

Sept. 10, 1935.

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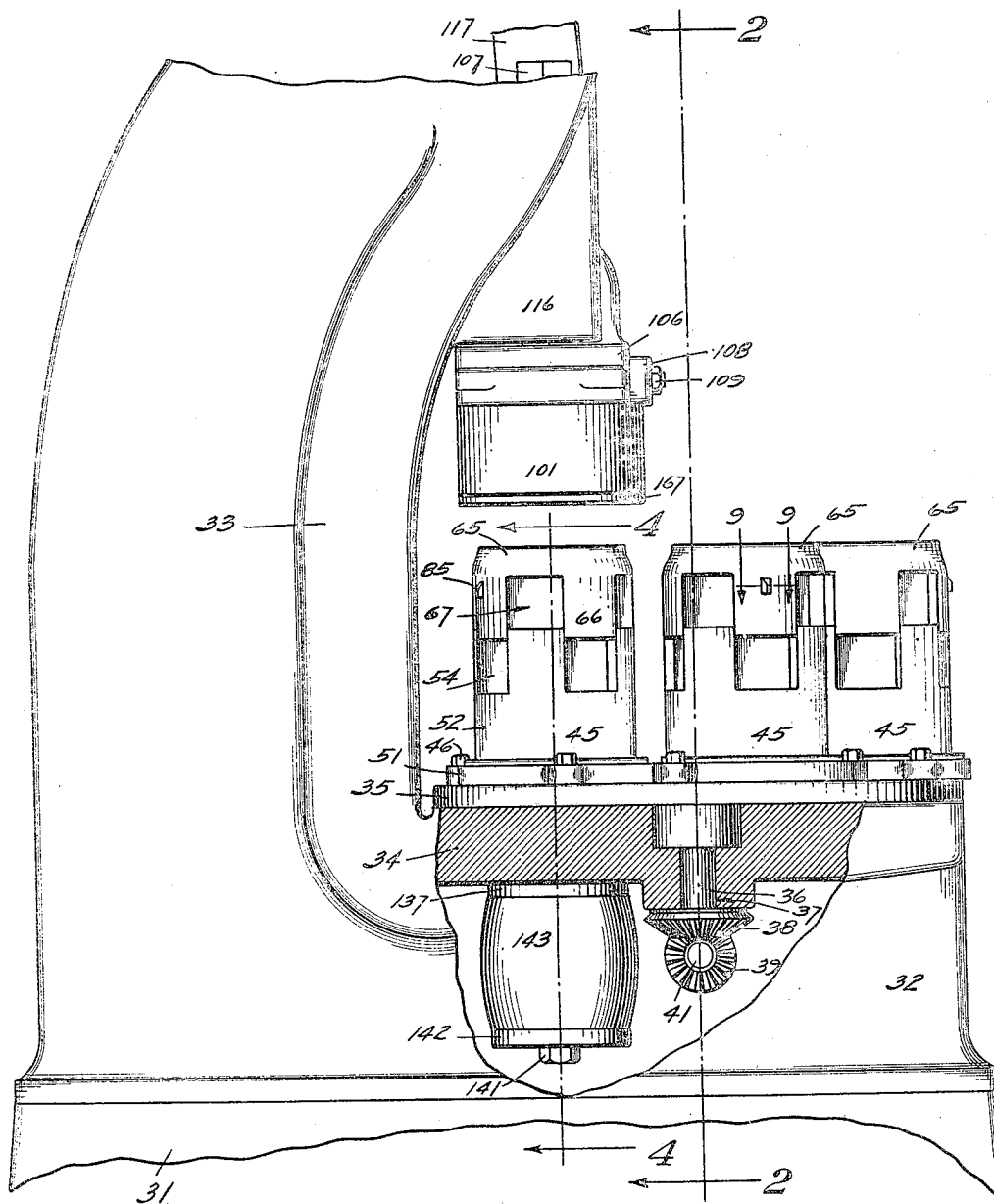
2,013,654

