide plates 140, 140 which are secured to the table 15 by screws 141, 141.

On the under side of the movable jaw 136 is a pair of bosses 142, 142, each of which is counterbored at 143 for the reception of one end of the spring 144, the opposite end of which bears against the inner end of an adjusting screw 145 which extends through the boss 142 and provides suitable bearing for the shaft 125.

Each of the screws 145 is counterbored to receive one end of a pin 147 which extends through the spring 144, and is slidably mounted at its opposite end in the boss 142 on the under side of the fixed jaw 136 of the chuck. The springs 144 tend to move the movable jaw 136 toward the fixed jaw 135.

Movement of the jaw 136 away from the jaw 135 is effected by the cam 148 secured to the base 1 and extending from station L to station A. The cam 148 is adapted to be engaged by a roller 149 rotatably mounted on the under side of the movable jaw 136 by means of a screw 150.

Each of the jaws 136 and 138 is provided with horizontally disposed shoulders 151, 152 respectively, on which the can tops are adapted to rest, the peripheral edge of the can top being adapted to rest within undercut grooves 153 and 154 formed respectively in the jaws 135 and 136 immediately adjacent the shoulders 151 and 152 thereon.

The fixed jaw 135 is cut away as illustrated at 155, Fig. 11, to provide working space for a pair of wire-gripping fingers 156, 156, which are slidably mounted in grooves 157, 157 formed in the upper face of the table 15.

Plates 158, 158 are secured to the table 15, and extend over the wire-gripping fingers 156 for retaining the said fingers within the grooves 157. The outer ends of the fingers 156 are operatively connected to levers 159, 159 by means of screws 160, 160 which project through slots 161, 161 formed in the ends of the levers 159. The levers 159, 159 are adjustable mounted on studs 161, 161 secured in the table 15, and which are provided with eccentric sleeves 162, 162, on which the levers 159 pivot. The eccentric sleeves 162 are provided with flanges 163 which overlie the hubs 164 of the levers 159 and are held in their adjusted positions by lock nuts 165 mounted on the studs 161. The levers 159 are each provided with an arm 166 having semi-circular projections 167 adapted to engage angularly disposed edges 168 on radially slidably operating blocks 169 which are slidably mounted on the table 15 and are guided by the guide plates 170, 170 secured to the table 15 by screws 171, 171.

The wire-gripping fingers 156 are provided with parallel wire-gripping faces 172 and when the operating block 169 is moved radially outward the levers 159, 159 are turned about their pivots in a manner to advance the wire-gripping surfaces 172, 172 of the fingers 156 toward each other. Continued outward movement of the operating block 169 causes the semi-circular projections 167 to ride onto the parallel longitudinal edges 173, 173 of the operating blocks 169, thereby locking the fingers 156 in their wire-engaging positions. Movement of the wire-engaging surfaces 172 of the fingers 156 in the opposite direction to release the wire is effected by means of a spring 174, the opposite ends of which are respectively secured to the arms 166, 166. Release of the fingers 156
is effected by movement of the operating block 169 in a direction toward the center of the table 15.

Sliding movement of the operating block 169 is effected by suitably cams, as will be fully disclosed hereinafter, which are adapted to engage a roller 175 rotatably mounted on a screw 176 mounted in the operating block 169.

Station A comprises a magazine into which the prefashioned covers are placed, to be fed into the empty and open chucks 19 as they are successively indexed with the said magazine. The magazine comprises a vertically extending rod 180 rigidly secured in the stationary table 9, see Figs. 13, 14 and 15, and a pair of laterally adjustable vertically extending rods 181, 181. Each of the rods 181 is rigidly secured in a supporting foot 182 which is adapted to slide in a groove 183 formed in the upper side of the stationary table 9. The supporting feet 182 are slotted at 184 for the reception of locking bolts 185 which are tapped in the stationary table 9.

These supporting feet 182 are each adapted to be adjusted by means of an adjusting screw 186 having one end rotatably mounted in the outer end of the supporting foot. Each adjusting screw 186 is provided with a transverse annular groove 187 which is adapted to receive a pin 188 extending through the said foot and into one side of the said groove, whereby longitudinal movement of the screw 186 will effect lateral adjustment of the rod 181 relative to the stationary rod 180. The screw 186 extends through, and is threaded in, a lug 189, whereby the turning of the screw effects longitudinal movement thereof, a lock nut 190 being provided on the screw 186 adjacent the lug 189 for retaining the same in its adjusted position.

Adjustment of the vertically extending rods 181 is provided for the purpose of accommodating covers of different sizes, for example, covers used on cans ranging from size No. 1 to size No. 5 as can tops are generally known in the art.

Upon referring to Fig. 13, it will be noted that the rods 181 are adjustable in a path extending at equal angles from a line drawn through the center of the table 15 and the center of the fixed rod 180, whereby the said posts 180, 181 and 181 will be at all times equally spaced 120° apart on a circle drawn through the centers of the three posts, whereby the tops, regardless of their size, will, at all times, be stacked in correct position to be delivered into the open chucks carried by the movable table 15, the movable jaws of the chucks being so constructed that they will accommodate and rigidly hold can tops within the range above noted.

The can tops are fed from the bottom of the stack formed in the magazine by a pair of spaced feeding elements disposed at the opposite sides of the can tops and located on a line drawn through the center of the bottom can top at right angles to the radial line above mentioned. Each of these feeding elements 195 comprises a substantially flat disk 196 in the peripheral edge of which is formed a helical groove 197.

As shown in Fig. 15, the stacked can tops normally rest on the upper surface 198 of the disks 196. The disks 196 are adapted to be rotated in the same direction, and in so doing the knife edges 199 formed on the lead ends of the helical grooves 197 enter between the first and second can top on the lower side of the stack, whereby the first of said can tops is directed into the grooves 197, 197 of the disks 196 and is thereby separated from the stack, the remaining covers in the stack being supported on the upper surfaces 198, 198 of the said disks. As the disks 196, 196 continue to rotate the selected can top which has been extracted from the stack rides in the said helical grooves 197, 197 until such time as the tail ends of the said grooves are directly opposite each other and in line with the engaged can top, whereas the said can top is released from the disks 196, 196 and drops into the open chuck 19 lying directly below the magazine.

For the purpose of supporting and rotating the disks 196, 196 each disk is provided with a hub 200, which is secured to the lower end of a vertically extending shaft 201 rotatably mounted in a carrier 202 having laterally extending flanges 203 which are adapted to slide in guide ways 204 formed in the stationary table 9, guide plates 205, 205 being provided and secured to the stationary table 9 by means of retaining screws 206 for the purpose of maintaining the said carriers in the guide ways 204.

Above the carriers 202 and resting thereon, each of the shafts 201 is then circled by a collar 207 on top of which rests a mitre gear 208 which is rigidly attached to the shaft 201. Each of the collars 207 is provided with an integral arm 209 having a suitable bearing 210 formed therein, in which is rotatably mounted an elongated hub 211 of a mitre gear 212 which meshes with the mitre gear 208 on the upper end of the shaft 201. On the outer end of the hub 211 is secured a collar 213, whereby longitudinal movement of the hub relative to the bearing 210 is prevented. The hub 211 is suitably splined, at 214, to receive a key 215 mounted in a shaft 216 which extends through the hub 211, and by means of which the gear 212 is driven, the splined 214 permitting relative longitudinal movement between the shaft 216 and the gear 212, for purposes hereinafter set forth.

On the inner end of each of the shafts 216 is secured one element 217 of a universal joint 218, the second element 219 of the universal joint being secured to the one end of
a shaft 290 which is rotatably mounted in bearings 221, 221, formed in a bracket 222 secured to the stationary table 9. Intermediate the bearings 221, 221, each of the shafts 290 is provided with a gear 223, rigidly secured thereto. The gears 223, 223 mesh with a common pinion 224 which is secured to one end of a shaft 225, which is rotatably mounted at one of its ends in a bearing 226, formed in the bracket 222. The opposite end of the shaft 225 is rotatably mounted in one of the bearings 192 formed on the collar 151, which is secured to the hollow post 14 by means of a set screw 227.

Adjacent the bearing 192 the shaft 225 is provided with a bevel pinion 228 which meshes with the constantly rotating bevel gear 128 secured to the upper end of the common drive shaft 123.

The feeding elements 199, 195 are adapted to be adjusted respectively on lines extending at equal angles with respect to the said center line drawn through the center of the table 15 and the center of the magazine, so that, regardless of the size of can top stacked in the magazine, the said feeding elements will engage the lowestmost can top at diametrically opposed points on a line extending through the center of each of the said feeding elements and through the center of the engaged can top, whereby any tendency of the can tops to tilt laterally will be eliminated.

For the purpose of adjustment, each of the carriers 202 is provided with a lug 229 having a groove or notch 230 in its upper side which is adapted to receive one end of an adjusting screw 231, collars 232, 232 being provided and engaging the opposite sides of the lug 229, whereby longitudinal movement of the screw will effect the corresponding longitudinal movement of the carrier. Each of the screws 231 is threaded through a lug 233 carried by the stationary table 9, a lock nut 234 being provided on each of the adjusting screws for locking the carrier in its adjusted position.

The universal joints 218 permit the above adjustment of the feeding elements 195 and constitute a means by which the said feeding elements are continuously driven regardless of the position to which they may be adjusted, and during the adjustment of the said feeding elements proper alignment between the motive gears 208, 212 is permitted by the collar 207 rotating about the shaft 201 and the shaft 216 sliding longitudinally through the hub 211 of the gear 212.

Obviously the stationary table 9 is suitably apertured as shown at 235 to permit the passage of the can tops therethrough and to permit the above described adjustment of the rods 181, 181 and the feeding elements 195, 195.

After the feeding elements 195 have dropped a can top into the open chuck 19, positioned below the magazine, the movable table 15 is moved through an angle of 30°, during which the roller 149 carried by the movable jaw 136 of the said chuck rides off the end 148a of the cam 148, permitting the said jaw 136 of the chuck to be advanced toward the fixed jaw 138 thereof, by the springs 144, 144, whereby the inserted can top, resting on the shoulders 151 and 152 of the jaws 136 and 138 respectively, will be moved into the respective undercut grooves 153 and 154 of said chuck jaws, whereby the said can top is securely held in the said chuck.

In order to insure the correct positioning of the can top in the chuck as the said table 15 moves to bring the inserted can top into position at station B the can top rides under a suitable shoe 236 located at station B.

As shown in Figs. 11 and 12, the jaws 135 and 136 of the chuck are beveled as shown at 237 to permit working clearance for the shoe 236. The shoe 236 is pivotally attached to the lower ends of a pair of links 238 and 239, the opposite ends of said links being pivoted at 240 to brackets 241, 241 carried on the under side of the stationary table 9. A spring 242, having one end secured to the lower end of the link 238 and its opposite end secured to the stationary table 9, tends to turn the links 238 and 239 on their pivots and thereby move the said shoe 236 at all times toward the movable table 15 in a plane substantially parallel thereto. The advance end of the shoe 236 is flared upwardly as illustrated at 243, Fig. 19, to insure passage of the inserted can top under the shoe.

The under side of the shoe is provided with suitable friction material 244 which will engage the can top, moving the same into the correct position between the jaws of the chuck, and at the same time the spring 242 causes the said shoe to press the inserted can top tightly against the shoulders 151 and 152 of the said jaws of the chuck in order that the peripheral edge of the inserted can top will be properly located within the undercut grooves 153 and 154 of the chuck jaws.

As shown in Fig. 88, the pre-formed can top illustrated at e is provided with a wire-receiving groove y, and the base of this groove is suitably scored as illustrated at y' for purposes hereinafter set forth. The can tops, as stacked in the magazine and fed to the chucks on the movable table of the chuck, in the condition illustrated in Fig. 85, and as the can top is advanced from position B to position C the groove y is brought into vertical alignment with a suitable punch 250, which is located on a radially extending line drawn through the center of the table and through the center of the can top, as it is held in the chuck. In all sizes of can tops within the range above noted the distance from the peripheral edge of the pre-formed top to the center of the wire-receiving groove y remains
constant, therefore, the distance from the center of the table to the center of the punch 250 remains constant at all times.

The punching of the wire-receiving hole in the base of the wire-receiving groove 254 is effected by mechanism illustrated in Figs. 18, 20, 21, 22, 23 and 24, which constitutes the elements of station C.

The punch 250, as illustrated in the drawings, is a substantially round pointed affair having a diameter substantially equal to the diameter of the wire to be placed in the can top. The punch 250 is mounted in a carrier 251 and is adapted to be adjusted longitudinally thereof by means of a screw 252 tapped in the upper end of said carrier. Locking screws 253, 254 are tapped into the said carrier 251 and extend transversely thereof, their inner ends engaging the punch 250 for the purpose of securing the same in its adjusted position within said carrier. A groove 255 is formed in one side of the carrier 251 and extends longitudinally thereof, being adapted to receive the reduced end 255 of a screw 256 which is tapped into the side of a punch head 257.

The punch head 257 in the present instance comprises a cylindrical plunger which is vertically and slidably mounted in a suitable bushed sleeve 258 carried in a boss 259 formed integral with a bracket 260, which is suitably secured to the upper side of the stationary table 9. Rotation of the sleeve 258 within the boss 259 is prevented by a set screw 261, and rotation of the plunger 257 within the sleeve 258 is prevented by a set screw 262 having a reduced end 263 adapted to a longitudinally extending groove 264 in the said plunger.

The plunger 257 receives a vertical reciprocation, whereby the punch 250 is caused to perforate the can top, and for this purpose the said plunger is provided with an operating head 265 in the form of a flat yoke-shaped element having legs 266, 266 between which is positioned a guide block 267. The guide block is loosely mounted on a horizontally extending shaft 268 which is rotatably mounted in bearings 269, 270 formed integral with the bracket 260. Secured to the shaft 268, intermediate the bearings 269, 270, is a cam 270 having a suitably shaped cam groove 271 in which a cam roller 272 is adapted to travel. The cam roller 272 is rotatably mounted on a suitable stud 273 secured to and projecting laterally from the operating head 265 of the plunger 257.

Vertical adjustment of the plunger 257 relative to the head 265 may be effected by means of an axially aligned adjusting element 274 having right and left hand screw threads 275, 276 adapted to correspondingly threaded apertures formed in the head 265 and the plunger 257 respectively. A lock nut 278 is provided on the screw 275 and engages the under side of the head 265 for maintaining the adjustment.

On the inner end of the shaft 268 is secured a gear wheel 279 which meshes with a pinion 280 secured to the outer end of a shaft 281, which is rotatably mounted, at its outer end, in a bearing 282 secured to the stationary table 9, the inner end of said shaft being rotatably mounted in one of the bearings 128 on the collar 131 aforesaid. Intermediate the bearings 128 and 282 a bevel pinion 283 is secured to the shaft 281 and meshes with the common driving bevel gear 128 aforesaid.

The cylindrical punch 250 is provided with a lateral extension 284 which is tapped to a knife edge 285, see Fig. 24, extending parallel to the center of the punch 250, the walls of the lateral extension 284 being tangent to the cylindrical body of the punch and converging to a common line spaced from the center of the punch, thereby forming the knife edge 285 which parallels the axis of the punch. The lower edge of the lateral extension 284 is likewise beveled to a knife edge as illustrated at 286, whereby the perforation formed in the base of the groove y of the can x will have a V-shaped portion, the apex of which is coincident with the scoring y in the base of the groove y for purposes hereinafter set forth.

From position C the pierced can top is advanced to position D which, in the present instance, is an idle position, from which the said can top is subsequently advanced to position E, in which a suitable length of wire is measured and cut from a source of supply and subsequently threaded into the previously formed perforation in the can top.

Station E is shown in detail in Figs. 26 to 38 inclusive. The supply of wire z, in the present instance, comprises a coil z wound about a reel 290, which is rotatably mounted on a spindle 291 secured in the outer end of an arm 292, the opposite end of which is secured to the upper end of a standard 293 secured to the stationary table 9. From the coil z the wire z extends through a suitable cleaning device 294, to and between a pair of measuring wheels 295 and 296, from which the said wire extends to and between a pair of feeding wheels 297 and 298. From the feeding wheels 297, 298 the wire passes through a hardened steel bushing 299 which constitutes a fixed element of a suitable shearing mechanism 300 and into a threading tube 301, which is axially aligned with the said bushing 299 and with the wire-receiving opening z previously formed in the said can top.

The mechanism outlined above is operatively mounted on a suitable frame 302 carried by and rigidly secured to the stationary table 9.
The measuring wheel 296 is secured to the upper end of a vertical shaft 302 which is rotationally mounted in a bearing 304 formed on a bracket 305, which is rigidly secured to the upper end of the frame 302. The measuring wheel 295 is rotationally mounted on a stud 306 which is secured in a block 307 slidably mounted in a guide head 308 rigidly secured to a vertical extension 309 of the frame 302.

Rigidly secured to each of the measuring wheels 295 and 296 are co-operating gear wheels 310 and 311 respectively. The measuring wheel 295 is adapted to be advanced toward the measuring wheel 296 for the purpose of firmly gripping the wire a between the peripheral edges of said wheels, said edges being suitably grooved, as shown at 312. For the above purpose, an arm 314 is pivotally attached at 315 to the guide head 308. A pin 316 extends through a suitable aperture formed in said guide head and is engaged on one of its ends by the said arm 314, the opposite end of said pin engaging the slide block 307, on which the measuring wheel 295 is rotationally mounted. Suitable weights 317 are hung on the free end of the arm 314 and supply the power by which the said measuring wheel 295 is held in wire gripping relation with respect to the measuring wheel 296.

The feed wheel 298 is mounted on a horizontally disposed shaft 318, one end of which is mounted in a bearing 319 formed on the upper end of the frame 302, the opposite end of said shaft being mounted in a bearing 320 formed on the end of a bracket 320a which is secured to the frame 302. The feed roll 297 which co-operates with the feed wheel 298 is loosely mounted on a stud 321, which is secured in a slide block 322 slidably mounted in a guideway 323 formed in a vertical extension 324, at the upper end of the frame 302. The otherwise open end of the guideway 323 is closed by a bridge element 325 in which is slidably mounted a pin 326, one end of which engages the slide block 322 and the opposite end of which is engaged by an arm 327 pivoted at 328 to the bridge element 325. On the free end of the arm 327 is hung suitable weights 328, by means of which the feed wheel 297 is held in wire gripping contact with respect to the said wheel 298.