APPARATUS FOR NECKING-IN AND FLANGING TUBULAR BODIES

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6 Sheets-Sheet 1

Fig. 1



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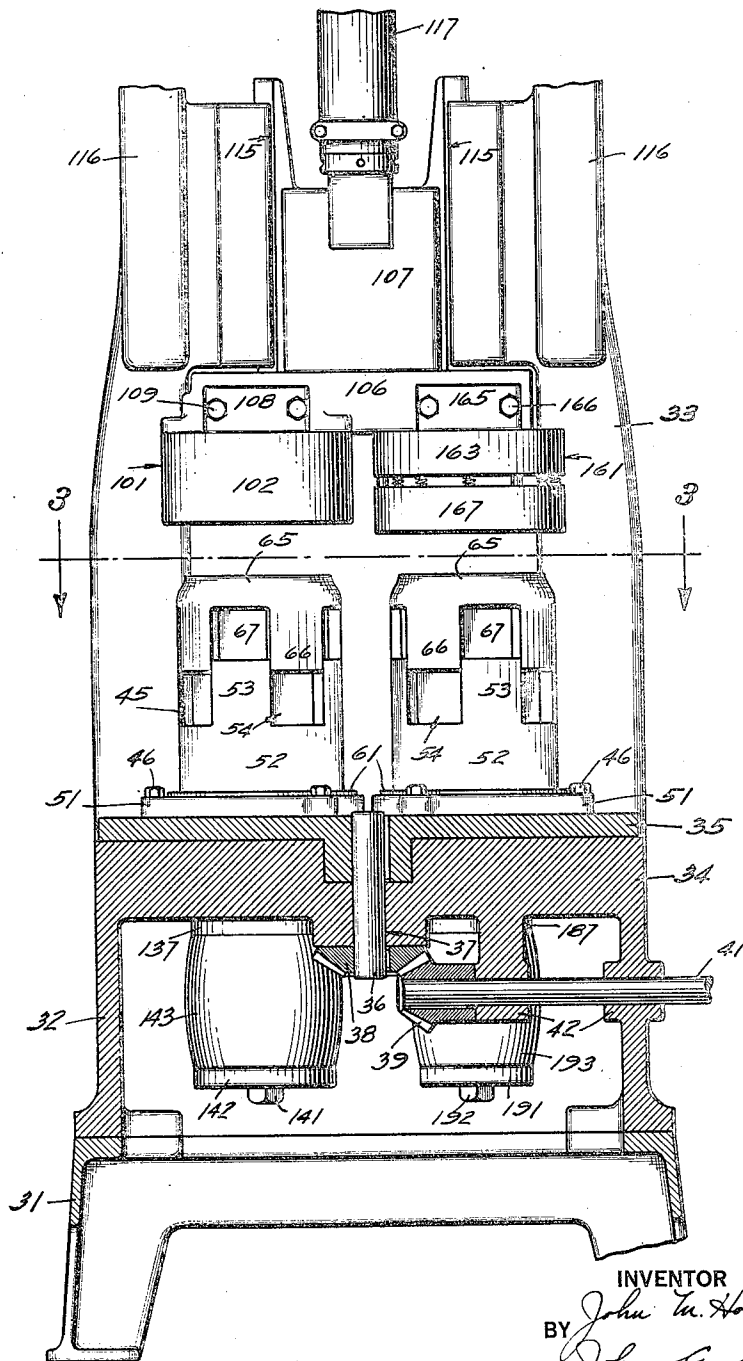
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Fig. 2



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Fig. 3

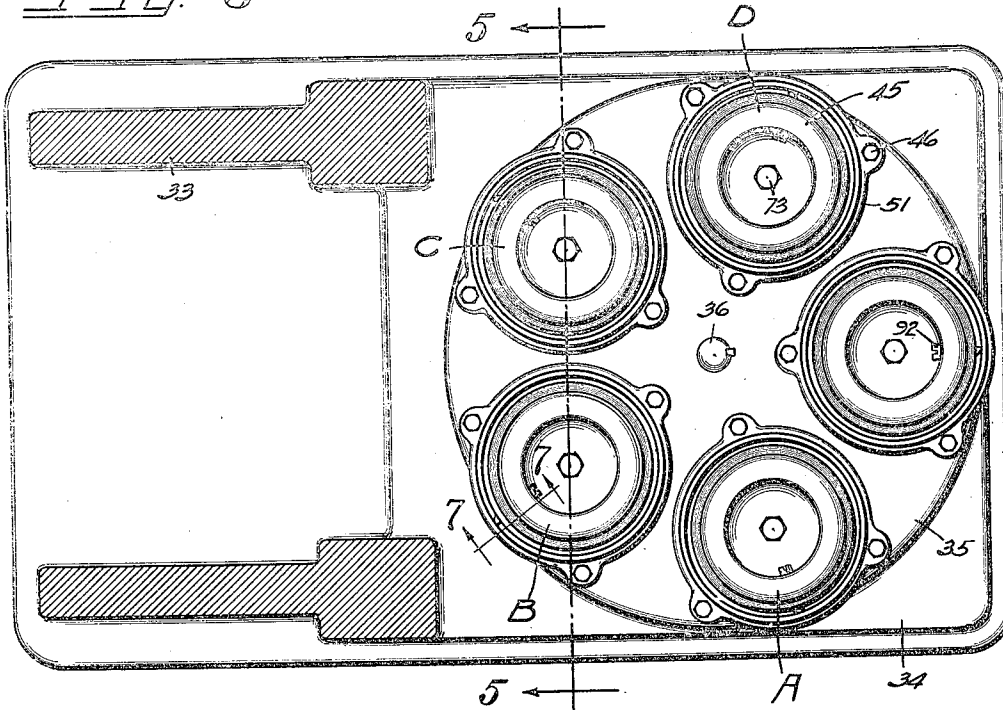
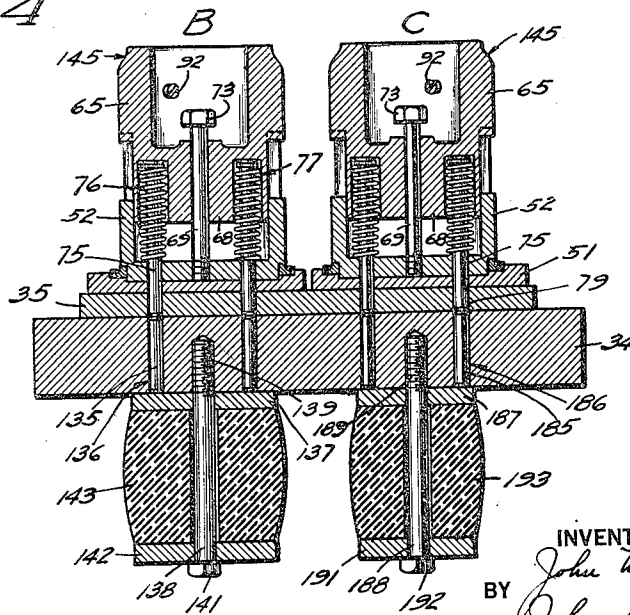