The feed wheels 297 and 298 are provided with peripheral grooves 329 in which the wire a is adapted to run, and secured respectively to the feed wheels 297 and 298 are gear wheels 330 and 331, by means of which the said feed rolls are caused to rotate in unison.

The feed roll 296 is driven by means of a mitre gear 332 which is secured to said feed wheel in any suitable manner. The mitre gear 332 meshes with a corresponding mitre gear 333 which is rotationally mounted on a vertical shaft 334, one end of which is positioned in the upper side of the portion 319 of the frame 302 and the opposite end of which is positioned in the bearing 335 formed on a bracket 336 which is secured to the said portion 319 of the frame 302 by screws 337.

Secured to the hub of the mitre gear 333 is a gear wheel 338, the teeth of which are adapted to mesh with the teeth 339 of a gear 340, a portion of the periphery of which is plain as indicated at 341. Fig. 28, the gear 338 having a plain portion 342 adapted to be engaged by the plain portion 341 of the gear wheel 343. The shaft 303 and consequently the gear 340 are constantly driven by means hereinafter described.

While the mitre gear 333, through the gears 338, 340, receives an intermittent rotative movement, the feed wheels 297 and 298 are correspondingly rotated to feed the wire a down through the shearing mechanism 300, through the threading tube 301 and into the hole w in the can top z, when the said can top is properly indexed with respect to the said threading tube 301.

A circular plate 345 is also secured to the hub of the mitre gear 333 and is provided with a convexe surface 344 which engages and rides on a convexed surface 345 formed on a plate 346 secured to the gear 340, for the purpose of steadying the mitre gear 343, and consequently the feed wheels 297 and 298, while the same remain quiescent.

The measuring wheel 296 being secured to the upper end of the shaft 303 is continuously driven by said shaft, whereby the wire a is formed into a loop z, Fig. 28, between the intermittent rotation of the feed wheels 297 and 298.

The circumference of each of the measuring wheels 295 and 296 is equal to the length of wire which is to be inserted in each of the can tops, whereby a single revolution of the measuring wheels will draw from the coil z the exact amount of wire required, and the feed wheels 297 and 298, being the same diameter as the said measuring wheels, a single rotation thereof will feed the desired length of wire through the shearing mechanism 300 and into the threading tube 301.

The shaft 303 is provided at its lower end with a gear wheel 347 which meshes with a gear wheel 348 secured to a shaft 349 which is rotationally mounted in bearings 350, 351 formed in the frame 302. The shaft 349 is provided with a bevel gear wheel 352 which meshes with a bevel pinion 353 secured to one end of a horizontal shaft 354, which is rotationally mounted in a bearing 355 secured to the stationary table 9 and in one of the bearings 352 formed on the collar 131 aforesaid. A bevel pinion 356 is secured to the shaft 354 and meshes with the common driving bevel gear wheel 128 on the shaft 125. By this means power is applied to the elements of station E.
Normally, the wire-gripping fingers 156 associated with each of the chucks 19 are separated to permit the passage of the wire between the said jaws. At each time as the feed wheels 297 and 298 deliver a length of wire through the threading tube 301 and into the hole 30 in the can top positioned below the said chuck the wire-gripping fingers 156 are immediately moved toward each other for the purpose of gripping the wire and holding the same in correct position to be laid in the wire-receiving groove y of the can top. This is accomplished by moving the operating block 169 radially outward between the arms 166, 166 of the levers 159, which control the said wire-gripping fingers 156, until the semi-circular portions 167 of the arms 166 are in engagement with the parallel edges 173 of the operating block 169.

Movement of the operating block 169 is effected by means of a cam 357 carried by a wheel 358 rotatably mounted on a bearing 359 secured to the under side of the stationary table 9 by means of a screw 360. Secured to the cam wheel 358 is a gear wheel 361 which meshes with a gear wheel 352 secured to the lower end of the continuously rotating shaft 349.

Immediately after the wire-gripping fingers 156 have engaged the wire z the measured length of wire is sheared from the supply by the shearing mechanism 300.

As above noted, the shearing mechanism comprises a hardened steel bushing 229 which forms the fixed blade of the shear, and with which a rotatable shear blade 363 cooperates. The rotatable shear blade 363 is formed on and projects outwardly from a circular plate 364 which is secured to a wheel 365 secured to a shaft 366, which is rotatably mounted in suitable bearings formed in a vertically adjustable head 367 carried by and secured to the frame by bolts 367a passing through slots 367b formed in the frame 302. On the upper end of the shaft 366 is secured a gear wheel 368 which meshes with the gear wheel 369 secured to the upper end of the continuously rotating shaft 349. The operation of the movable shear blade 363 is so timed that the wire z is sheared immediately after being gripped by the fingers 156.

In order to permit the wire z to be removed from the threading tube 301, the said tube is split longitudinally and on a line coincident with the path of movement of the wire as the can top is moved from station E to station F.

The stationary portion 301a of the tube 301 is secured at its upper end in a bracket 370, which is secured to the head 367 by screws 371. The lower end of said stationary portion 301a engages a bracket 372 secured to the frame 302, for the purpose of steadying the lower end of the tube. The movable half 301b of the tube 301 is secured at its upper end in a lever 373 which is pivoted at 374 to the head 367. A spring 368 tends to maintain the tube in its closed position.

The tube 301 is adapted to be opened by means of a cam segment 375 which engages the point 376 on the lever 373 thereby turning the said lever on its pivot against the action of the spring 368 and opening the said tube 301. The cam segment 375 is carried by the continuously rotating wheel 365 on the shaft 366, and as soon as the point 375a of the cam segment 375 passes the point 376 of the lever 373 the spring 368 immediately closes the tube 301.

While the tube 301 is maintained in its open position the table 16 is moved through an angle of 30° to carry the can top with the wire inserted therein from station E to station F.

As shown in Fig. 35, the wire-receiving opening, extending through the tube 301, for the greater part of its length is of a considerably greater diameter than the wire z, but immediately adjacent the lower end of said tube the opening there through is reduced in diameter to a diameter substantially the same as the diameter of said wire, whereby the end of the wire will be accurately threaded into the wire-receiving hole w in the underlying can top.

A suitable guide tube 377 is provided to guide the wire from the gripping point of the feed rolls 297 and 298 into the hardened steel bushing 299.

Adjustment of the head 367 is provided in order that the wire will be sheared at exactly the proper point above the can top, to provide a length of wire which will be sufficient, when laid in the groove y, to extend completely around the can top with the tail end of the wire lying immediately adjacent the hole w through which the opposite end of the wire projects to the under side of the can top.

The wire cleaning device 294 comprises a suitable cup in which the body of cleaning material 378, such as felt, is placed. The wire z passes through the said body of felt, or other cleaning material, for the purpose of removing any and all foreign matter which may adhere to the wire. The cup is provided with a neck 379 having a longitudinally extending opening 380 formed therein. The neck 379 is secured in a bracket 381 which is secured to the guide head 308 on the extension 309 of the frame 302.

In order to properly guide the wire z between the feed rolls 297 and 298 a suitable eye 382 is provided, the said eye being carried by a bracket 383 which is secured to a portion 384 of the frame 302 as shown in Fig. 26.

In order to prevent the wire z from unwinding from the coil z', suitable braking mechanism is provided for the reel 290, which com-
prises a washer 384 which engages the upper side of the hub 285 of the reel 290, and in turn is engaged by one end of a compression spring 386, the opposite end of which is engaged by a washer 387 mounted on the spindle 291. The upper end of the spindle 291 is threaded for the reception of a pressure regulating nut 388.

As shown in Fig. 88, the wire 3 extends vertically through the hole 30 in the can top, and is held in this position by the wire-gripping fingers 136 as the can top is moved from station E to station F.

Station F, in the present instance, is an idle position wherein no operation is performed relative to the can top.

From station F, the can top, with the wire 3 inserted in the hole 30, is moved to station G wherein the wire 3 is laid and secured in the wire-receiving groove 31 of the can top 3. Station G is shown in detail in Figs. 30 to 54 inclusive, and comprises a suitable bracket 390 which is secured to and partly carried by the stationary table 9, and partly by the main base 1 through auxiliary brackets 391, 391.

The wire 3 is laid in the groove 31 by means of a wire-laying shoe 392 which is carried by a suitable head 393. The head 393 is adapted to be rotated and vertically reciprocated with respect to the said can top. The wire-laying shoe 392, as shown in Fig. 47, is provided on its forward edge with a wide vertically extending groove 394 which extends downwardly along the front edge of the said shoe and continues under the lower edge 395 thereof, to a point approximately at the center of said shoe. From the forward point 396 of the said shoe 392 the walls of the groove 394 gradually approach each other, which gradually narrows the said groove until, at point 396a, the groove is substantially the same width as the wire-receiving groove 31 in the can top 3, whereby the wire is accurately guided into the groove 31 of the can top 3. From the point 396a on the bottom edge 395 of the shoe 392 to the tail end 397 of said shoe the lower edge thereof is provided with a depending rib 398 which is substantially the same width as the groove 31, and is adapted to force the wire 31 into the bottom of said groove 31, as shown in Fig. 48. As shown in Fig. 47, the rib 398 and the center of the groove 394 are formed on an arc having a radius substantially the same as the radius of the groove 31 in the can top 3.

Obviously, as the head 393 is rotated the shoe 392 will follow the groove 31 in the can top. The wire 3 will be engaged by the forward wide-mouth portion of the groove 394 in the said shoe and guided into the groove 31, being pressed into the bottom of said groove by the rib 398 adjacent the tail end of said shoe.

In being moved from station E to station G, the end of the wire extending above the can top will necessarily be bent over in order to pass under the portions of the stationary table 9 lying intermediate the said stations, leaving the free end of the wire 3 extending in a direction toward the station from which the can top has been moved, and in order to assure the wire 3 of being engaged by the shoe 392 the shoe is provided with a forward extending guide or feeler 399 as shown in Figs. 47 and 48.

The forward end of the feeler 399 lies immediately adjacent the outer wall of the groove 31 as shown in Fig. 49. In order to lay the wire in the groove 31 without further bending the same the initial movement of the shoe 392 is effected in the direction in which the free end of the wire is pointing when the can top is moved to station G.

In order to secure the wire in the groove, the inner wall of the said groove 31 is rolled around the said wire in the manner illustrated in Fig. 55, by means of a roller 400, which follows immediately after the tail end 397 of the shoe 392, as shown in Fig. 46. The roller 400 is rotatably mounted on a suitable head 401 which is adapted to be raised under the can top 3, to be moved radially with respect to its center of rotation in order to cause the flange 402 of the roller 400 to engage the metal constituting the inside wall of the groove 31, and thereby rolling the said inside wall of the groove 31 around the wire 3.

Rotation of the head 401 in synchronism with the travel of the shoe 392 causes the said inside wall of the groove to be progressively displaced and thereby secure the wire in the groove immediately after the wire is forced into the bottom of the groove by the said shoe 392.

The periphery of the flange 402 of the roller 400 is rounded to such an extent that the metal of the can top will not be scored or cut but is sufficiently sharp to roll the metal tightly around the wire.

As clearly shown in the drawings, the inner wall of the groove 31 is wider than the outer wall thereof. In rolling the metal of the inner wall of the groove around the wire 3 to secure the wire in the groove, the said inner wall of the groove is narrowed and the metal forming the upper portion of said inner wall and the metal forming the curved portion 31 of the can top lying immediately adjacent and inwardly disposed with respect to the said inner wall is displaced by the flange 402 of the roller 400, without imposing any undue strain upon the displaced metal, or the metal of any other portion of the can top, and without altering the diameter or the position of the groove 31 or the ripping wire 3 laid therein.

The action of the flange 402 in displacing the metal as above noted draws sufficient metal from the upper portion of the said
inner wall of the groove and the curved portion \( x^2 \) immediately adjacent thereto to permit of the above progressive rolling of the metal around the wire. As clearly illustrated in Fig. 90a, the curvature of the portion \( x^2 \) is somewhat flattened or reduced by the metal displacing operation, thus the metal of no other part of the can top is affected by this operation, as this curved portion \( x^2 \) provides all the mental necessary.

The wire-laying shoe 392 is secured to the lower end of a spring-pressed plunger 403, by means of a screw 404. The plunger 403 is vertically slidably mounted in the bore 405 of a cylindrical head 406 formed integral with and on the outer end of a slide bar 407, which is slidably mounted in a guideway 408 formed on the under side of the head 393, being maintained within the said guideway by means of plates 409, 409. One end of the guideway 408 is closed by the plate 410 which is provided with a notch 411, the portion of the plate immediately adjacent the groove extending into a groove 412 formed in the head 413 of an adjusting screw 414, the threaded portion of said screw engaging the threads in a lug 415 which extends downwardly from and is attached to the slide bar 407. The turning of the screw 414 will move the wire-laying shoe 392 radially with respect to the center of rotation of the head 393, whereby the circle on which the rib 398 of said shoe travels may be made to conform to the groove \( y \) in the can top.

The plunger 403 is shouldered at 416, and is provided with a stem 417, of reduced diameter, which projects through an opening formed in the head 418 of the cylinder 406. A compression spring 419 energizing the said stem 417 is confined between the shoulder 416 of the plunger and the head 418 of the cylinder to press the shoe 392 downwardly relative to the slide bar 407. Downward movement of the plunger 403 is limited by a transversely extending pin 420 mounted in the reduced stem 417 of said plunger. Rotation of the plunger 403 within the cylinder 406 is prevented by means of a reduced portion 421 of a screw 422 extending into a longitudinal groove 423 formed in one side of the plunger 403.

The rotating head 393 is rigidly secured to the lower end of a vertically disposed shaft 425 by means of a set screw 424. The shaft 425 and consequently the rotating head 393 and shoe 392 are adapted to be reciprocated vertically, and for this purpose the upper end of the shaft 425 is threaded at 426 for the reception of threads formed within in a cap 427. The upper end of the cap 427 is provided with an axially aligned opening for the reception of an adjusting stud 428 having a head 429 or which is located within the cap 427 between the end thereof and the upper end of the shaft 425, whereby, while the adjusting stud 428 is held against rotation, the shaft 425 and the cap 427 thereon may be rotated with respect to the adjusting stud 428. The adjusting stud 428 is mounted in the lower end of a yoke 429 having vertically extending legs 430 extending at the opposite sides of and in engagement with a guide block 431, which is loosely mounted on a horizontally extending shaft 432 between a collar 433 and a cam disk 434 secured to said shaft. On the yoke 429 is rotatably mounted a cam roller 435 which extends laterally from the yoke into a groove 436 formed in the cam 434 fixed to the shaft 432, whereby rotation of the shaft 425 and the said cam thereon will move the wire-laying shoe 392 vertically with respect to the underlying can top.

Obviously, rotation of the adjusting stud 428 will affect vertical adjustment of the shoe 392 with respect to the underlying can top, a locking nut 437 being provided for securing the stud in the adjusted position. One end of the shaft 425 is rotatably mounted in a bearing 438 formed on a bracket 439, the cam 434 being secured to the shaft 425 immediately adjacent one end of said bearing. Secured to the said shaft adjacent the opposite end of said bearing is a mitre gear 439. The shaft 425 while permitted to rotate within the bearing 438 is held against longitudinal movement with respect to said bearing by the cam 434 and gear wheel 439 secured to said shaft. The opposite end of the shaft 425 is splined to an elongated hub 440 formed on a gear wheel 441, the said hub 440 being rotatably mounted within a bearing 442 formed on a bracket 443 which is secured to the stationary table 9. A collar 444 is secured to the end of the hub 440 opposite the gear wheel 441 which engages one end of the bearing 442, said collar 444 engaging the opposite end of said bearing and preventing longitudinal movement of the hub 440 with respect to the bearing 442. Thus, the bracket 439 may be adjusted radially with respect to the center of the stationary table 9 while the bracket 443, with the gear wheel 441 rotatably mounted therein, is permanently secured to the said table.

The gear wheel 441 meshes with a pinion 445 secured to one end of a shaft 446 which is rotatably mounted in a bearing 447 secured to the stationary table 9. The opposite end of the shaft 446 is rotatably mounted in one of the bearings 132 formed on the collard 131 aforesaid. Secured to the shaft 446, intermediate the bearings 132 and 447, is a bevel pinion 448 which meshes with the common driving bevel gear 128 aforesaid, whereby the elements of station G receive the power.

The mitre gear 439 on the one end of the shaft 432 meshes with a similar mitre gear 449 mounted on the upper end of a vertical
shaft 450 which is rotatably mounted in bearings 451 and 452 formed on the bracket 390. Secured to the shaft 450, immediately below the bearing 451, is a gear wheel 453 which meshes with a pinion 454 rotatably mounted on a stud 455 secured in the said bracket 390. On the hub of the gear 454 is secured a gear 456 which meshes with a pinion 457 having an elongated hub 458 which is rotatably mounted in a bearing 459 formed in the bracket 390. The shaft 425 is axially aligned with and extends through the elongated hub 458 of the pinion 457, the said shaft being provided with a key 460 which is slidably mounted in a key groove 461 formed in the hub 458, whereby the said shaft 425 is continuously rotated and at the same time permitted longitudinal reciprocation with respect to the hub 458 of the pinion 457. The collar 462 is secured to the lower end of the hub 458 for preventing vertical movement of the said hub with respect to the bearing 459.

The roller 400 is rotatably mounted on a pin 463 which is set at an angle with respect to the axis of the can top e, and with respect to the center around which the head 401, in which the roller 400 is mounted, is adapted to rotate, whereby the plane of the flange 402 of the roller extends at an angle with respect to the general plane of the can top e, the operating plane of said flange 402 extending substantially at a tangent to the under side of the curved portion a of said can top as illustrated in Fig. 52.

The roller carrying head 401 is slidably mounted in an auxiliary head 465, the longitudinal side edges 466 of the roller carrying head 401 flaring outwardly, as shown in Fig. 54, and being located within a horizontally disposed groove 467 formed in the upper side of the auxiliary head 465, the side walls 468 of the said groove 467 being undercut as shown, thereby forming a dove-tail slidable connection between the roller carrying head 401 and the auxiliary head 465.

Longitudinal adjustment of the roller carrying head 401 with respect to the auxiliary head 465 is effected by means of an adjusting screw 469, one end of which is provided with left hand threads adapted to a lug 470 formed on the auxiliary head 465, the opposite end 471 of said screw being provided with right hand threads adapted to a depending lug 472 formed on the under side of the roller carrying head 401, whereby the position of the roller 400 may be radially adjusted in a horizontal plane extending at right angles with respect to the center of rotation of the carrying head 401.