Fig. 4



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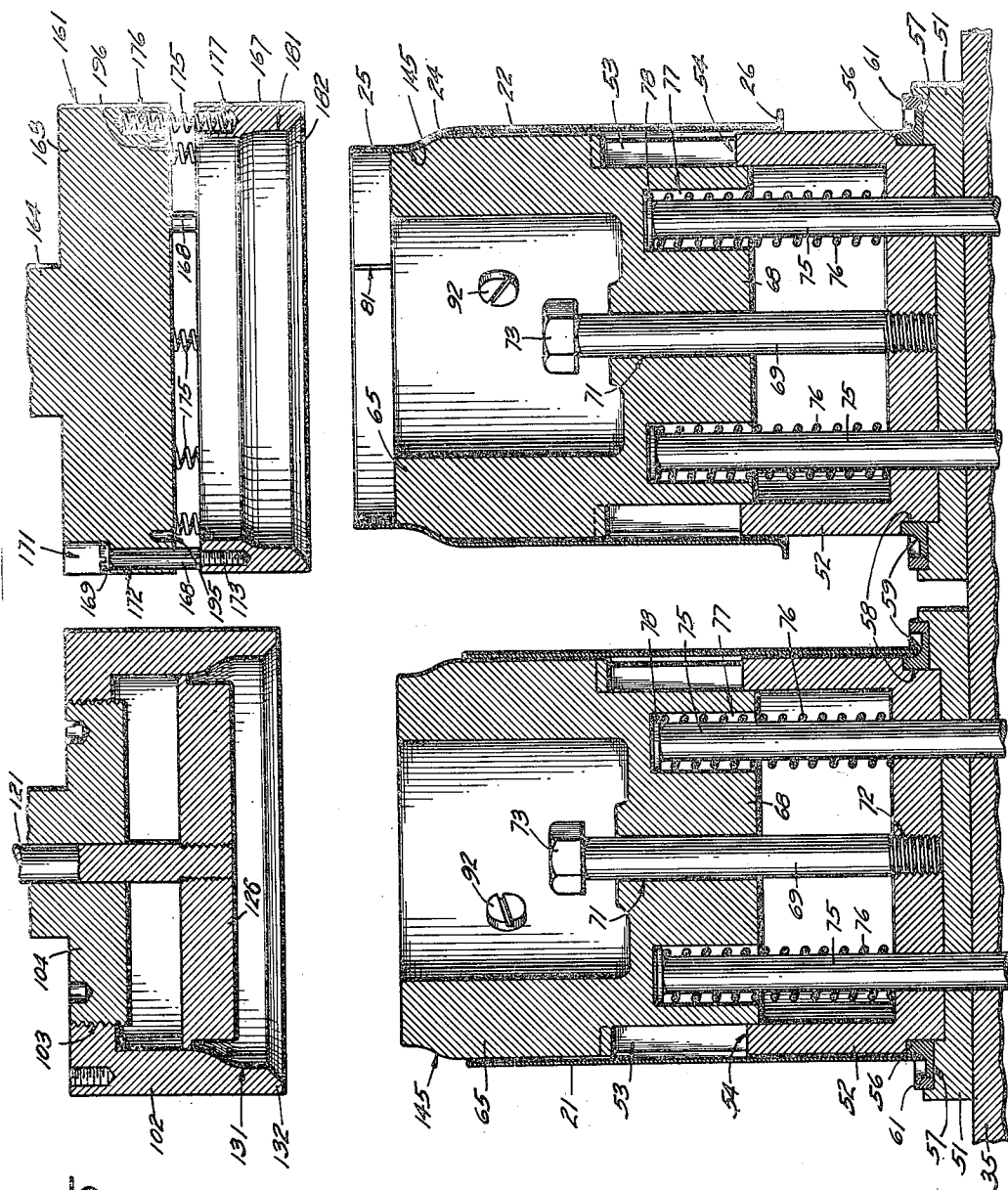