The auxiliary head 465 is mounted in a plunger 475. The plunger 475 is rotatably and vertically slidably mounted in a bearing 476 formed on the bracket 390. The upper end of the plunger 475 is provided with a circular flange 474 which constitutes an enlargement at the upper end of said plunger in which is formed an under cut groove 477 which is adapted to receive a rib 478 formed on the under side of the auxiliary head 465, the longitudinal side walls 479 of said rib flaring outwardly in accordance with the under cut side walls of the groove 477 with which they co-operate to guide the auxiliary head 465 in its movement transversely of the plunger 475. The dove-tail groove 477 extends at an angle with respect to the axis or center of rotation of the plunger 475 and in a plane substantially parallel to the plane of the flange 402 of the roller 400, as clearly shown in Fig. 52.

The rib 478 of the auxiliary head 465 is provided with a downwardly extending projection 479 which is provided with a groove 480 disposed at an angle with respect to the center of rotation of the plunger 475 and substantially perpendicular to the plane of the dove-tail groove 477, said projection 479 being located in a transversely extending groove 481 formed in the upper end of the plunger 475. Within the angularly disposed groove 480 is slidably mounted a corresponding angularly disposed finger 482 secured to the upper end of a shaft 483 which is axially aligned with the plunger 475 and is adapted to slide longitudinally within said plunger.

The plunger 475 is provided with a longitudinal key groove 484 in which is slidably mounted the key 485 secured to the shaft 483. The lower end of the shaft 483 is provided with a key 486 which is adapted to slide in a key groove 487 formed in the elongated hub 488 of a pinion 489, the hub 488 being rotatably mounted in a bearing 490 formed in the bracket 390, a collar 491 on the hub 488 preventing longitudinal movement thereof with respect to said bearing.

The pinion 493 meshes with a gear wheel 492 which is secured to the hub of a pinion 493 rotatably mounted on a stud 494 secured in the bracket 390. The pinion 493 meshes with a gear wheel 495, secured to the lower end of the shaft 450, adjacent the bearing 452 on the bracket 390. By this means the wire-laying shoe 392 and the roller 400 are synchronously rotated in a fixed relation to each other for the purpose of laying and securing the wire e in the groove y of the can top e.

The head 393 constitutes a rotary support for the wire-laying shoe 392 and the plunger 475 constitutes a rotary support for the roller 400. The roller carrying head 401 and the auxiliary head 465 constitute a two part carrier for the roller 400 which is movable as a whole transversely of the rotary support and permits of radial adjustment of the roller relative to the center of rotation of the rotary support.

The lower end of the plunger 475 is provided with a circular groove 496 which is
adapted to receive pins 497 carried by a yoke arm 498 secured to a horizontally extending shaft 499 pivotally mounted in the bracket 390. On the shaft 499 is secured a lever 500, on the outer end of which is rotatably mounted a cam roller 501 adapted to ride in a groove 502 formed in the periphery of a cam 503 which is secured to and rotates with the shaft 450. The said shaft 450 is threaded at 504 and 505 for the reception of threaded collars 506 and 507 respectively, by which adjustment of the cam 503 longitudinally of the shaft 450 may be effected.

The shaft 483 is provided with a pair of spaced collars 508 between the adjacent sides of which is formed a circular groove 509 adapted to receive pins 510 carried by a yoke arm 511. The yoke arm 511 is secured to a longitudinally extending shaft 512 which is pivotally mounted in the bracket 390. On the shaft 512 is secured an arm 513 on the outer end of which is rotatably mounted a roller 514 adapted to ride in a cam groove 515 formed in the periphery of a cam 516 which is carried by and rotates with the shaft 450. An adjusting collar 517 is mounted on the threaded portion 505 of the shaft 450 above the cam 516 and a similar adjusting collar 518 is adapted to a threaded portion 519 of the shaft 450 below the said cam 516, whereby the position of the cam 516 in the shaft 450 is determined.

The cams 503 and 516 are suitably splined to the shaft 450, whereby they are rotated in unison with said shaft and are permitted longitudinal adjustment with respect thereto.

In order to prevent the movable jaw 136 of the cover carrying chuck 19 from being moved away from the fixed jaw 135 of said chuck while the roller 400 is rolling the metal comprising the inside wall of the groove of the cover over the ripping wire, a short cam 520, see Fig. 41, carried by posts 421 secured to the bracket 390, engages the outer side of the roller 149 of the movable jaw 136, whereby the said jaw 136 is immovably held while the chuck remains at station G.

Vertical movement of the plunger 475 is regulated and limited by an adjustable screw 522 which is threaded into the bracket 390 and has a plain portion 523 extending longitudinally through the bearing 476 thereof, the end of which is adapted to engage the upper side of a yoke arm 498, thereby limiting the upward vertical movement of the plunger 475.

During the time the movable table 15 is receiving its intermittent movements of 30° each, the head 393 is raised by the cam 434 to a position above and clear of the said table and the chucks carried thereby, and the roller 400 is withdrawn toward the center of rotation of the plunger 475 by the cam 516, and the said plunger 475 is lowered by the cam 503 to move the said roller 400 and its carrying head 401 to a position below and clear of the under side of said movable table 15. As soon as the table 15 is stopped, indexed and properly locked, to bring one of the chucks 19 into position at station G, the continued rotation of the cam 434 lowers the said head 393 until the wire-laying shoe 392 engages the upper side of the can top a. The head 393 being continuously rotated immediately causes the shoe 392 to engage the wire z and lay the same in the wire-receiving groove y in the manner above described. At the same time the cams 503 and 516 move the plunger 475 and the roller 400 upwardly under the can top a until the upper edge of the flange 402 of the roller 400 is positioned immediately under the lower side of the curved portion a1 of the can top a, as illustrated in Fig. 52.

The groove 515 in the cam 516 and the groove 503 in the cam 503 are so arranged that as the roller 400 is moved into the position described a slight relative longitudinal movement between the plunger 475 and the shaft 483 is effected. The said relative movement between the shaft 450 and the plunger 475 causes the angularly disposed finger 462 to move upwardly relative to the auxiliary head 465. The auxiliary head 466 being held against relative vertical movement with respect to the plunger 475 is caused to move transversely with respect to said plunger and to follow the path as directed by the angularly disposed groove 477 in which the rib 478 of the auxiliary head is slidably mounted. By this means as the roller 400 is moved up into position under the curved portion a1 of the can top a it is also moved radially with respect to the center of rotation of the plunger 475 and the periphery of the flange 402 of said roller is brought into engagement with the inner wall of the groove y in said can top, and as the said roller moves into its final outward position the said flange displaces the engaged portion of the said inner wall of the groove rolling the same around the ripping wire z to the position illustrated in Figs. 52, 53 and 50, and in so doing the curve portion of the said can top is straightened to a slight extent to permit this rolling of the inside wall of the groove without disturbing the metal of any other portion of the can top.

Obviously, the wire-laying operation is started by bringing the shoe 392 into initial engagement with the wire at a point immediately adjacent the hole w in the can top through which the wire extends. Likewise the cam 434, 503 and 516 are so relatively timed that the rolling in of the wall of the groove around the wire is started at a point immediately adjacent the hole w or at a point immediately beyond the opening w with respect to the direction of travel of the shoe 392 and the roller 400, thereby permitting...
the tail end $z^t$ of the wire to be laid in the groove $w$, to a point immediately adjacent the opening $w$, as shown in Fig. 89, as the shoe 529 completes a full revolution around the can top.

It is desirable to have the tail end $z^t$ of the wire $z$ located as close as possible to the opening $w$ after the wire has been laid in the groove, in order that when the can top is moved to the position at which the hole $w$ is hermetically sealed the single gob of solder which is adapted to hermetically seal the said hole will also function to anchor the said tail end of the wire $z^t$ in the groove $y$.

Continued rotation of the power supplying shaft 446 causes the cams 434, 503 and 516 to withdraw the wire-laying shoe 399 and the roller 400 into their inoperative positions clear of the table 15 in order that the same may receive its next successive step at 30° movement.

After the portion of the wire $z$ which extends above the can top $z$ has been secured in the groove $y$ the can top is moved into position in station $H$, wherein the portion of the wire extending below the said can top is formed into a loop and from position $H$ the can top is moved to station $I$ wherein the formed loop is twisted into its final state.

Stations $H$ and $I$ are shown in detail in Figs. 55 to 70 inclusive. The can top $z$ with the portion of the wire $z$ lying above said top rolled into the groove $y$ and the portion of the wire extending below the said can top being gripped by the wire-gripping fingers 156, 158 of the chuck 19 immediately below the said can top and extending downwardly and substantially perpendicular to the can top is moved from station $G$ to station $H$, wherein the downwardly extending portion of the wire engages one side of the loop-forming mandrel 520, as shown in Figs. 58 and 59. As soon as the chuck 19 carrying the can top $z$ is properly indexed at station $H$, the loop-forming mandrel 520 with a bending head 521 thereon is moved longitudinally toward said wire, a bending pin 522 on the said head 521 engaging the wire $z$ at the side opposite to that engaged by the mandrel 520, as illustrated in Fig. 59. In the advanced position of the bending head 521 the wire $z$ is positioned between one end of the said bending head 521 and the adjacent end of a stationary head 523 which is provided with an annular groove 524 in which the bending pin 522 is adapted to travel. The bending mandrel 520 is then turned in the direction of the arrow, Fig. 59, and the bending pin 522 on the head 521 thereof engages the wire $z$ and bends it around the said mandrel 520 from the position shown in Fig. 59 to the position shown in Fig. 60.

Prior to the bending operation the wire-gripping fingers 156 are released from the wire and remain in the open position until the free end $z^t$ of the said wire $z$ is brought into the position shown in Fig. 60, whereupon the said fingers 156 are again closed and thereby again grip the wire adjacent the under side of the can top and also the free end $z^t$ thereof.

The stationary head 525 is provided with an opening 525 axially aligned with the loop-forming mandrel 520, the said mandrel being adapted to rotate within said opening during the loop-forming operation. The stationary head 525 is provided with an integral stud 526 which is secured in the upper end of a bracket 527, by means of a nut 528 mounted on said stud. The bracket 527 is secured to a vertically movable carriage 529 which is provided with a depending plunger 530 slidably mounted in a bearing 531 secured to the main base 1.

The loop-forming mandrel 520 is rotatably and slidably mounted in bearings 532 and 533 formed integral with a bracket 534 secured to the said movable carriage 529.

Between the bearings 532 and 533 a pinion 535 is mounted on the mandrel 520 and is provided with a key 536 which extends into a longitudinally extending key groove 537 formed in the said mandrel 520. The gear 533 meshes with a second gear 538 which is rotatably mounted on a shaft 539 secured in bearings 540 and 541 formed in the bracket 534. The gear 538 meshes with a gear 542 which is secured to a shaft 543 rotatably mounted in bearings 544 formed on the bracket 534 and in a bearing 545 formed integral with the vertically movable carriage 529.

Secured to the outer end of the shaft 543 is an intermittent bevel pinion 546, see Figs. 56 and 61, which meshes with an intermittent bevel gear 547 formed on the upper end of a sleeve 548 which is rotatably mounted in a bearing 549 formed on the carriage 529. The sleeve 548 is provided with a flange 550 which rests on the upper side of the bearing 549, a collar 551 being secured to the sleeve 548 adjacent the lower side of the bearing 549 whereby the said sleeve is held against longitudinal movement but permitted rotary movement relative to said bearing.

On the upper side of the gear 547 is secured a cam plate 551 having a vertically extending peripheral flange 552 on which a cam path is formed, and which is engaged by a cam roller 553 rotatably mounted on one arm 554 of a bell-crank lever which is pivoted at 555 to an extension 556 of the stationary shaft 539. The second arm 557 of the bell-crank lever is in the form of a yoke, each arm of which carries a laterally extending pin 558 adapted to extend into an annular groove 559 formed in a collar 560, which is secured to the end of the loop-forming mandrel 520 by means of a nut 561.

The loop-bending head 521 comprises a cir-
cular flange 562 formed integral with the mandrel 520 and a collar 563, which is mounted on the mandrel 520 and is adapted to slide longitudinally of said mandrel and with respect to the flange 562 thereof. Springs 564 tend to move the collar 563 away from the flange 562, the said springs being mounted in openings 565 and 566 formed in the collar 563 and flange 562 respectively, pins 567 extending through the center of said springs and secured in the said flange 562. Limit screws 568 are secured in the collar 563 and extend through openings 569 formed in the flange 562, whereby movement of said collar is limited with respect to the said flange.

Axially aligned with the sleeve 548 is a vertically extending drive shaft 570, said shaft being rotatably mounted in a bearing 571 secured to the stationary table 9 and in a bearing 572 formed integral with the aforementioned bearing 531 which is secured to the base 1.

The shaft 570 is splined to the sleeve 548 as indicated at 373, whereby the said sleeve, while being permitted to move longitudinally of said shaft, is adapted to be rotated by said shaft. A collar 574 on the lower end of the shaft 570 in engaging the under side of the bearing 572 prevents longitudinal movement of said shaft.

On the upper end of the shaft 570 is secured a bevel gear 575 which meshes with a bevel pinion 576 secured to one end of a shaft 577, which is rotatably mounted in bearings 578 secured to the stationary table 9. On the opposite end of the shaft 577 is a bevel pinion 579 which meshes with a bevel gear 580 secured to the upper end of a shaft 581 which is rotatably mounted in a bearing 582 secured to the stationary table 9. Meshing with the bevel gear 580 is a second pinion 588 which is secured to one end of a shaft 584 rotatably mounted in bearings 585 and 586 and secured to the stationary table 9. The shaft 584 is also rotatably mounted in one of the bearings 131 formed on the collar 130 aforesaid, the said shaft being provided with a bevel pinion 587 which meshes with the common driving gear 128 on the common drive shaft 125.

Adjacent the bearing 586 the shaft 584 is provided with a bevel pinion 588 which meshes with a bevel gear 589 secured to one end of a shaft 590 rotatably mounted in a suitable bearing 591 carried by the stationary table 9. Also secured to the shaft 590, below the stationary table 9, is a spur gear 592 which meshes with a pinion 593 rotatably mounted on the table 9. The pinion 593 meshes with a second pinion 598 which is also rotatably mounted on the stationary table 9 and in turn meshes with a gear 595 which is rotatably mounted on a bearing 596 secured to the stationary table 9 by a screw 597. Secured to the gear 595 is a cam plate 598 on which is formed a cam 599 adapted to engage the cam roller 175 on the operating block 169 which controls the operation of the wire-gripping fingers 156.

Secured to the shaft 570 is a cam 600 having a cam groove 601 adapted to receive a cam roller 602 which is rotatably mounted on one arm of a lever 603 pivoted at 604 to the bearing 531 aforesaid, see Figs. 56 and 57. The opposite end of the lever 603 is rounded as illustrated at 605 and projects into a transversely extending slot 606 formed in the plunger 530 to which the carriage 529 is secured.

As the chuck 19 with the cam top 25 thereon moves away from station G toward station H a cam plate 607, see Fig. 70, which is secured to the under side of the stationary table 9 engages the roller 175 on the operating block 169 and as the table 15 is moved the said roller rides against the angularly disposed edge 608 of the cam 607, which moves the operating block 169 radially inward, thereby releasing the arms 166 of the finger controlling levers 159 from the parallel edges 173, 174 of the said operating block, the spring 174 moving the arms 166, 167 toward each other, thereby turning the levers 159 on their pivots and causing the wire-gripping fingers 156, 156 to be moved apart thereby releasing the wires 25.

During this movement of the table 15 the vertically movable carriage 529 assumes a low position in which the gear 535 carried thereby is clear of the under side of said table. The mandrel 520 is moved longitudinally of the bearing 532 and outward with respect to the stationary head 523 with barely the end of the mandrel 520 located within in the opening 525 in said stationary head 523. In this position the collar 563 is separated from the flange 562 on the mandrel 520 to the extent permitted by the limit screws 568. The bending pin 592 is withdrawn from the annular groove 524 in the stationary head 523.

With the elements in this position the outer end of the bending pin 592 is spaced apart from the face 523a of the stationary head 523 a sufficient distance to permit the wire 25 to enter between the two and to engage the end of the mandrel 520 as the chuck 19 carrying the cam top is moved into and indexed at position H. A suitable guide 609 is secured to the bracket 527 and provided for the purpose of directing the wire into the said position. As the chuck 19 is indexed, rotation of the shaft 570, through the cam 600, lever 603 and plunger 530, raises the carriage 529 and the elements carried thereon to the position illustrated in Figs. 56 and 57.

Continued rotation of the shaft 570 through the cam 552 and bell-crank lever 554, 555 causes the longitudinal movement of the mandrel 520 to the position shown in
Fig. 58 wherein the wire \( z \) is gripped between the adjacent faces 52a and 56a of the fixed head 52 and the movable collar 563 respectively, the bending pin 522 projecting into the annular groove 524 in the head 523 outside the wire \( z \).

During this period one of the plain portions 546a of the intermittent gear 547 is in engagement with the plain portion 547a of the intermittent gear 547. Continued rotation of the shaft 570 causes the tooth portion 547a of the gear 547 to engage one of the tooth portions 546b of the gear 546, whereby the mandrel 520 is turned from the position shown in Fig. 59 to the position shown in Fig. 60, thereby forming the loop \( z^* \) in the wire \( z \) around the said mandrel, the pin 522 acting as the means for bending the wire around the mandrel, the said pin moving in the annular groove 524 of the fixed head 523. The untoothed portion 545c of the gear 547 next engages one of the untoothed portions 545c of the gear 546, and at the same time the cam 559 on the cam plate 558 moves the operating block 169 radially outward which separates the arms 163, 163 of the finger controlling levers 155, 155 causing the wire-grasping fingers 156, 156 to move toward each other and thereby grip the end \( z^* \) of the wire \( z \) in the manner indicated in Fig. 60. The fingers are again locked in this position by the semicircular portions 167 of the arms 166 riding on to the parallel longitudinal edges 173, 173 of the operating block 169.

Continued rotation of the shaft 570 causes the cam roller 553 to ride on to the low portion of the cam 552, a spring 610 having one of its ends connected to the arm 554 of the bell-crank lever 556 and its opposite end secured to the fixed bearing 545 causing the said bell-crank lever to be turned on its pivot which moves the mandrel 520 longitudinally with respect to the fixed head 523, the springs 564 moving the sliding collar 563 relative to the flange 562 of the mandrel, whereby the bent loop \( z^* \) is stripped from the end of the mandrel 520. Continued rotation of the cam 552 causes further longitudinal movement of the mandrel 520 wherein the end of said mandrel is moved clear of the stationary head 523 which completely releases the bent loop \( z^* \) from the elements of station H.

At the same time the continued rotation of the shaft 570, through the cam 600 and the lever 603, lowers the vertically movable carriage 529 and the elements carried thereby to the position wherein the gear 555 is clear of the under side of the movable table 15. The chuck 19 carrying the can top \( z \) is then moved from station H to station I, and during this movement continued rotation of the shaft 570 causes the toothed portion 547d of the gear 547 to engage one of the toothed portions 546d, whereby the mandrel 520 is rotated and the pin 522 carried thereby is moved from the position shown in Fig. 60 to the position shown in Fig. 59, wherein the mandrel is ready to receive the wire extend downwardly from the can top carried by the next successive chuck 10.

As the can top with the previously bent loop \( z^* \) moves into position I the said loop moves between a pair of open jaws 611 and 612 which are pivotally mounted on a pin 613 carried on the upper end of a plunger 614, which is slidable mounted in and longitudinally movable with respect to a sleeve 615. A key 616 is secured to the plunger 614 and is adapted to slide in a key groove 617 formed in the sleeve 615, whereby the plunger 614 will rotate with the sleeve 615. The sleeve 615 is rotatably mounted in a bearing 618 secured to the base 1, and, below said bearing, is provided with a gear 619. A collar 621 is secured to the upper end of the sleeve 615 and together with the gear 619 prevents longitudinal movement of the sleeve relative to the bearing 618. The gear 619 meshes with a gear wheel 620, which is rotatably mounted on a stud 621 carried by the bearing 618. Secured to the gear 620 is a gear wheel 622 which meshes with an intermittent gear 624 secured to the drive shaft 621.

As above noted, one end of the shaft 581 is rotatably mounted in the bearing 582 secured to the stationary table 9, and the lower end of said shaft 581 is rotatably mounted in a bearing 625 formed integral with a bracket 625 which is secured to the main base 1.

The intermittent gear 624 is provided with a plain peripheral portion 624a, and the gear 622 is provided with concaved portions 622a, which are adapted to engage the plain portion 624a of the gear 624, during portions of the operation of the device (see Fig. 65r). The number of teeth in the toothed portion of the gear 624 is such that the gear 622 will receive 1 1/2 revolutions, whereupon one of the concaved portions 622a of the said gear will come in contact with the untoothed portion 624a of the gear 624.

To prevent chattering of the gear 622 during the quiescent periods a circular plate 627 is secured to the gear 622, and is provided with concaved portions 628 which are adapted to engage and ride on a circular peripheral edge 629 of the segmental plate 630 carried by the gear 624.

The plunger 614 is transversely slotted at 632 for the reception of the jaws 611 and 612. The upper end of the jaw 611 is provided with a circular projection 633 which is adapted to enter the open portion of the loop \( z^* \), and also to enter a circular opening 634 formed in the jaw 612. The jaws 611 and 612 are adapted to be moved to an open position to receive the loop \( z^* \) by a compression spring 635 having one of its ends mounted
in a circular opening 638 formed in the jaw 611 and its opposite end mounted in a circular opening 637 formed in the jaw 612. The jaws 611 and 612 are adapted to be closed by a vertically movable spindle 638 which is mounted in and axially aligned with the plunger 614 and is further adapted to receive longitudinal movement with respect to said plunger and the jaws 611 and 612 carried thereby.

The upper end of the spindle 638 is cone shaped, as illustrated at 639, and is adapted to be projected between semi-circular portions 640 formed on arms 641 and 642, which are formed integral with the jaws 611 and 612 and project below the pivot 613 thereof, being located within the transverse slot 632 of the plunger 614. Obviously, vertical upward movement of the spindle 638 with respect to the plunger 614 will cause the arms 641 and 642 to be spread apart, whereby the jaws 611 and 612 will be closed against the loop 30 in the wire 2.

Twisting of the loop in this manner will effect a fore-shortening of the said loop with respect to the can top 2. In order to prevent undue strain being applied to the wire the plunger 614 is adapted to be gradually moved toward the under side of the can top as the loop is being twisted, and for this purpose the lower end of the plunger 614 is provided with an annular groove 643 which is adapted to receive rollers 644 carried by the yoke end 645 of a lever 646, which is pivotally mounted at 647 to the bracket 626 secured to the base 1. The opposite end 648 of the lever 646 is provided with a roller 649 which is adapted to ride in a cam groove 650 formed in the periphery of the cam wheel 651 which is secured to the shaft 581.

In order to maintain the grip of the jaws 611 and 612 on the loop, while the loop is being twisted, the operating spindle 638 is provided with an annular groove 652 adapted to receive rollers 633 carried in the yoke end of a lever 654 which is pivoted at 655 to the bracket 666. The opposite end of the lever 654 is provided with a roller 666 adapted to ride in a cam groove 657 formed in the periphery of the cam wheel 651. The cam groove 657 is so shaped that the spindle 638 receives an initial longitudinal movement with respect to the plunger 614 for purposes of closing the jaws 611 and 612 on the previously bent loop 30, and thereafter causing vertical movement of the plunger 638 in unison with the plunger 614 as the loop is being twisted for the purpose of maintaining the grip of the said jaws on the loop. When the twisting of the loop has been completed the spindle 638 is moved in the opposite direction relative to the jaws and to the plunger, whereby the jaws will be released from the said loop, the jaws being opened by the spring 635.

During the movement of the can top from station H to station I the jaws 611 and 612 occupy a position below the lowest point of the loop 30 and are raised to the position shown in Fig. 68 as soon as the chuck 19 is indexed at station I. In order to center the loop 30 with respect to the jaws 611 and 612, the upper end of the plunger 614 is provided with a pair of guides 638 which engage the said loop and center the same with respect to the jaws when the jaws receive initial vertical movement. By this means the opening in the loop 30 is brought into axial alignment with the circular projection 638 on the jaw 611.

In order to relieve the teeth of the gear 622 from the shock when the advanced tooth on the gear 624 engages the co-operating tooth of the gear wheel 622, the said gear is provided with a plate 636 having a sturdy tooth 639 which is adapted to contact with a similar tooth 661 formed on a plate 662 secured to the under side of the gear 622.

As the chuck is moved from station I to station J the fingers 156 are again released from the twisted loop 30 by the roller 175 on the operating block 179 engaging a second fixed cam block 663 secured to the under side of the stationary table 9. The wire-gripping fingers 156 thereafter remain open until the said chuck is again moved into position at station E.

The can top with the twisted loop is moved from station I to station J wherein the hole w through which the wire extends is hermetically sealed and the tail end 30 of the wire lying within the groove y in the said can top is simultaneously anchored in the said groove by the gob of solder which seals the hole w.

A suitable spool 665 of resin core solder wire v is rotatably supported on the stationary table 9 by posts 666 having a laterally extending arm 657 on which said spool is rotatably mounted. From the spool 666 the solder wire v is fed through an opening 668 formed in a vertically reciprocable element 669 into a vertically extending circular bore 670 formed in said element, through which the said wire extends to a point immediately adjacent the can top v as secured at station J. The lower end of the bore 670 is closed by a suitable nipple 671 having a central opening 672 extending longitudinally therethrough, and in which the said solder wire v is located. Within the bore 670 is located a bushing 673 having longitudinally extending passageway 674 for said solder wire.
Intermediate the bushing 673 and the nipple 671 the solder wire \( \varphi \) is adapted to be engaged by a pair of fluted feed wheels 674, 676, secured to shafts 677 and 678 respectively. The shaft 678 is rotatably mounted in bearings 679 formed in the lower end of the vertically movable element 669.

The shaft 677 is rotatably mounted in bearings 680 which are adjustably mounted in slots 681 formed in said lower end of the element 669, adjusting screws 682 being provided whereby the feed wheel 675 may be advanced toward the feed wheel 676 to insure a proper gripping of the solder wire \( \varphi \) between the peripheries of said feed wheels. Gear wheels 683 and 683a are provided on the shafts 677 and 678 respectively, whereby the said feed wheels 675 and 676 are rotated.

Secured to the shaft 678 is a ratchet wheel 684 and pivotally mounted on the end of the shaft 678 is a bell-crank lever 685 on one arm of which is pivotally mounted at 684a a pair of pawls 686 adapted to be pressed into engagement with the teeth of the ratchet wheel 684 by springs 687 secured to the bell-crank 685.

To the second arm 688 of the bell-crank lever 685 is secured one end of a spring 689, the opposite end of said spring being secured to a post 690 extending laterally from the vertical movable element 669. The end of the arm 688 of the bell-crank lever 685 is adapted to engage a stop 691 secured to the stationary table 9, so that as the vertical movable element 669 is raised the bell-crank 685 will be turned on its pivot and the pawls 686 will rotate the ratchet wheel 684 and the shaft 678 and thereby feed a desired amount of the solder wire \( \varphi \) out of the lower end of the nipple 671.

The vertical movable element 669 is provided with laterally extending longitudinal ribs 692, 693, which are adapted to slide in guideways 695, 696 which are secured to the stationary table 9. The ribs 692 are slidably secured in the guideways 695 by a pair of U-shaped elements 694, 694 which are rigidly connected by a bridge element 695, see Fig. 82.

By this construction the vertical slideable element 669 may be readily moved from the guideways 693 by raising the U-shaped element 694 to a position clear of the guideway 693 whereupon the vertical movable element 669 may be moved laterally with respect to the guideway 693 and thereby entirely disconnected from the operating elements of the machine for the purpose of making any adjustment of the elements carried by the element 669 that may be necessary.

The vertical movable element 669 is provided with a slot 696 at its upper end in which is rotatably mounted a roller 697 on a pin 698 extending across the slot 696. The roller 697 is engaged by the slotted end 699 of an operating lever 700. The lever 700 is secured to a shaft 701 which is rotatably mounted in bearings 702 secured to the stationary table 9. On the shaft 701 is secured a lever 703 to which is connected one end of a rod 704, the opposite end of said rod being provided with a forked head 705 which engages a guide block 706 loosely mounted on an operating shaft 707. The operating shaft 707 is rotatably mounted in bearings 708, 709 and is provided with a cam 710 having a groove 711 in which a cam roller 712 is secured to the forked end 705 of the rod 704 operates.

Obviously, rotation of the shaft 707 effects a vertical reciprocation of the vertical movable element 669 whereby the desired length of the soldering wire \( \varphi \) is fed outwardly from the nipple 671 when the element 669 is raised and on the downward movement of said element the projecting end of the solder wire \( \varphi \) is carried downwardly against the can top \( z \).

It will here be noted that the solder wire \( \varphi \) is aligned with and positioned directly above the hole \( w \) in the can top \( z \).

In order that the solder will fuse instantaneously with the can top, the portion of the can top immediately surrounding the hole \( w \) therein, while the can top is located at station 1, is pre-heated by means of a suitable gas jet 713, see Fig. 84, and as the projecting end of the solder wire is lowered into contact with the pre-heated can top at station 1 the said wire passes immediately adjacent to a gas flame which is projected from a gas jet 714 located at station 1. Thus, the projecting portion of solder wire is melted and caused to flow into the hole \( w \) around the wire \( z \), thereby hermetically sealing the said hole in the manner illustrated in Figs. 95 and 96. The solder at the same time flows to a certain extent in the wire groove \( y \) thereby anchoring the tail end \( y \) of the wire \( z \), as illustrated in said figures.

The shaft 707 is provided with a gear wheel 715 which meshes with a pinion 716 secured to one end of a shaft 717 which is rotatably mounted in a bearing 718 secured to the stationary table 9, and in one of the bearings 732 formed in the collar 131 aforesaid.

On the shaft 717 is secured a bevel pinion 719 which meshes with the common driving bevel gear 128 on the drive shaft 125. By this mechanism the vertical movable element 669 is operated.

To protect the nipple 671 from the heat of the gas flame projecting from the jet 714, the said nipple is provided with heat-resisting covering 720.

To assist the fusing of the solder \( \varphi \) with the can top \( z \) and the wire \( z \), a second gas flame is projected upwardly against the underside of the can top from a gas jet 721, see Fig. 75.

The gas jets 713 and 714 are connected to a gas line 722, and the gas jet 721 connected to a gas line 723. The gas lines 722 and 723 are connected to a common gas line 724. The gas
line 724 is provided with a suitable controlling valve 725, see Fig. 7. The gas line 724 is connected to one outlet of a T fitting 726, a second outlet of said fitting being connected to a pipe 727 by means of which gas is supplied to the fitting 726. A third outlet of the fitting 726 is connected to an air pipe 728. The gas and air pipes 727 and 728 are connected to suitable sources of supply, not shown.

The supply pipes 727 and 728 are provided with individual control cocks 729 and 730 respectively, whereby the proper mixture of gas and air may be attained at the fitting 726. The supply pipes 727 and 728, intermediate the cocks 729 and 730 and the fitting 726, are respectively provided with additional control cocks 731 and 732 having operating handles 733 and 734 which are connected by 20 a bar 735.

The bar 735 is connected by a link 736 to a bell-crank lever 737 pivoted at 738 to the base 1 of the machine. The second arm of the bell-crank 737 is connected by a link 739 to the power control lever 62 of the machine, so that when the lever 62 is operated to stop the machine the control cocks 731 and 732 will be simultaneously operated to cut off the supply of gas and air to the gas jets 713, 714 and 721.

Each of said jets is provided with a pilot 740, said pilot being connected to a common feed pipe 741 which is tapped into the gas line 727 between the control cocks 729 and 731, so that when the machine is again placed in operation the gas jets will be automatically lighted.

In order to chill the solder quickly, a suitable water jet 742 is provided adjacent the gas jet 721. The water jet 742 is connected to a suitable water supply pipe 743 which is provided with a suitable control valve 744 which, in the present instance, is a common piston valve and is not shown in detail. The valve 744 is adapted to be operated by a rod 745 slidably mounted in a bearing 746 mounted on the web 2 of the machine. The water jet 742 is adapted to direct a small stream of water against the under side of the can top a, but not in direct contact with the solder applied thereto. The valve 744, which controls the water jet is adapted to be opened only at such time as the oscillating lever 24 moves in its backward stroke to permit the pawl 22 to drop into one of the indentations 21 on the ring 20, at which time the rod 745 is adapted to be engaged by the hub of the pawl 22, whereby the valve 744 is momentarily operated to permit water to squirt from the jet 742.

The forward movement of the arm 24 moves the movable table 15 through an angle of 30° which carries the can top from station J to station K wherein the loop a is first deflected and then bent upward into the concaved side of the can top a.

For this purpose the shaft 707 is provided with a bevel gear 750 which meshes with a bevel gear 751 secured to a shaft 752 which is mounted in a bearing 753 projecting from the bearing 708. The lower end of the shaft 752 is rotatably mounted in a bearing 754 secured to a bracket 755 which in turn is secured to the base 1.

Slightly mounted in guideways 756 formed in the bracket 755 is a slide bar 757, one end of which is provided with a hook 758 which lies in the path of the loop a as the can top is moved from station J to station K. As soon as the chuck 19 carrying the can top is indexed at station K the hook 758 is moved radially outward by means of a roller 759 which is rotatably mounted on the opposite end of the bar 757 and rides in a cam groove 760 formed in a cam 761 which is secured to one face of a cam wheel 762. The cam wheel 762 is secured to the vertical shaft 752 and is adapted to be rotated continuously thereby.

The radial movement of the hook 758 deflects the loop a from the position shown in broken lines to the position shown in full lines in Fig. 80, whereupon the said loop is adapted to be engaged by the upper end of a vertically movable plunger 768.

The plunger 763 is slidably mounted in bearings 764 and 765 formed in a slide 766 which is slidably mounted in guideways 767 formed in the bracket 755. The plunger 763 is provided with a longitudinal groove 768, see Fig. 80, adapted to receive a plain end of a screw 769 carried by the bearing 764, whereby the plunger is prevented from rotating with respect to the slide 766. The plunger 763 is provided with a lateral projection 770, the said projection being in the form of a key driven into an opening formed in the side of the plunger 763 opposite the groove 768. The projection 770 acts as a shoulder against which one end of a spring 771 rests, the opposite end of said spring being seated on the upper side of the bearing 765.

The slide 766 is provided with a gear rack 772, the teeth of which mesh with the teeth of a gear pinion 773 which is rotatably mounted on a spindle 774 secured in and extending between the upper ends of a pair of links 775, 776, the opposite ends of said links being pivotally connected, at 776, to one arm 777 of a bell-crank lever which is pivoted at 778 to the bracket 755. The second arm 779 of the bell-crank lever is provided with a roller 780 which rides in a cam groove 781 formed in a cam 782 carried on the under side of the cam wheel 762. The pinion 773 also meshes with the teeth of a rack 783 which is secured to a web 784 formed in the bracket 755.

As the cam wheel 762 is rotated the hook 758 of the slide bar 757 is moved radially inward by means of a roller 759 which is rotatably mounted on the opposite end of the bar 757 and rides in a cam groove 760 formed in a cam 761 which is secured to one face of a cam wheel 762. The cam wheel 762 is secured to the vertical shaft 752 and is adapted to be rotated continuously thereby.

The radial movement of the hook 758 deflects the loop a from the position shown in broken lines to the position shown in full lines in Fig. 80, whereupon the said loop is adapted to be engaged by the upper end of a vertically movable plunger 768.
758 deflects the loop \( z \) as above noted. The bell-crank lever 777, 779 is rocked about its pivot which raises the spindle 774 on which is mounted the pinion 773, the pinion 773 meshing with the fixed rack 783 and the movable rack 772 causes the slide 766 to be raised and the bearing 765 thereof to engage the lower end of the spring 771, the upper end of the spring being in engagement with the lateral projection 770 of the plunger 758. 758 raises the said plunger into engagement with the deflected loop \( z \), thereby bending the loop 764 from the position shown in full line in Fig. 80 to the position shown in broken lines in Fig. 81.

Continued movement of the slide 766, after the loop is bent upward in engagement with the concave side of the can top \( z \), is taken up by the spring 771 which increases the pressure exerted against the bent loop by the plunger 763 which permanently sets the loop in its position illustrated in Fig. 96.

Continued rotation of the cam wheel 762 withdraws the plunger 763 to its normal position below the movable table 15. When the plunger 763 assumes its lower position the table 15 is again moved through an angle of 30°, thereby carrying the can top from station K to station L, wherein the completed can top is removed from the chuck 19 and deposited in a suitable receptacle adjacent the base 1.