Fig. 5

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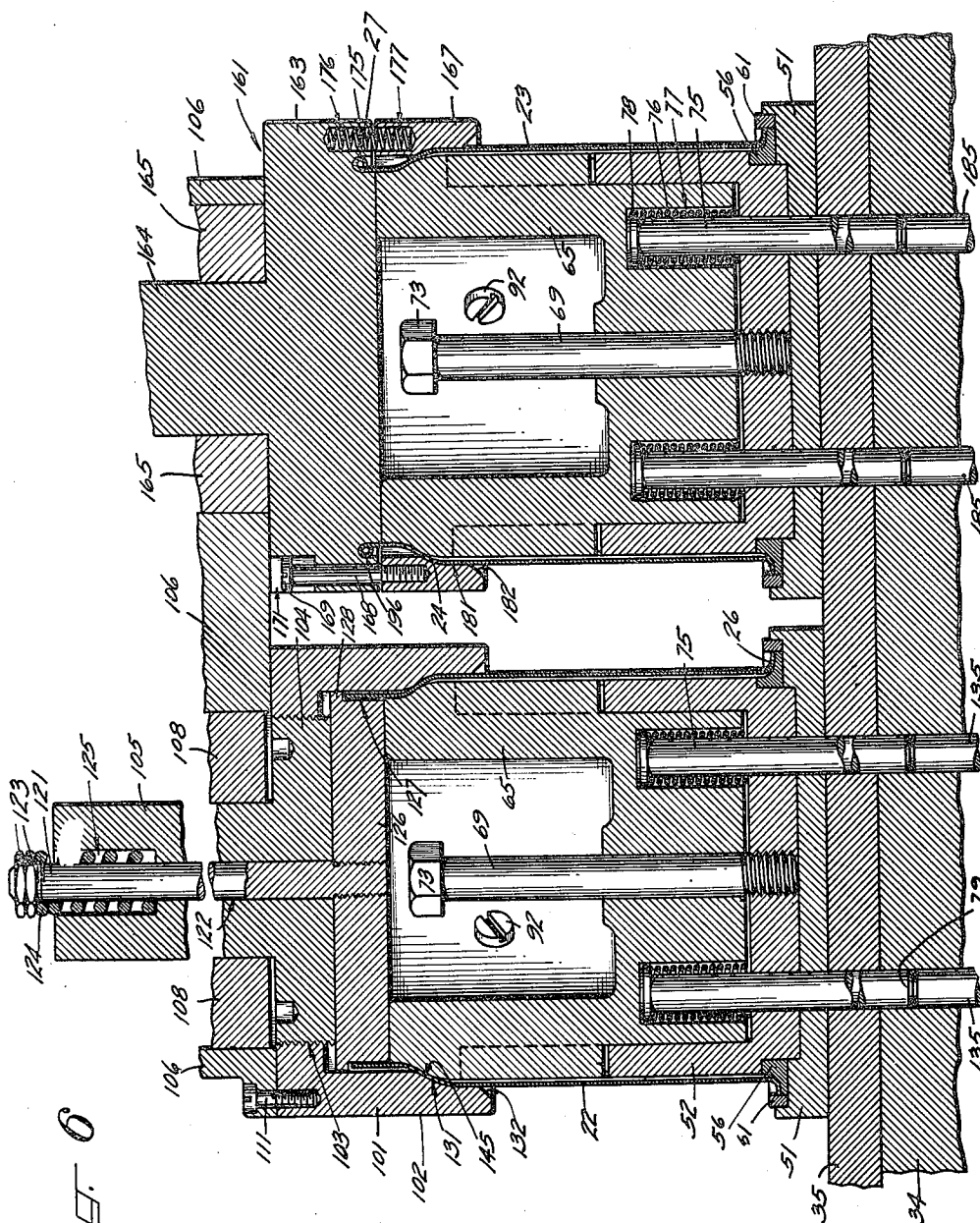