In moving from station K to station L the roller 149 on the fixed jaw 138 of the chuck 19 rides onto an inclined end 148b of the cam 148 which moves the jaw 138 radially outward, thereby releasing the grip of the chuck from the completed can top.

Secured to the plunger 763 is an arm 785 which extends laterally from station K to station L, and is provided at its outer end with a pad 786 which when the plunger 763 is raised engages the under side of the can top \( z \), thereby raising the can top from the shoulders 751 and 752 in the chuck 19 to the position above the jaws of the chuck as illustrated in Fig. 72. At the same time as the can top is raised out of the chuck by the pad 786 it is adapted to be magnetically secured to the ejecting apparatus located at station L.

The ejecting apparatus comprises a post 790 rigidly secured to the stationary table 9. Pivotally mounted on the post 790 is a collar 791 which is provided with vertically extending arms 792, to the upper and lower ends of which are respectively pivoted levers 793 and 794. The outer end of each of the levers 793 and 794 is pivotally connected to a collar 795 secured to a stem 796 projecting vertically from an electro-magnet 797. The levers 793 and 794 are operatively connected by a vertically extending link 798, in the lower end of which is rotatably mounted a roller 799 adapted to ride on a cam 800 secured to the stationary table 9 by means of screws 801, as shown in Fig. 71.

Secured to the collar 791 is a lever 802 to which is pivotally connected at 803 one end of a connecting rod 804, the opposite end of 790 being pivotally connected to a crank pin 805 on a crank 806 which is secured to the upper end of the continuously rotating shaft 752. As the shaft 752 rotates the collar 791 is oscillated on the post 790. The roller 799 riding the cam 800 lowers the electro-magnet 797 into a position with its lower end immediately adjacent to the upper side of the can top \( z \), whereupon the electro-magnet is energized causing the can top to adhere thereto.

Continued rotation of the shaft 752 causes the collar 791 to be moved in an opposite direction and the roller 799 to ride onto the high part of the cam 800, thereby raising the can top \( z \) clear of the chuck 19 and the movable table 15. At the same time the electromagnet is carried from position in vertical alignment with the chuck 19 to a position above an angularly disposed receptacle 807, whereupon the electro-magnet 790 is de-energized permitting the can top \( z \) carried thereby to be dropped into the receptacle 807.

As shown in Fig. 85, the electro-magnet 797 is connected in series circuit with a source of power 810 and a switch 811. The switch 811 comprises a fixed blade 812 and a relatively movable blade 813. The blade 813 is provided with a post 814 which is adapted to be engaged by a cam 815 secured to the shaft 752 so that current is supplied to the electro-magnet 797 from the source 810 at the predetermined intervals above noted, the cam 815 making or breaking the circuit in the switch 811 at the desired time.

The movable table 15 may be supported adjacent its outer end at spaced intervals around the rigid base 1 by rollers 816 rotatably mounted on adjustable bearing pins 817 carried in supporting blocks 818 secured to the horizontal flange 3 of the base 1.

As shown in Fig. 83 the supporting pins 817 for the rollers 816 are eccentrically positioned on the portions 817a of the studs which are secured in the blocks 818 by means of securing nuts 819, whereby the position of the rollers 816 may be minutely adjusted.

The solenoid 83, which controls the release of the operating rod 62, is adapted to be connected in a circuit with a source of electrical energy and one or more controlling switches which may be positioned at desired points around the machine to be operated by the attendant from any desired position in order to stop the machine immediately.

From the foregoing description of the machine, the operation thereof will be apparent. The operation may be summarized as follows:

Can tops in the form illustrated in Fig. 86...
are stacked in the magazine located at station A and are automatically fed one at a time to each of the chucks 19 which are carried by the movable table 18, as the open
chucks are successively indexed with the said station A.

From station A the chuck with the can top therein is moved to station B wherein the can top is forced down into correct position in the chuck, the jaws of the chuck being closed
around the can top to rigidly secure the same in place within the chuck as the chuck is moved from station A to station B.

The can top is then moved to station C wherein the wire-receiving hole w is punched in the base of the wire-receiving groove y in the can top z as illustrated in Fig. 87.

From station C the chuck with the can top therein is moved to station D which, in the present instance, is an idle station.

From station D, the can top is moved to station E wherein a suitable length of wire is drawn from the reel, measured, cut and threaded through the previously punched
hole in the can top, as illustrated in Fig. 88.

As this time the wire-engaging fingers 156 are closed against the inserted wire and rigidly hold the wire in position.

From station E, the can top is moved to station F, which, like station D, in the present instance, is an idle station.

From station F, the can top is moved to station G wherein the portion of the wire extending above the can top is laid in the wire-receiving groove y (see Fig. 89), and secured therein by the inner wall of the said groove y being rolled around the said wire z, as illustrated in Figs. 90 and 91.

From station G, the can top moves to station H wherein the portion of the wire extending below the can top is formed into a suitable loop, as shown in Fig. 92, the wire-
engaging fingers 156 being released from the wire to permit the free end of the wire to be brought into a position to be engaged by the fingers, whereafter the said fingers are again operated to engage the wire.

From station H, the can top, with the formed loop, is carried to station I wherein the free end of the wire and the body of the wire above the loop are twisted together to complete the loop, as shown in Fig. 93.

From station I, the can top moves to station J wherein solder is applied to hermetically
seal the hole in the can top through which the wire projects and to anchor the tail end of the wire in the groove y, as shown in Figs. 94 and 95.

From station J, the can top moves to station K wherein the formed loop is first deflected and then bent upwardly into the concave formed in the underside of the can
top, as shown in Fig. 96.

From station K, the can top moves to station L wherein the jaws of the chuck 19 are
opened, the finished can top raised out of the chuck, and then engaged by the electromagnetic ejecting apparatus and deposited in the receiving receptacle located adjacent the base of the machine.

Thus it will be seen that the operation of the machine is entirely automatic and requires but a single attendant to stack the pre-formed can tops in the magazine at station A, remove the completed can tops from the receiving receptacle located at station L, and to keep the machine supplied with wire and solder from time to time.

As above noted, the piercing w, through which the ripping wire passes, is provided with a V-shaped extension which points in the direction in which the wire z has been progressively forced into the wire-receiving groove y of the can top, the apex of said V lying in line with the scoring y' in the base of the groove y.

The function of the V-shaped extension of the hole w is to facilitate the initial tearing or cutting of the metal of can top when force is applied to the ripping wire in a direc-
tion away from the can top and to direct the tearing or cutting of the metal into the scoring y' in order that the center of the can top will be removed on a clean cut line, leaving no sharp projecting pieces of metal which could injure the person opening the can.

While the specification and drawings show the can tops as being of a circular form, obviously the chucks and operating units of the various stations of the machine can, by slight modification, be adapted to operate on can tops of various other forms and shapes, such as triangular, rectangular, polygonal, elliptical or oval, without departing from the essential features of the invention.

We claim:
1. The combination in a machine for placing a ripping wire in a can top having a sub-
stantially flat body portion in which is formed a wire-receiving groove, of means for pierc-
ing the can top in the base of the groove, means for threading the wire through the piercing perpendicular to the body portion of the can top, means for laying the wire in the groove, and means for displacing the metal forming one wall of the groove for securing the wire therein.

2. The combination in a machine for placing a ripping wire in a can top having a sub-
stantially flat body portion in which is formed a wire-receiving groove, of means for pierc-
ing the can top in the base of the groove, means for threading the wire through the piercing perpendicular to the body portion of the can top, means for laying the wire in the groove, and means for displacing the metal forming one wall of the groove and the portion of the body immediately adjacent the said wall of the groove for securing the wire in the groove.
3. The combination in a machine for placing a ripping wire in a can top having a substantially flat body portion in which is formed a wire-receiving groove, of means for piercing the can top in the base of the groove, means for threading the wire through the piercing perpendicular to the body portion of the can top, means for laying the wire in the groove, means for displacing the metal forming one wall of the groove and the portion of the body immediately adjacent the said wall of the groove for securing the wire in the groove, and means for additionally anchoring the tail end of the wire to the can top.

4. The combination in a machine for placing a ripping wire in a can top having a wire-receiving groove, of means for piercing the can top, means for threading the wire through the piercing, means for laying the wire in the groove, means for securing the wire in the groove, and means for sealing the piercing around the wire and anchoring the tail end of the wire adjacent the piercing.

5. The combination in a machine for placing a ripping wire in a can top having a wire-receiving groove, of means for piercing the can top, means for removing a predetermined amount of wire from a supply, means for threading one end of the wire through the piercing, means for feeding a portion of the predetermined length of wire through the piercing, means for laying the portion of the wire at one side of the can top in the groove, and means for securing the wire in the groove.

6. The combination in a machine for placing a ripping wire in a can top having a wire-receiving groove, of means for piercing the can top, means for threading a portion of the wire through the piercing, means for laying another portion of the wire in the groove, means for securing the last said portion of the wire in the groove, and means for forming the portion of the wire extending through the piercing into a loop.

7. The combination in a machine for placing a ripping wire in a can top having a wire-receiving groove, of means for piercing the can top, means for threading a portion of the wire through the piercing, means for laying another portion of the wire in the groove, means for securing the last said portion of the wire in the groove, means for forming the portion of the wire extending through the piercing into a loop, and means for twisting said loop.

8. The combination in a machine for placing a ripping wire in a can top having a wire-receiving groove, of means for piercing the can top, means for threading the wire through the piercing, means for laying the wire in the groove, means for securing the wire in the groove with its tail end adjacent the piercing, means for securing the wire in the groove, and means for simultaneously sealing the piercing around the wire and anchoring the tail end of the wire adjacent the piercing.

9. The combination in a machine for placing a ripping wire in a can top having a wire-receiving groove, of means for piercing the can top, means for drawing a predetermined length of wire from a supply, means for threading the wire through the piercing, means for shearing the measured length of wire from the supply, means for laying the wire in the groove, and means for securing the wire in the groove.

10. The combination in a machine for placing a ripping wire in a can top having a wire-receiving groove, of means for piercing the can top, means for applying a gob of solder around the wire at the piercing to seal the piercing.

11. The combination in a machine for placing a ripping wire in a can top of means for piercing the can top, means for threading the wire through the piercing, means for laying the wire in the groove, means for securing the wire in the groove, and means for applying a gob of solder around the wire at the piercing to seal the piercing, and means for chilling the solder immediately after the seal is formed.

12. The combination in a machine for placing a ripping wire in a can top of means for piercing the can top, means for threading the wire through the piercing, means for laying the wire in the groove, means for securing the wire in the groove, means for applying a gob of solder around the wire at the piercing to seal the piercing, and means for heating the portion of the can top around the piercing prior to the application of solder thereto.

13. The combination in a machine for placing a ripping wire in a can top of means for piercing the can top, means for threading the wire through the piercing, means for laying the wire in the groove, means for securing the wire in the groove, means for applying a gob of solder around the wire at the piercing to seal the piercing, and means for heating the portion of the can top around the piercing prior to the application of solder thereto.

14. The combination in a machine for placing a ripping wire in a can top of means for piercing the can top, means for threading the wire through the piercing, means for laying the wire in the groove, means for securing the wire in the groove, means for heating the wire and the can top at the piercing, means for feeding solder toward the preheated can top, means for heating the solder as it is fed toward the can top to cause the solder to flow around the wire and seal the piercing.

15. The combination in a machine for plac-
ing a ripping wire in a can top of means for piercing the can top, means for threading the wire through the piercing, means for laying the wire in the groove, means for securing the wire in the groove, means for heating the wire and the can top at the piercing, means for feeding solder toward the preheated can top, means for heating the solder as it is fed toward the can top to cause the solder to flow around the wire and seal the piercing, and means for chilling the solder and the can top immediately after the seal is formed.

16. The combination in a machine for placing a ripping wire in a can top having a wire-receiving groove, of means for piercing the can top, means for threading one end of the wire through the piercing, means for gripping the wire adjacent the side of the can top opposite to that in which the groove is formed, means for laying the wire in the groove, and means for securing the wire in the groove.

17. The combination in a machine for placing a ripping wire in a can top having a wire-receiving groove, of means for piercing the can top, means for threading one end of the wire through the piercing, means for gripping the wire adjacent the side of the can top opposite to that in which the groove is formed, means for laying the wire from the groove side of the can top in the groove, means for securing the laid portion of the wire in the groove, and means for forming a loop in the end of the wire projecting through the piercing.

18. The combination in a machine for placing a ripping wire in a can top having a wire-receiving groove, of means for piercing the can top, means for threading one end of the wire through the piercing, means for gripping the wire adjacent the side of the can top opposite to that in which the groove is formed, means for laying the portion of the wire which is on the grooved side of the can top in the groove, means for securing the laid portion of the wire in the groove, means for releasing the wire-gripping means, means for bending the portion of the wire extending through the piercing into a loop with the end of the wire located adjacent the body portion of the wire adjacent the piercing, means for operating the wire-gripping means to grip the body and end of the wire adjacent the can top, means for twisting said end and said body portion of the wire together to complete the loop, and means for bending the finished loop into a position substantially parallel to the can top.

20. The combination, in a machine for placing ripping wires in can tops each of which is provided with a wire-receiving groove, of a supporting structure, a conveyor movably mounted on said supporting structure, chucks on the conveyor in spaced relation to each other for receiving the respective can tops, means on the supporting structure for successively feeding the can tops to the respective chucks, means on the supporting structure for piercing the can tops, means on the supporting structure for threading a wire through the piercing in each can top, means on the supporting structure for laying the wire in the groove, means on the supporting structure for securing the wire in the groove, means on the supporting structure for bending the portion of the wire extending through the piercing into a loop, means for removing the can tops from the chucks, and means for moving the conveyor in intermittent steps to bring each can top into position with the said operating means on the supporting structure successively.

21. The combination in a machine for placing ripping wires in can tops each having a wire-receiving groove, of a supporting structure, a table movable with respect to said support, means on the table for receiving can tops in spaced relation to each other, means on the support for piercing the can tops, means on the support for threading a wire through the perforation formed in each can top, means on the support for laying the wire in the groove of each can top, means on the support for securing the wire in the groove, and means for moving the table in intermittent steps to bring the respective can tops into registry successively with the said piercing, threading, laying and securing means.

22. The combination in a machine for placing ripping wires in can tops each having a wire-receiving groove, of a supporting structure, a table movable with respect to said support, means on the table for receiving can tops in spaced relation to each other, means for automatically and successively feeding the individual can tops to the respective receiving means on the table, means on the support for piercing the can tops, means on the
support for threading a wire through the perforation formed in each can top, means on the support for laying the wire in the groove of each can top, means on the support for securing the wire in the groove, and means for moving the table in intermittent steps to bring the respective can tops into registry successively with the said feeding, piercing, threading, laying and securing means.

26. The combination in a machine for placing ripping wires in can tops each having a wire-receiving groove, of a supporting structure, a table movable with respect to said support, means on the table for receiving can tops in spaced relation to each other, means on the support for piercing the can tops, means on the support for threading a wire through the perforation formed in each can top, means on the support for laying the wire in the groove of each can top, means on the support for securing the wire in the groove, means carried by the support for sealing the aperture around the wire extending therethrough, and means for moving the table in intermittent steps to bring the respective can tops into registry successively with the said piercing, threading, laying and securing, and sealing means.

27. The combination in a machine for placing ripping wires in can tops each having a wire-receiving groove, of a supporting structure, a table movable with respect to said support, means on the table for receiving can tops in spaced relation to each other, means on the support for piercing the can tops successively, means on the support for threading a wire through the perforation formed in each can top, means on the support for laying the wire in the groove of each can top with its tail end adjacent the aperture, means on the support for securing the wire in the groove, means carried by the support for simultaneously sealing said aperture and anchoring the tail end of the wire to the can top, and means for moving the table in intermittent steps to bring the respective can tops into registry successively with the said piercing, threading, laying and securing, and anchoring and sealing means.

28. The combination in a machine for placing ripping wires in can tops each having a wire-receiving groove, of a supporting structure, a table movable with respect to said support, means on the table for receiving can tops in spaced relation to each other, means on the support for piercing the can tops successively, means on the support for threading a wire through the perforation formed in each can top, means on the support for laying the wire in the groove of each can top, means on the support for securing the wire in the groove, means on the support for forming the portion of the wire extending through the can top into a loop, and means for moving the table in intermittent steps to bring the respective can tops into registry successively with the said piercing, threading, laying and securing, and loop forming means.

29. The combination in a machine for placing ripping wires in can tops each having a wire-receiving groove, of a supporting structure, a table movable with respect to
said support, means on the table for receiving can tops in spaced relation to each other, means on the support for piercing the can tops successively, means on the support for threading a wire through the perforation formed in each can top, means on the support for laying the wire in the groove of each can top, means on the support for securing the wire in the groove, means for forming the portion of the wire extending through the can top into a loop, means on the support for bending the loop into a position substantially parallel to the body of the can top, means on the support for ejecting the can tops from the machine, and means for moving the table in intermittent steps to bring the can tops successively into registry with the said feeding, threading, laying and securing, sealing and anchoring, loop forming, and loop bending means.

32. The combination in a machine for placing ripping wires in can tops each having a wire-receiving groove, of a supporting structure, a table movable with respect to said support, means on the table for receiving can tops in spaced relation to each other, means on the support for piercing the can tops successively, means on the support for threading a wire through the perforation formed in each can top, means on the support for laying the wire in the groove of each can top, means on the support for securing the wire in the groove, means on the support for forming the portion of the wire extending through the can top into a loop, means on the support for bending the loop into a position substantially parallel to the body of the can top, means on the support for feeding the individual can tops to the receiving means on the table, means on the support for piercing the can tops, means on the support for threading a wire through the perforation in each can top, means on the support for laying the wire in the groove with its tail end adjacent said perforation, means on the support co-operating with the wire-laying means for displacing the metal forming one wall of said groove for holding the wire in the can top, means carried by the support for simultaneously sealing said perforation and anchoring the tail end of the wire in the can top, means on the support for forming the portion of the wire extending through the can top into a loop, means on the support for bending the loop into a position substantially parallel to the body of the can top, means on the support for ejecting the can tops from the machine, means for moving the table in intermittent steps to bring the can tops successively into registry with the said feeding, piercing, laying and holding, sealing and anchoring, loop forming, loop bending, and ejecting means, and means for locking the table against movement between the said intermittent steps thereof.

33. In a machine for assembling ripping wires in can tops in continuous cycle, the combination of a supporting structure, a plurality of operating stations positioned at spaced intervals around a common center located in said supporting structure, a table rotatably mounted in said supporting structure with its center of rotation in axial alignment with said common center, a series of can top receiving elements located around said table in spaced relation to each other, means for moving said table in intermittent steps whereby said can top receiving elements are carried progressively from station to station, a common drive shaft for said plurality of operating stations rotatably mounted in said supporting structure in axial alignment with said common center, and means at each station operable by said common drive shaft for performing various operations of the assembling cycle.

34. In a machine for assembling ripping
wires in can tops in continuous cycle, the combination of a supporting structure, a plurality of operating stations positioned at spaced intervals around a common center located in said supporting structure, a table rotatably mounted in said supporting structure with its center of rotation in axial alignment with said common center, a series of can top receiving elements located around said table in spaced relation to each other, means for moving said table in intermittent steps whereby said can top receiving elements are carried progressively from station to station, a common drive shaft for said plurality of operating stations rotatably mounted in said supporting structure in said axial alignment with said common center, means at each station operable by said common drive shaft for performing various operations of the assembling cycle, and means for locking said table against movement between the said intermittent steps thereof.

33. In a machine for assembling ripping wires in can tops in continuous cycle, the combination of a supporting structure, a plurality of operating stations positioned at spaced intervals around a common center located in said supporting structure, a table rotatably mounted in said supporting structure with its center of rotation in axial alignment with said common center, a series of can top receiving elements located around said table in spaced relation to each other, means for moving said table in intermittent steps whereby said can top receiving elements are carried progressively from station to station comprising an oscillating arm pivotally mounted in said supporting structure at said common center, said table being provided with a plurality of indentations arranged in a circle around said center, an operating detent on said oscillating arm adapted to enter certain of said indentations, a locking detent on said supporting structure adapted to enter certain of said indentations, means for oscillating said arm, means for operating said locking detent and means for synchronously withdrawing said operating detent from the occupied indentation and for permitting said locking detent to enter one of said indentations.

36. In a machine for assembling ripping wires in can tops in continuous cycle, the combination of a supporting structure, a plurality of operating stations positioned at spaced intervals around a common center located in said supporting structure, a table rotatably mounted in said supporting structure with its center of rotation in axial alignment with said common center, a series of can top receiving elements located around said table in spaced relation to each other, means for moving said table in intermittent steps whereby said can top receiving elements are carried progressively from station to station comprising an oscillating arm pivotally mounted in said supporting structure at said common center, said table being provided with a plurality of indentations arranged in a circle around said center, a pawl pivotally mounted on said oscillating arm adapted to enter certain of said indentations, a locking bolt adapted to enter certain others of said indentations, means for oscillating said arm, means for operating said locking bolt, means for synchronously withdrawing said pawl from the occupied indentation and permitting the said bolt to enter one of said indentations, and means for withholding said pawl from entering the indentations adapted to be entered by said locking bolt.

37. In a machine for assembling ripping wires in can tops in continuous cycle, the combination of a supporting structure, a plurality of operating stations positioned at spaced intervals around a common center located in said supporting structure, a table rotatably mounted in said supporting structure with its center of rotation in axial alignment with said common center, a series of can top receiving elements located around said table in spaced relation to each other, means for moving said table in intermittent steps whereby said can top receiving elements are carried progressively from station to station, means for locking said table against movement between the intermittent steps thereof, a common drive shaft for said plurality of operating stations, a common source of power for said machine, means for operatively connecting said common drive shaft said table moving means and said table locking means with said common source of power including a clutch, means for disengaging said clutch, and electrically operated means for controlling said clutch disengaging means.

38. In a machine for assembling ripping wires in can tops in continuous cycle, the combination of a supporting structure, a plurality of operating stations positioned at spaced intervals around a common center located in said supporting structure, a table rotatably mounted in said supporting structure with its center of rotation in axial alignment with said common center, a series of can top receiving elements located around said table in spaced relation to each other, means for moving said table in intermittent steps whereby said can top receiving elements are carried progressively from station to station, means for locking said table against movement between the intermittent steps thereof, a common drive shaft for said plurality of operating stations, a common source of power for said machine, means for operatively connecting said common drive shaft said table moving means and said table locking means with said common source of power including a clutch, means for disengaging said clutch, and electrically operated means for controlling said clutch disengaging means.
said clutch disengaging means, and manually operable means for re-engaging said clutch.

39. In a machine for assembling ripping wires in can tops in continuous cycle, the combination of a supporting structure, a plurality of operating stations positioned at spaced intervals around a common center located in said supporting structure, a table rotatably mounted in said supporting structure in axial alignment with said common center, a series of can tops receiving elements located around said table in spaced relation to each other, means for moving said table in intermittent steps whereby said can top receiving elements are carried progressively from station to station, means for locking said table against movement between the intermittent steps thereof, a common drive shaft for said plurality of operating stations, a common source of power for said machine, means for operationally connecting said common drive shaft to said table means and said table locking means with said common source of power including a manually operable clutch and a safety clutch, means for automatically disengaging said safety clutch when excessive load is applied to the machine, and means for holding said safety clutch in its disengaged condition until said safety clutch is manually set.

40. In a machine for placing a ripping wire in a can top, a chuck for holding the can top comprising a pair of relatively movable jaws each having a groove adapted to receive the peripheral edge of the can top, means for forcing one of the jaws toward the other of said jaws to grip the can top therebetween, and means for supporting the one jaw for sliding parallel motion with respect to the other jaw.

41. In a machine for placing a ripping wire in a can top, a chuck for holding the can top comprising a pair of relatively movable jaws each having a groove adapted to receive the peripheral edge of the can top, means for forcing one of the jaws toward the other of said jaws to grip the can top therebetween, means for separating the jaws to release the can top, and means for supporting the one jaw for sliding parallel motion with respect to the other jaw.

42. In a machine for placing a ripping wire in a can top, a chuck for holding the can top comprising a pair of relatively movable jaws, a shoulder formed on each jaw against which the can top is adapted to rest, each jaw having a groove adjacent the shoulder adapted to receive the peripheral edge of the can top, means for moving one of said jaws toward the other of said jaws for gripping the can top therebetween, and means for supporting the one jaw for sliding parallel motion with respect to the other jaw.

43. In a machine for placing a ripping wire in a can top, a chuck for holding the can top comprising a fixed jaw and a movable jaw, shoulders on the respective jaws in a common plane against which the can top rests, each jaw having a groove formed therein adjacent the supporting shoulder adapted to receive the peripheral edge of the can top, resilient means for forcing the movable jaw toward the fixed jaw for gripping the can top, and means for supporting the movable jaw for sliding parallel motion with respect to the fixed jaw.

44. In a machine for placing a ripping wire in a can top, a chuck for holding the can top comprising a fixed jaw and a movable jaw, shoulders formed on the respective jaws in a common plane on which the can top is adapted to rest, each jaw having a groove formed therein adjacent the supporting shoulder adapted to receive the peripheral edge of the can top, resilient means for forcing the movable jaw toward the fixed jaw to grip the can top, a cam for moving the movable jaw in the opposite direction to release the can top, and means for supporting the movable jaw for sliding parallel motion with respect to the fixed jaw.

45. In a machine for placing a ripping wire in a can top, the combination of a supporting structure, a table movably mounted on said support, a chuck for holding the can top comprising a fixed jaw secured to the table and a movable jaw slidably mounted on the table, each jaw having a groove formed therein and adapted to receive the peripheral edge of the can top, resilient means for moving the movable jaw toward the fixed jaw to grip the can top, a projection on the movable jaw, a cam on the support for engaging said projection to move the movable jaw in the opposite direction to release the can top, and means for moving the table relative to the support for effecting the operation of the movable jaw of the chuck.

46. In a machine for placing a ripping wire in a can top, the combination of a supporting structure, a table movably mounted on said support, a chuck for holding the can top comprising a fixed jaw secured to the table and a movable jaw slidably mounted on the table, each jaw having a groove formed therein and adapted to receive the peripheral edge of the can top, resilient means for moving the movable jaw toward the fixed jaw to grip the can top, means for piercing the can top, means for threading a wire through the piercing, wire gripping fingers carried by the table adjacent one side of the groove in the fixed jaw of the chuck, and means for operating the wire gripping fingers to grip the wire.

47. In a machine for placing a ripping wire in a can top, the combination of a supporting structure, a table movably mounted on said support, a chuck for holding the can top comprising a fixed jaw secured to the table...
and a movable jaw slidably mounted on the table, each jaw having a groove formed therein and adapted to receive the peripheral edge of the can top, resilient means for moving the movable jaw toward the fixed jaw to grip the can top, means for forcing the movable jaw to grip the can top, means for threading a wire through the piercing, wire gripping fingers carried by the table adjacent one side of the groove in the fixed jaw of the chuck, means for operating the wire gripping fingers to grip the wire, and means for locking the wire gripping fingers in their wire gripping position.

48. In a machine for placing a ripping wire in a can top, the combination of a supporting structure, a table movably mounted on said support, a chuck for holding the can top comprising a fixed jaw secured to the table and a movable jaw slidably mounted on the table, each jaw having a groove formed therein and adapted to receive the peripheral edge of the can top, resilient means for moving the movable jaw toward the fixed jaw to grip the can top, means for threading a wire through the piercing, wire gripping fingers carried by the table and located adjacent one side of the can top receiving groove of the fixed jaw of the chuck, levers pivoted to the table and operatively connected to the wire gripping fingers, means for separating the wire gripping fingers and means for closing the wire gripping fingers comprising an element adapted to be inserted between the opposite ends of the respective finger controlling levers.

49. In a machine for placing a ripping wire in a can top, the combination of a supporting structure, a table movably mounted on said support, a chuck for holding the can top comprising a fixed jaw secured to the table and a movable jaw slidably mounted on the table, each jaw having a groove formed therein and adapted to receive the peripheral edge of the can top, resilient means for moving the movable jaw toward the fixed jaw to grip the can top, means for forcing the movable jaw to grip the can top, means for threading a wire through the piercing, wire gripping fingers carried by the table and located adjacent one side of the can top receiving groove of the fixed jaw of the chuck, levers pivoted to the table and operatively connected to the wire gripping fingers, means for separating the wire gripping fingers and means for closing the wire gripping fingers comprising a pair of longitudinally slideable fingers, pivotally mounted operating levers each having one end operatively connected to one end of one of the wire gripping fingers, the opposite ends of said levers extending substantially parallel to each other, an operating block adapted to enter between the said parallel ends of said levers, said block being tapered at one end to spread the said ends of the lever, the said block having parallel edges beyond the taper to lock the levers in their spread relation.

50. In a machine for placing a ripping wire in a can top, the combination of a supporting structure, a table movably mounted on said support, a chuck for holding the can top comprising a fixed jaw secured to the table and a movable jaw slidably mounted on the table, each jaw having a groove formed therein and adapted to receive the peripheral edge of the can top, resilient means for moving the movable jaw toward the fixed jaw to grip the can top, means for piercing the can top, means for threading a wire through the piercing, wire gripping fingers carried by the table and located adjacent one side of the can top receiving groove of the fixed jaw of the chuck, levers pivoted to the table and operatively connected to the wire gripping fingers, means for separating the wire gripping fingers and means for closing the wire gripping fingers comprising an element adapted to be inserted between the opposite ends of the respective finger controlling levers, a cam rotatably mounted on the support for operating the wedge block to close the wire gripping fingers, a cam on the support for operating the wedge block to unlock the fingers, and means for moving the table relative to the support for effecting the wire finger opening operation.
wire in a can top the combination of means for holding the can top, means for piercing the can top, means for threading a wire through the piercing, means for gripping the wire adjacent the can top holding means comprising a pair of longitudinally slidable fingers, pivotally mounted operating levers each having one end operatively connected to one end of one of the wire gripping fingers, the opposite ends of said levers extending substantially parallel to each other, an operating block adapted to enter between the said parallel ends of said levers, said block being tapered at one end to spread the said ends of the lever, the said block having parallel edges beyond the taper to lock the levers in their spread relation, a cam for moving the operating block in one direction to lock the fingers, and a cam for moving the operating block in the opposite direction to unlock the fingers.

55. In a machine for placing ripping wires in can tops, the combination of a supporting structure, a table mounted for relative movement with respect to said supporting structure, a series of can top receiving chucks on said table, a magazine for said can tops carried by said supporting structure, and means for feeding individual can tops from the magazine to the respective chucks on said table.

56. In a machine for placing ripping wires in can tops, the combination of a supporting structure, a table mounted for relative movement with respect to said supporting structure, a series of can top receiving chucks on said table, a magazine for said can tops carried by said supporting structure, means for feeding individual can tops from the magazine to the respective chucks on said table comprising a plurality of rotatable feed screws having lead edges adapted to pass between the two lowermost can tops in the magazine and thereby direct the bottom can top into the grooves of said feed screws, and means for rotating the feed screws to deliver the selected can top to one of the chucks on the table.

57. In a machine for placing ripping wires in can tops, the combination of a supporting structure, a table mounted for relative movement with respect to said supporting structure, a series of can top receiving chucks on said table, a magazine for said can tops carried by said supporting structure, means for feeding individual can tops from the magazine to the respective chucks on said table comprising a plurality of rotatable feed screws having lead edges adapted to pass between the two lowermost can tops in the magazine and thereby direct the bottom can top into the grooves of said feed screws, means for rotating the feed screws to deliver the selected can top to one of the chucks on the table, and means for moving the table in intermittent steps to bring the chucks successively into alignment with the magazine.

58. In a machine for placing ripping wires in can tops, the combination of a supporting structure, a table mounted for relative movement with respect to said supporting structure, a series of can top receiving chucks on said table, a magazine for said can tops carried by said supporting structure, a plurality of rotatable elements spaced at definite intervals around said magazine, each rotatable element having a shoulder formed on its upper face on which the can tops in said magazine rest and a helical groove for engaging the peripheral edges of the can tops communicating at one end with said shoulder and at its opposite end with the lower face of said rotatable element which is located above said table, and means for synchronously rotating said elements whereby the lowermost can top in the magazine is separated from the other can tops therein and delivered by said helical grooves to a chuck on said table.

59. In a machine for placing ripping wires in can tops, the combination of a supporting structure, a table mounted for relative movement with respect to said supporting structure, a series of can top receiving chucks on said table, a magazine for said can tops carried by said supporting structure, a plurality of rotatable feeding elements spaced at definite intervals around said magazine, means for synchronously rotating said feeding elements whereby the lowermost can top in the magazine is separated from the other can tops therein and delivered to a chuck on said table, means for adjusting said feeding elements to accommodate can tops of various sizes, and means for guiding the feeding elements during adjustment to retain the definite relative spacing of said elements throughout the range of adjustment thereof.

60. In a machine for placing ripping wires in can tops, the combination of a supporting structure, a table mounted for relative movement with respect to said supporting structure, a series of can top receiving chucks on said table, a magazine for said can tops carried by said supporting structure, means for feeding individual can tops from the magazine to the respective chucks on said table, said magazine comprising a plurality of vertically extending rods located at definite spaced intervals around said magazine, one of said rods being rigidly secured in said supporting structure, and means for adjusting each of the other rods of said plurality of rods in definite paths relative to said fixed rod, whereby said magazine may be adapted to receive can tops of various sizes and the said definite relative spacing of said rods will be retained throughout the range of adjustment thereof.

61. In a machine for placing ripping wires in can tops, the combination of a supporting
structure, a table rotatably mounted on said support, a series of chucks adapted to receive the can tops each chuck comprising a jaw fixed to the table and a jaw movable on a line extending radially with respect to the center of the table, each jaw having a shoulder on which the can top is adapted to rest and an undercut groove adjacent the shoulder adapted to engage the peripheral edge of the can top, said jaws being separated in a plane extending at right angles to the radial line on which the one jaw is moved, and a shoe carried by said support and lying in the said right angle plane between the jaws, adapted to force the can top into said undercut grooves and against said shoulders when the table is moved relative to the shoe.

62. In a machine for placing ripping wires in can tops, the combination of a supporting structure, a table rotatably mounted on said support, a series of chucks adapted to receive the can tops each chuck comprising a jaw fixed to the table and a jaw movable on a line extending radially with respect to the center of the table, each jaw having a shoulder on which the can top is adapted to rest and an undercut groove adjacent the shoulder adapted to engage the peripheral edge of the can top, said jaws being separated in a plane extending at right angles to the radial line on which the one jaw is moved, a shoe carried by said support and lying in the said right angle plane between the jaws, adapted to force the can top into said undercut grooves and against said shoulders when the table is moved relative to the shoe, a link at each end of said shoe each link having one end pivoted to the shoe and the opposite end pivoted to the support, and a spring connected at one end to the shoe and at the opposite end to the support for forcing the shoe toward the table.

63. In a machine for placing ripping wires in can tops, the combination of a supporting structure, a table rotatably mounted on said support, a series of chucks adapted to receive the can tops each chuck comprising a jaw fixed to the table and a jaw movable on a line extending radially with respect to the center of the table, each jaw having a shoulder on which the can top is adapted to rest and an undercut groove adjacent the shoulder adapted to engage the peripheral edge of the can top, said jaws being separated in a plane extending at right angles to the radial line on which the one jaw is moved, a shoe carried by said support and lying in the said right angle plane between the jaws, adapted to force the can top into said undercut grooves and against said shoulders when the table is moved relative to the shoe, a link at each end of said shoe each link having one end pivoted to the shoe and the opposite end pivoted to the support, and a spring connected at one end to the shoe and at the opposite end to the support for forcing the shoe toward the table said shoe being flared away from the table at one end to permit the can tops to ride under the shoe.

64. In a machine for placing ripping wires in can tops, the combination of a supporting structure, a table mounted for relative movement with respect to said supporting structure, a series of chucks on said table adapted to respectively receive individual can tops, means on the supporting structure for piercing successively the can tops carried by said chucks, and means for moving said table to bring said chucks into successive registry with said piercing means.

65. In a machine for placing ripping wires in can tops, the combination of a cylindrical punch for piercing said can tops, and a lateral extension on said punch having side walls tangent to the cylindrical body of the punch and converging to a knife edge spaced laterally from the center of said punch.

66. In a machine for placing ripping wires in can tops, the combination of a punch for piercing said can tops comprising a substantially cylindrical body portion and a lateral extension having side walls tangent to said cylindrical body and converging to a knife edge spaced from and parallel to the axis of said body.