Fig. 6

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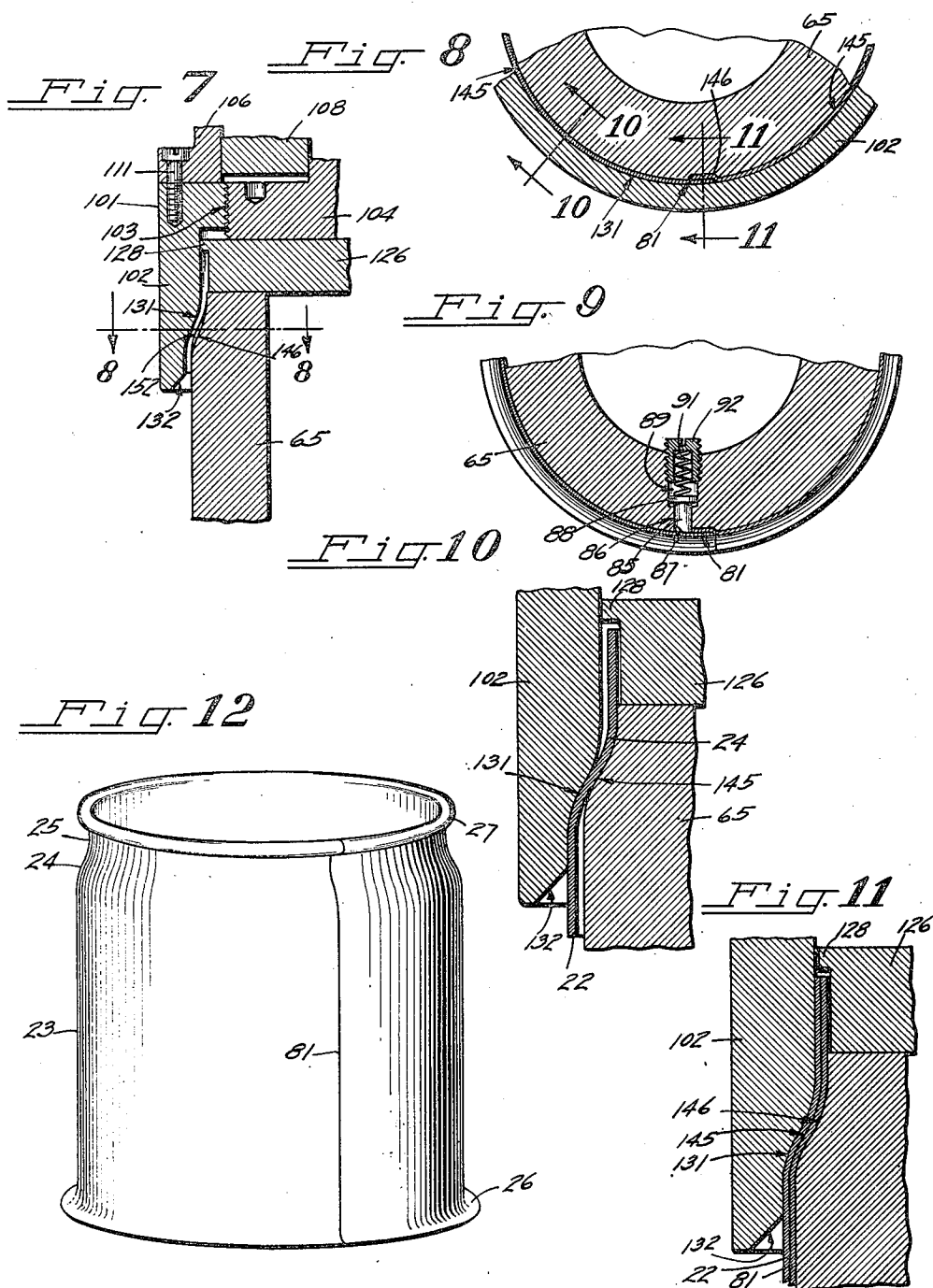
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APPARATUS FOR NECKING-IN AND FLANGING TUBULAR BODIES

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UNITED STATES PATENT OFFICE

2,013,654

APPARATUS FOR NECKING-IN AND
FLANGING TUBULAR BODIES

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4 Claims. (Cl. 153—48)

The present invention relates to the reformation of the ends of tubular bodies as, for example, cans and containers to alter their shape and/or dimensions and has particular reference to the necking-in, flanging and curling of the ends of the tubular body.