67. In a machine for placing ripping wires in can tops, the combination of a punch for piercing said can tops comprising a substantially cylindrical body portion pointed at one end and a lateral extension having side walls tangent to said cylindrical body and converging to a knife edge spaced from and parallel to the axis of said body, said lateral extension having a second knife edge adjacent the pointed end of said body having a knife edge extending perpendicular to said body portion.

68. In a machine for placing ripping wires in can tops, the combination of a punch for piercing said can tops comprising a substantially cylindrical body portion pointed at one end and a lateral extension having side walls tangent to said cylindrical body and converging to a knife edge spaced from and parallel to the axis of said body, said lateral extension having a second knife edge extending perpendicular to said body portion from the first said knife edge to the said body portion of the punch.

69. In a machine for placing ripping wires in can tops, the combination of a punch for piercing said can tops comprising a substantially cylindrical body portion pointed at one end and a lateral extension having side walls tangent to said cylindrical body and converging to a knife edge spaced from and parallel to the axis of said body, said lateral extension adjacent the pointed end of said body having a second knife edge extending perpendicular to said body portion from the first said knife edge to the said body portion of the punch.
first said knife edge to the said body portion, the second knife edge being spaced above the pointed end of said punch.

70. In a machine for placing ripping wires in can tops each having a groove for receiving a wire, the combination of a punch for piercing a can top in the bottom of said groove comprising a substantially cylindrical and pointed body portion having a lateral extension projecting in a direction longitudinally of the groove to be pierced, the side walls of said extension being tangent to said body portion and converging to a knife edge spaced apart from said body portion and located on a line extending longitudinally of the groove and passing through the center of the said cylindrical body portion of the punch.

71. In a machine for placing ripping wires in can tops the combination of a punch for piercing the can tops, a carrier for said punch means for adjusting the punch longitudinally of said carrier, an operating plunger adapted to receive said carrier, means for securing the carrier in the operating plunger, and means for reciprocating said operating plunger.

72. In a machine for placing a ripping wire in a can top, means for piercing the can top to receive the wire, and relatively fixed means disposed adjacent and out of contact with the can top for threading the wire through the piercing in the can top perpendicularly to the general plane of the body thereof.

73. In a machine for placing a ripping wire in a can top having been previously pierced to receive the wire, means for threading the wire through the piercing in the can top comprising a tube with which the piercing is adapted to be aligned, and means for feeding the wire through the tube and the piercing.

74. In a machine for placing a ripping wire in a can top having been previously pierced to receive the wire, means for threading a wire through the piercing in the can top comprising a longitudinally split tube with which the piercing is adapted to be aligned, means for retaining the tube in a closed condition, a pair of co-operating feeding wheels for feeding the wire through the tube and the piercing, means for gripping the wire adjacent the can top, means for shearing the measured length of wire from the supply, and means for opening the tube to release the wire.

75. In a machine for placing ripping wires in can tops having been previously pierced to receive said wires, means for threading a wire through the piercing in each of said can tops comprising a tube with which the piercing is adapted to be aligned, means for retaining the tube in a closed condition, a pair of co-operating feeding wheels for feeding the wire through the tube and the piercing, means for gripping the wire adjacent the can top, means for shearing the measured length of wire from said supply, and means for feeding the wire through said tube and said piercing.

76. In a machine for placing ripping wires in can tops having been previously pierced to receive said wires, means for threading a wire through the piercing in each of said can tops comprising a longitudinally split tube with which the piercing is adapted to be aligned, means for retaining the tube in a closed condition, means for drawing a predetermined length of wire from a supply thereof, means for feeding a predetermined length of wire through said tube and said piercing, means for shearing the measured length of wire from said supply, means for securing said length of wire in a definite position relative to said can top, and means for opening the tube to permit the wire to pass therefrom.

77. In a machine for placing ripping wires in can tops having been previously pierced to receive said wires, means for threading a wire through the piercing in each of said can tops comprising a longitudinally split tube with which the piercing is adapted to be aligned, means for retaining the tube in a closed condition, means for drawing a predetermined length of wire from a supply thereof, means for feeding a predetermined length of wire through said tube and said piercing, means for shearing the measured length of wire from said supply, means for adjusting the shearing means relative to the can top to govern the position of the ends of the wire with respect to the can top, means for securing said length of wire in a definite position relative to said can top, and means for opening the tube to permit the wire to pass therefrom.

78. In a machine for placing ripping wires in can tops having been previously pierced for the reception of the wires, means for threading a wire through the piercing in each can top comprising a longitudinally split tube with which the piercing is adapted to be aligned, means for retaining the tube in a closed condition, a pair of co-operating measuring wheels for drawing a predetermined length of wire from a supply reel, a pair of co-operating feeding wheels for feeding the wire through the tube and the piercing, means for gripping the wire adjacent the can top, means for shearing the measured length of wire from the supply, and means for opening the tube to release the wire.

79. In a machine for placing ripping wires in can tops having been previously pierced for the reception of the wires, means for threading a wire through the piercing in each can top comprising a longitudinally split tube with which the piercing is adapted to be aligned, means for retaining the tube in a closed condition, a pair of co-operating measuring wheels for drawing a predetermined length of wire from a supply reel, a pair of co-operating feeding wheels for feeding the wire through the tube and the piercing, means for driving said measuring and feeding wheels at substantially the same peripheral speeds, means for gripping the wire adjacent the can top, a rotary shear for cutting
the measured length of wire from the supply, and means for opening the tube to release the wire.

80. In a machine for placing ripping wires in can tops having been previously pierced for the reception of the wires, means for threading a wire through the piercing in each can top comprising a longitudinally split tube with which the piercing is adapted to be aligned, means for retaining the tube in a closed condition, a pair of co-operating measuring wheels for drawing a predetermined length of wire from a supply reel, a pair of co-operating feeding wheels for feeding the wire through the tube and the piercing, means for guiding the wire from the feed wheels to the tube, means for gripping the wire adjacent the can top, means for shearing the measured length of wire from the supply, and means for opening the tube to release the wire.

81. In a machine for placing ripping wires in can tops having been previously pierced for the reception of the wires, means for threading a wire through the piercing in each can top comprising a longitudinally split tube with which the piercing is adapted to be aligned, means for retaining the tube in a closed condition, a pair of co-operating measuring wheels for drawing a predetermined length of wire from a supply reel, means for cleaning the wire between the supply reel and the measuring wheels, a pair of co-operating feeding wheels for feeding the wire through the tube and the piercing, means for gripping the wire adjacent the can top, means for shearing the measured length of wire from the supply, and means for opening the tube to release the wire.

82. In a machine for placing ripping wires in can tops, means for threading a wire through a previously formed opening in a can top, and means independent of the threading means for cleaning the wire.

83. In a machine for placing ripping wires in can tops, means for threading a wire through a previously formed opening in a can top, and means for cleaning the wire comprising a body of fibrous material through which the wire passes.

84. In a machine for placing ripping wires in can tops having been previously pierced to receive the wire, means for threading a wire through the piercing in each can top comprising a longitudinally split tube with which the piercing is adapted to be aligned, means for supporting one portion of the tube in a fixed position, means for partially supporting the other portion of the tube, resilient means for retaining the tube in a closed condition, means for feeding a wire through the tube, means for shearing the wire adjacent one end of the tube comprising a fixed blade and a rotary blade, and means carried by the rotary blade adapted to engage the movable portion of the tube to open the tube to release the wire after the wire has been sheared.

85. In a machine for placing a ripping wire in a can top having been previously pierced to receive the wire, a longitudinally split tube with which the piercing is adapted to be aligned, said tube having a bore in the end adjacent the can top of a diameter substantially equal to the diameter of the wire to be inserted in the can top, and a bore at the opposite end substantially greater in diameter than the said wire to facilitate the entrance of the wire into the tube.

86. In a machine for placing a ripping wire in a can top having been previously pierced to receive the wire, a longitudinally split tube with which the piercing is adapted to be aligned, said tube having a bore in the end adjacent the can top of a diameter substantially equal to the diameter of the wire to be inserted in the can top, a bore at the opposite end substantially greater in diameter than the said wire to facilitate the entrance of the wire into the tube and a beveled face formed between the two bores to facilitate the entrance of the wire into the smaller bore.

87. In a machine for placing ripping wires in can tops each having a groove for receiving a wire, the combination of means adapted for movement relative to the can top and the wire for guiding the wire into the groove and means for securing the wire in the groove.

88. In a machine for placing ripping wires in can tops each having a groove for receiving a wire, the combination of means adapted for movement relative to the can top and the wire for guiding a wire into the groove, means movable with the guiding means for forcing the wire into the base of the groove, and means for securing the wire in the groove.

89. In a machine for placing ripping wires in can tops each having a groove for receiving a wire, the combination of means for holding one end of the wire in fixed relation to the can top, means movable relative to the can top and the wire for laying the wire in the groove, and means for effecting relative movement between the can top and the wire laying means to effect the wire laying operation.

90. In a machine for placing ripping wires in can tops each having a groove for receiving a wire, the combination of means for laying the wire in the groove comprising a shoe having a throat at its forward end for guiding the wire into the groove and a rib at its rear end adapted to ride in the groove for forcing the wire into the bottom of said groove, and means for effecting relative movement between the shoe and the can top to lay the wire.

91. In a machine for placing ripping wires in can tops each having a groove for receiving a wire, the combination of a rotatably.
mounted shaft with which the can top is adapted to be axially aligned, a head on said shaft adjacent the can top, a shoe for laying the wire in the groove, a carrier for said shoe slidably mounted in said head, and means for adjusting said carrier radially with respect to said head.

92. In a machine for placing ripping wires in can tops each having a groove for receiving a wire, the combination of a rotatably mounted shaft with which the can top is adapted to be axially aligned, a head on the shaft adjacent the can top, a shoe for laying the wire in the groove, and means for resiliently supporting said shoe in said head.

93. In a machine for placing ripping wires in can tops each having a groove for receiving a wire, the combination of a rotatably mounted shaft with which the can top is adapted to be axially aligned, a head on the shaft adjacent the can top, a shoe for laying the wire in the groove, means for resiliently supporting said shoe in said head, means for rotating said shaft to effect the wire laying operation by the shoe, and means for raising and lowering the head and the shoe relative to the can top.

94. In a machine for placing ripping wires in can tops each having a groove for receiving the wire, the combination of a supporting structure, a movable table, checks on the table for holding the can tops, means on the table for rigidly holding one end of the wire, a shaft with which a can top is adapted to be axially aligned, a shoe carried by the shaft for laying the wire in the groove, a frame carried by the support, a sleeve rotatably mounted in the frame axially aligned with and splined to the said shaft, means on the frame for raising and lowering the shaft and the shoe, means on the frame for rotating said sleeve and said shaft, and means for permitting adjustment of the frame relative to the support and the table, for permitting axial alignment of the shaft with can tops of various sizes.

95. In a machine for placing ripping wires in can tops each having a groove for receiving the wire, the combination of a supporting structure, a movable table, checks on the table for holding the can tops, means on the table for rigidly holding one end of the wire, a shaft with which a can top is adapted to be axially aligned, a shoe carried by the shaft for laying the wire in the groove, a frame carried by the support, a sleeve rotatably mounted in the frame axially aligned with and splined to the said shaft, means for raising and lowering the shaft and the shoe, means on the frame for rotating said sleeve and said shaft, and means for permitting adjustment of the frame relative to the support and the table, for permitting axial alignment of the shaft with can tops of various sizes, a drive shaft carried by the frame, and means on the support for rotating the drive shaft irrespective of the adjustment of the frame.

96. In a machine for placing ripping wires in can tops each having a groove for receiving the wire, the combination of a supporting structure, a movable table, checks on the table for holding the can tops, means on the table for rigidly holding one end of the wire, a shaft with which a can top is adapted to be axially aligned, a shoe carried by the shaft for laying the wire in the groove, a frame carried by the support, a sleeve rotatably mounted in the frame axially aligned with and splined to the said shaft, means on the frame for raising and lowering the shaft and the shoe, means on the frame for rotating said sleeve and said shaft, means for permitting adjustment of the frame relative to the support and the table, for permitting axial alignment of the shaft with can tops of various sizes, a drive shaft carried by the frame, and means on the support for rotating the drive shaft irrespective of the adjustment of the frame comprising a gear rotatably mounted on the support in axial alignment with the said drive shaft and splined to said drive shaft.

97. In a machine for placing ripping wires in can tops each having a groove for receiving a wire and a wire disposed in a predetermined position relative to the groove, the combination of means for holding one end of the wire in fixed relation to the can top, means for laying the wire in the groove, and means for displacing the metal of the can top immediately adjacent the groove for securing the wire in the groove.

98. In a machine for placing ripping wires in can tops each having a groove for receiving a wire and a wire disposed in a predetermined position relative to the groove, the combination of means for holding one end of the wire in fixed relation to the can top, means for laying the wire in the groove comprising a roller adapted to engage the metal forming one wall of said groove, means for advancing said roller toward the wire, and means for effecting relative movement between the roller and the can top whereby the metal of the groove wall is displaced with respect to the wire for securing the wire in the groove.

99. In a machine for placing ripping wires in can tops each having a groove for receiving a wire and a wire disposed in a predetermined position relative to the groove, the combination of means for holding one end of the wire in fixed relation to the can top, means for laying the wire in the groove, means for securing the wire in the groove comprising a roller having a relatively sharp peripheral edge adapted to engage the metal forming one wall of said groove be-
between the wire and the body of the can top, means for advancing said roller toward the wire, and means for effecting relative movement between the roller and the can top whereby the metal of the groove wall is displaced with respect to the wire for securing the wire in the groove.

100. In a machine for placing ripping wires in can tops each having a wire-receiving groove and a wire positioned in the groove, the combination of a roller adapted to engage the metal forming one wall of the groove for folding said metal around the wire placed in the groove, a carrier for said roller, a rotatable support for said carrier axially aligned with said can top, and means for moving said carrier radially with respect to said support for effecting engagement of the roller with the wall of the groove.

101. In a machine for placing ripping wires in can tops each having a wire-receiving groove and a wire positioned in the groove, the combination of a roller adapted to engage the metal forming one wall of the groove for folding said metal around the wire placed in the groove, a carrier for said roller, a rotatable support for said carrier axially aligned with said can top, means for moving said carrier radially with respect to said support for effecting engagement of the roller with the wall of the groove, and means for rotating the support.

102. In a machine for placing ripping wires in can tops each having a wire-receiving groove and a wire positioned in the groove, the combination of a roller adapted to engage the metal forming one wall of the groove for folding said metal around the wire placed in the groove, a carrier for said roller, a rotatable support for said carrier axially aligned with said can top, a radially extending inclined guideway for the carrier formed on the rotary support, means for moving said carrier along said inclined guideway for effecting engagement of the roller with the wall of the groove, and means for rotating the support.

103. In a machine for placing ripping wires in can tops each having a wire-receiving groove and a wire positioned in the groove, the combination of a roller adapted to engage the metal forming one wall of the groove for folding said metal around the wire placed in the groove, a carrier for said roller, a rotatable support for said carrier axially aligned with said can top, a radially extending inclined guideway for the carrier formed on the rotary support, means for moving said carrier along said inclined guideway for effecting engagement of the roller with the wall of the groove, means for rotating the support, and means for raising and lowering the rotary support relative to the can top.

104. In a machine for placing ripping wires in can tops each having a wire-receiving groove and a wire positioned in the groove, the combination of a roller adapted to engage the metal forming one wall of the groove for folding the said metal around the wire placed in the groove, a carrier for said roller, a rotary support for said carrier axially aligned with the can top, said carrier having an opening disposed at an angle relative to the longitudinal center of said rotary support, a shaft axially aligned with said rotary support, a projection on said shaft extending at an angle with respect to the longitudinal center of the shaft and located in the angularly disposed opening in the carrier, means for moving the shaft longitudinally for effecting radial movement of the roller relative to the center of rotation of the rotary support, and means for rotating the support.

105. In a machine for placing ripping wires in can tops each having a wire-receiving groove and a wire positioned in the groove, the combination of a roller adapted to engage the metal forming one wall of the groove for folding the said metal around the wire placed in the groove, a carrier for said roller, a rotary support for said carrier axially aligned with the can top, said carrier having an opening disposed at an angle relative to the longitudinal center of said rotary support, a shaft axially aligned with said rotary support, a projection on said shaft extending at an angle with respect to the longitudinal center of the shaft and located in the angularly disposed opening in the carrier, means for moving the shaft longitudinally for effecting radial movement of the roller relative to the center of rotation of the rotary support, and means for rotating the support.

106. In a machine for placing ripping wires in can tops each having a wire-receiving groove and a wire positioned in the groove, the combination of a roller adapted to engage the metal forming one wall of the groove for folding the said metal around the wire placed in the groove, a carrier for said roller, a rotatable support for said carrier axially aligned with said can top, means for moving said carrier radially with respect to the can top, and means for moving the shaft longitudinally with the rotary support and relative thereto for effecting radial movement of the roller relative to the rotary support as the said support is being moved longitudinally relative to the can top, and means for rotating the support.

107. In a machine for placing ripping wires in can tops each having a wire-receiving groove and a wire positioned in the groove, the combination of a roller adapted to engage the metal forming one wall of the groove for folding said metal around the wire placed in the groove, a carrier for said roller, a rotatable support for said carrier axially aligned with the said can top, means for moving said carrier radially with respect to said support for effecting engagement of the roller with the wall of the groove, said carrier being made in two parts slidably connected one with the other, and means for adjusting the said parts with respect to each other, whereby the roller may be adjusted relative to the center of rotation of the rotary support for use with can tops of various sizes.

108. In a machine for placing ripping wires in can tops each having a wire-receiving groove and a wire positioned in the groove, the combination of a roller adapted to engage the metal forming one wall of the groove for folding the said metal around the wire placed in the groove, a carrier for said roller, a rotatable support for said carrier axially aligned with said can top, means for moving said carrier radially with respect to said support for effecting engagement of the roller with the wall of the groove, said carrier being made in two parts slidably connected one with the other, and means for adjusting the said parts with respect to each other, whereby the roller may be adjusted relative to the center of rotation of the rotary support for use with can tops of various sizes.
wire placed in the groove, a carrier for the roller, a rotary support on which the carrier is mounted, a shaft axially aligned with said rotary support operatively connected to said carrier and splined to said rotary support, means for moving the shaft longitudinally relative to the rotary support for moving the carrier and the roller radially with respect to the rotary support, and means for rotating the shaft whereby the rotary support and the roller are rotated relative to the can top.

108. In a machine for placing ripping wires in can tops each having a wire-receiving groove, the combination of a shoe operable above the can top for guiding the wire into said groove and for forcing the wire into the bottom of the groove, a roller operable below said can top and adapted to engage the metal forming one wall of said groove for displacing said metal relative to the wire whereby the wire is secured in the groove, and means for synchronously moving the wire laying shoe and metal displacing roller in a definite relation to each other longitudinally of the groove, whereby the wire is laid and secured in the groove in one operation.

109. In a machine for placing ripping wires in can tops each having a wire-receiving groove, the combination of a rigid supporting structure, a table on said rigid support, means for holding the can tops, a shoe carried by the supporting structure and operable above one of the can tops for guiding the wire into said groove and for forcing the wire into the bottom of the groove, a roller carried by the supporting structure and operable below said can top and adapted to engage the metal forming one wall of said groove for displacing said metal relative to the wire whereby the wire is secured in the groove, a rotary support for said shoe axially aligned with the can top, a rotary support for the roller axially aligned with the can top, a bracket secured to the rigid support for rotatably supporting said rotary supports in axial alignment with each other and the can top, means for synchronously moving the wire laying shoe and metal displacing roller in a fixed relation to each other longitudinally of the groove, whereby the wire is laid and secured in the groove in one operation, means carried by the bracket for raising and lowering said shoe relative to the can top, means carried by the bracket for raising and lowering the metal displacing roller relative to the can top, and means for adjusting the bracket relative to the rigid support and the table to align the said rotary supports with can tops of various sizes.

110. In a machine for placing ripping wires in can tops, the combination of means for applying a ripping wire in a can top with one end of said wire projecting substantially perpendicular to the plane of the can top, and means for bending the said projecting end of the wire into the form of a loop.

111. In a machine for placing ripping wires in can tops, the combination of a mandrel adapted to be engaged by a wire projecting from a can top, a bending element adapted to engage the side of the wire opposite to that engaged by the mandrel, and means for moving the bending element in a path concentric with the mandrel whereby the wire is bent around the mandrel into the form of a loop.

112. In a machine for placing ripping wires in can tops, the combination of a mandrel adapted to be engaged by a wire projecting from a can top, a bending element adapted to engage the side of the wire opposite to that engaged by the mandrel, means for moving the bending element in a path concentric with the mandrel whereby the wire is bent around the mandrel into the form of a loop, and means for gripping the free end of the wire adjacent the can top to hold the wire in the loop form.

113. In a machine for placing ripping wires in can tops, the combination of a mandrel adapted to engage one side of a wire projecting from a can top, a head on said mandrel, a projection on said head adapted to engage the opposite side of said wire, and means for moving said projection in a path concentric with said mandrel whereby the wire is bent around said mandrel into the form of a loop.

114. In a machine for placing ripping wires in can tops, the combination of a mandrel adapted to engage one side of a wire projecting from a can top, a head on said mandrel, a projection on said head adapted to engage the opposite side of said wire, means for moving said projection in a path concentric with said mandrel whereby the wire is bent around said mandrel into the form of a loop, and means for gripping the body and the free end of the wire adjacent the can top to maintain the wire in loop form.

115. In a machine for placing ripping wires in can tops, the combination of a mandrel adapted to engage one side of a wire projecting from a can top, a head on said mandrel, a projection on said head adapted to engage the opposite side of said wire, means for rotating said projection around said mandrel whereby the wire is bent around said mandrel into the form of a loop, and means for moving said head longitudinally of said mandrel for stripping the loop from the mandrel.

116. In a machine for placing ripping wires in can tops, the combination of a frame, a mandrel rotatably mounted in the frame and adapted to engage one side of a wire projecting from a can top, a head on said
mandrel, a projection on the head adapted to engage the opposite side of said wire, a fixed head on said frame in axial alignment with said mandrel having a cavity to receive the end of the mandrel and a groove concentric to the axis of the mandrel to receive said projection, means for rotating the mandrel to form the wire into a loop, means for moving the mandrel longitudinally relative to the cavity in the fixed head carried by the frame, and means for moving the head on the mandrel longitudinally of the mandrel to strip the formed loop therefrom.

117. In a machine for placing ripping wires in can tops, the combination of a frame, a mandrel rotatably mounted in the frame and adapted to engage one side of a wire projecting from a can top, a head on said mandrel, a projection on the head adapted to engage the opposite side of said wire, a fixed head on said frame in axial alignment with said mandrel having a cavity to receive the end of the mandrel and a groove concentric to the axis of the mandrel to receive said projection, means for rotating the mandrel to form the wire into a loop, means for moving the mandrel longitudinally relative to the cavity in the fixed head carried by the frame, means for moving the head on the mandrel longitudinally of the mandrel to strip the formed loop therefrom, and means for moving the frame toward and away from the can top.

118. In a machine for placing ripping wires in can tops, the combination of a mandrel adapted to engage one side of a wire projecting from a can top, a head on said mandrel, a projection on said head adapted to engage the opposite side of said wire, means for rotating said projection around said mandrel whereby the wire is bent around said mandrel into the form of a loop, means for holding the free end of the wire in a fixed relation to the body of the wire adjacent the can top, and means for twisting the free end of the wire with the body thereof, to complete the loop.

119. In a machine for placing ripping wires in can tops, the combination of a mandrel adapted to engage one side of a wire projecting from a can top, a head on said mandrel, a projection on said head adapted to engage the opposite side of said wire, means for rotating said projection in a path concentric with said mandrel whereby the wire is bent around said mandrel into the form of a loop, means for holding the free end of the wire in a fixed relation to the body of the wire adjacent the can top, means for stripping the loop from the mandrel, and means for twisting the free end of the wire with the body thereof for completing the loop.

120. In a machine for placing ripping wires in can tops, the combination of a mandrel adapted to engage one side of a wire projecting from a can top, a head on said mandrel, a projection on said head adapted to engage the opposite side of said wire, means for rotating said projection in a path concentric with said mandrel whereby the wire is bent around said mandrel into the form of a loop, means for holding the free end of the wire in a fixed relation to the body of the wire adjacent the can top, means for stripping the loop from the mandrel, means for twisting the free end of the wire with the body thereof for completing the loop, and means for releasing the wire-gripping means after the loop has been twisted.

121. In a machine for placing ripping wires in can tops, the combination of means for applying a ripping wire in a can top with one end of said wire projecting substantially perpendicular to the plane of the can top, means for bending the said projecting end of the wire into the form of a loop, and means for twisting the loop.

122. In a machine for placing ripping wires in can tops, the combination in means for twisting a wire loop of a pair of jaws adapted to receive and rigidly hold one portion of the loop thereafter, a second pair of jaws adapted to grip another portion of the loop, and means for rotating the last said pair of jaws relative to the first said pair of jaws to twist the loop.

123. In a machine for placing ripping wires in can tops, the combination in means for twisting a wire loop of a pair of jaws adapted to receive and rigidly hold one portion of the loop thereafter, a second pair of jaws adapted to grip another portion of the loop, means for guiding the last said portion of loop between the last said pair of jaws, and means for rotating the jaws to twist the loop.

124. In a machine for placing ripping wires in can tops, the combination in means for twisting a wire loop of a pair of jaws adapted to receive and rigidly hold one portion of the loop thereafter, a second pair of jaws adapted to grip another portion of the loop, means for guiding the loop between the jaws, means for rotating the last said pair of jaws relative to the first said pair of jaws to twist the loop, and means for moving the last said pair of jaws into and out of their loop-receiving position.

125. In a machine for placing ripping wires in can tops, the combination in means for twisting a wire loop of a pair of jaws adapted to receive a loop thereafter, means for rotating the jaws to twist the loop, and means for moving the jaws longitudinally of the loop as the loop is being twisted.

126. In a machine for placing ripping wires in can tops, the combination in means for twisting a wire loop of a pair of jaws adapted to receive and rigidly hold one portion of the loop thereafter, a second pair
of jaws adapted to grip another portion of the loop, means for rotating the last said pair of jaws relative to the first said pair of jaws to twist the loop, means for closing the jaws on the loop, and means for opening the jaws to release the loop.

127. In a machine for placing ripping wires in can tops, the combination in means for twisting a wire loop of a pair of jaws adapted to receive a loop therebetween, means for rotating the jaws to twist the loop, and means carried by one of said jaws adapted to enter the loop to retain an opening in the loop while the loop is being twisted.

128. In a machine for placing ripping wires in can tops, means for piercing the can top and means for threading a wire through said opening, and means for hermetically sealing the opening around the wire.

129. In a machine for placing ripping wires in can tops each having a piercing and a wire threaded through said piercing, means for hermetically sealing the opening around the wire comprising means for feeding a predetermined amount of solder to a point adjacent the piercing in said can top, and means for causing said solder to flow over the portion of the can top immediately adjacent the piercing and into the piercing around the wire.

130. In a machine for placing ripping wires in can tops each having a piercing and a wire threaded through said piercing, means for hermetically sealing the opening around the wire comprising means for pre-heating the can top around the piercing, means for feeding a predetermined amount of solder to a point adjacent the pre-heated portion of the can top, and means for causing the solder to flow over the pre-heated portion of the can top and into the piercing around the wire.

131. In a machine for placing ripping wires in can tops each having a piercing and a wire threaded through said piercing, means for hermetically sealing the opening around the wire comprising means for pre-heating the can top around the piercing, means for feeding a predetermined amount of solder to a point adjacent the pre-heated portion of the can top, means for causing the solder to flow over the pre-heated portion of the can top and into the piercing around the wire, and means for chilling the solder after the seal has been formed.

132. In a machine for placing ripping wires in can tops each having a piercing and a wire threaded through said piercing, the combination of means for holding a can top in a predetermined position, means for hermetically sealing the opening around the wire comprising a frame movable in a plane substantially perpendicular to the can top and to said holding means, a pair of co-operating feed wheels rotatably mounted in said frame and adapted to receive a strip of solder wire therebetween, means for intermittently rotating said feed wheels to advance the solder wire, means for moving the frame relative to the can top to apply the solder thereto, and means for projecting a flame adjacent the solder to cause the same to flow into the piercing.

133. In a machine for placing ripping wires in can tops each having a piercing and a wire threaded through said piercing, the combination of means for holding a can top in a predetermined position, means for hermetically sealing the opening around the wire comprising a frame movable in a plane substantially perpendicular to the can top and to said holding means, a pair of co-operating feed wheels rotatably mounted in said frame and adapted to receive a strip of solder wire therebetween, means for intermittently rotating said feed wheels to advance the solder wire, means for moving the frame relative to the can top to apply the solder thereto, and means for projecting a flame adjacent the solder to cause the same to flow into the piercing, and means for applying a cooling medium to the can top for chilling the solder after the seal has been formed.

134. In a machine for placing ripping wires in can tops each having a piercing and a wire threaded through said piercing, the combination of means for holding a can top in a predetermined position, means for hermetically sealing the opening around the wire comprising a frame movable in a plane substantially perpendicular to the can top and to said holding means, a pair of co-operating feed wheels rotatably mounted in said frame and adapted to receive a strip of solder wire therebetween, means for intermittently rotating said feed wheels to advance the solder wire, means for moving the frame relative to the can top to apply the solder thereto, means for projecting a flame adjacent the solder to cause the same to flow into the piercing, and means for applying a cooling medium to the can top for chilling the solder after the seal has been formed.

135. In a machine for placing ripping wires in can tops each having a piercing and a wire threaded through the piercing, the combination of a supporting structure, means for holding a can top in a fixed position on the support, a frame carried by the support and movable in a plane substantially perpendicular to the can top, a pair of co-operating feed wheels rotatably mounted in the frame and adapted to receive a strip of solder wire therebetween, means carried by the frame and adapted to engage the support to rotate the feed wheels to advance the solder when the frame is moved in one direction relative to the can top, means for preventing a backward movement of the solder when the frame moves in the opposite direction to apply the solder to the can top, and means for moving the frame in said plane relative to said can top.

136. In a machine for placing ripping wires in can tops each having a piercing and a wire threaded through the piercing, the
combination of a supporting structure, means for holding a can top in a fixed position on the support, a frame carried by the support and movable in a plane substantially perpendicular to the can top, a pair of co-operating feed wheels rotatably mounted in the frame and adapted to receive a strip of solder wire therebetween, means carried by the frame and adapted to engage the support to rotate the feed wheels to advance the solder when the frame is moved in one direction relative to the can top, means for preventing a backward movement of the solder when the frame moves in the opposite direction to apply the solder to the can top, means for moving the frame in said plane relative to said can top, and means for projecting a flame adjacent the solder to cause the solder to flow as the frame moves toward the can top.

In a machine for placing ripping wires in can tops each having a piercing and a wire threaded through the piercing, the combination of a supporting structure, means for holding a can top in a fixed position on the support, a frame carried by the support and movable in a plane substantially perpendicular to the can top, a pair of co-operating feed wheels rotatably mounted in the frame and adapted to receive a strip of solder wire therebetween, means carried by the frame and adapted to engage the support to rotate the feed wheels to advance the solder when the frame is moved in one direction relative to the can top, means for preventing a backward movement of the solder when the frame moves in the opposite direction to apply the solder to the can top, means for moving the frame in said plane relative to said can top, and means for projecting a flame adjacent the solder to cause the solder to flow as the frame moves toward the can top, means for projecting a flame against the can top to heat the same to facilitate the fluxing of the solder with the can top, and means for projecting a stream of cooling medium against the can top to chill the solder after the seal is formed.

In a machine for placing ripping wires in can tops, one end of the wire being formed into a loop projecting substantially perpendicular to the general plane of the can top, the combination of means for holding the can top in a predetermined position, means for bending the loop into a plane substantially parallel to the plane of the can top comprising an element adapted to be moved in a plane substantially parallel to the can top and relative to the said holding means, and adapted to deflect the loop into a position disposed at an angle relative to the plane of the can top, and an element movable in a plane substantially perpendicular to the plane of the said top and relative to the said holding means and adapted to engage the deflected loop and bend it into said plane substantially parallel to the can top.

In a machine for placing ripping wires in can tops, one end of the wire being formed into a loop projecting substantially perpendicular to the general plane of the can top, the combination of means for holding the can top in a predetermined position, means for bending the loop into a plane substantially parallel to the plane of the can top comprising a hook movable with respect to the holding means and adapted to slide in a plane substantially parallel to the can top adapted to deflect the loop into a position disposed at an angle relative to the plane of the can top, a plunger movable with respect to the holding means and adapted to slide in a plane substantially perpendicular to the plane of the can top adapted to engage the deflected loop and to bend the same into said plane substantially parallel to the can top.

In a machine for placing ripping wires in can tops, one end of the wire being formed into a loop projecting substantially perpendicular to the general plane of the can top, the combination of means for holding the can top in a predetermined position, means for bending the loop into a plane substantially parallel to the plane of the can top comprising a hook movable relative to the holding means and adapted to slide in a plane substantially parallel to the can top adapted to deflect the loop into a position disposed at an angle relative to the plane of the can top, a plunger movable with respect to the holding means and adapted to slide in a plane substantially perpendicular to the plane of the can top adapted to engage the deflected loop and to bend the same into said plane substantially parallel to the can top, a frame for slidably supporting said hook and said plunger, a shaft rotatably mounted in said frame,
and cams on said shaft for operating said hook and said plunger.

142. In a machine for placing ripping wires in can tops, one end of the wire being formed into a loop projecting substantially perpendicular to the general plane of the can top, means for bending the loop into a plane substantially parallel to the plane of the can top comprising a frame, a hook slidably mounted in said frame and adapted to deflect the loop into a position disposed at an angle relative to the can top, a slide on said frame, a plunger carried by said slide and adapted to engage the deflected loop and bend it into a plane substantially parallel to the can top, and means for resiliently supporting said plunger in said slide.

143. In a machine for placing ripping wires in can tops, one end of the wire being formed into a loop projecting substantially perpendicular to the general plane of the can top, means for bending the loop into a plane substantially parallel to the plane of the can top comprising a frame, a hook slidably mounted in said frame and adapted to deflect the loop into a position disposed at an angle relative to the can top, a slide on said frame, a plunger carried by said slide and adapted to engage the deflected loop and bend it into a plane substantially parallel to the can top, a gear rack carried by said frame, a gear rack carried by said slide, a pinion intermediate and engaging said gear racks, a lever pivoted to said frame, a link operatively connected at one end to said lever and operatively connected at its opposite end to said pinion, a shaft rotatably mounted in said frame, a cam on said shaft for rocking said lever on its pivot, and a second cam on said shaft for sliding said hook on said frame.

146. In a machine for placing ripping wires in can tops, the combination of a supporting structure, a table carried by said support, chucks on the table for holding the can tops, means for moving the table in intermittent steps, means for successively opening the chucks to release the can tops as they approach a predetermined point located on said support, means at said predetermined point for ejecting the can top from the chuck located at said predetermined point, electromagnetic means for taking said can top from said ejecting means, and means for operating said electro-magnetic means for carrying said can top away from said chuck and depositing it in a position adjacent the support.

147. In a machine for placing ripping wires in can tops, the combination of a supporting structure, a table carried by said support, chucks on the table for holding the can tops, means for moving the table in intermittent steps, means for successively opening the chucks to release the can tops as they approach a predetermined point located on said support, means at said predetermined point for ejecting the can top from the chuck located at said predetermined point, an electro-magnet for taking said can top from said ejecting means, means for supplying electric energy to said magnet at predetermined intervals, a lever pivoted in said support for movement in a horizontal plane and for movement in a vertical plane, said electro-magnet being supported at the free end of said lever, means for swinging said lever in said horizontal plane, and means for simultaneously swinging said lever in said vertical plane to carry said can top away from said chuck and deposit it in a position adjacent the support.

148. In a machine for placing ripping wires in can tops, gas jets for heating the can tops and the solder used in sealing the can top at a point where the rippling wire passes therethrough, valves for controlling the flow of gas to said jets, a lever for controlling the operation of the entire machine, and means connecting said control lever with said gas.
valves whereby the flow of gas to said jets is interrupted when said lever is operated to stop the machine.

149. In a machine for placing ripping wires in can tops, gas jets for heating the can tops and the solder used in sealing the can top at a point where the ripping wire passes therethrough, valves for controlling the flow of gas to said jets, a lever for controlling the operation of the entire machine, means connecting said control lever with said gas valves whereby the flow of gas to said jets is interrupted when said lever is operated to stop the machine, and continuously burning pilot lights for re-lighting said jets when the flow of gas is renewed by the operation of said lever to start the machine.

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