The present invention relates to the manufacture of tubular bodies and contemplates the altering or reforming of the body by necking-in one end of the body and flanging the opposite end, after which the reformed or necked-in end of the body is rolled over or curled. The necking-in operation of the present invention is similar to that disclosed in my United States Patent No. 1,698,999, issued January 15, 1929.

The principal object of the present invention is the provision of an apparatus for altering the shape and dimensions of the ends of a metal tubular body by necking-in and curling one end and flanging the opposite end.

An important object of the invention is the provision of an apparatus for simultaneously flanging and necking-in the ends of a tubular body and subsequently curling the necked-in end of the body.

An important object of the invention is the provision of an apparatus for simultaneously operating on a plurality of tubular bodies during which time each body is held on an internal base and is flanged while being successively presented to necking-in and curling operations.

Numerous other objects of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a fragmentary side elevation of an apparatus capable of carrying out the steps of the present invention, parts being broken back and shown in section;

Fig. 2 is a front elevation and front sectional view of the apparatus as viewed substantially along the line 2—2 of Fig. 1;

Fig. 3 is a sectional plan view taken substantially along the line 3—3 in Fig. 2;

Fig. 4 is a sectional detail of the lower part of the apparatus being taken substantially along the line 4—4 in Fig. 1;

Fig. 5 is an enlarged fragmentary sectional detail taken substantially along the line 5—5 in Fig. 3 and illustrating different stages in the reformation of the tubular bodies, certain working parts of the apparatus being illustrated at the beginning of the cycle of operations;

Fig. 6 is a view similar to Fig. 5, illustrating the working parts in position at the completion of the cycle of operations;

Fig. 7 is an enlarged, fragmentary, sectional plan detail taken substantially along the line 7—7 in Fig. 3;

Fig. 8 is a fragmentary plan view taken substantially along the line 8—8 in Fig. 7;

Fig. 9 is an enlarged fragmentary sectional plan detail taken substantially along the line 9—9 in Fig. 1;

Fig. 10 is an enlarged fragmentary longitudinal section taken substantially along the line 10—10 in Fig. 8;

Fig. 11 is a similar view taken substantially along the line 11—11 in Fig. 8; and

Fig. 12 is a perspective view of the completely reformed and flanged tubular body.

A tubular container body is selected for the purpose of illustrating the present invention, 20 and this body is subjected to different operations in a press-like apparatus which alters its form or shape. The original straight tubular form, indicated by the numeral 21 on the left-hand side of Fig. 5, is first reformed and brought into the shape indicated by the numeral 22, shown on the right-hand side of Fig. 5. In a subsequent operation this form 22 is finally reshaped into a flanged, reformed and curled tubular body 23, illustrated in Fig. 12 and also at the right-hand 30 side of Fig. 6.

This first reforming operation necks-in or alters the diameter of the upper end of the container body (left side of Fig. 5) providing a rounded shouldered body 24 leading into a neck 25 of smaller diameter. At the same time the lower end of the body 22 is bent outwardly to produce a flange 26. This constitutes the shape 22 which is then subjected to the second reforming operation wherein the upper edge of the neck 25 is bent outwardly, downwardly and inwardly to produce a curl 27 (right side of Fig. 6).

The apparatus for performing the aforesaid operations preferably comprises a supporting frame 31 (Figs. 1 and 2) on which is mounted a 45 press frame 32 extending upwardly as spaced reinforced webs 33 which support a bed 34 formed integrally therewith.

The bed 34 provides a support for an intermittently movable turret 35 keyed to a vertical shaft 36 extending through a bore 37 formed centrally of the bed 34. The shaft 36 at its lower end carries a bevel gear 38 which meshes with a similar gear 39 mounted on a horizontal drive shaft 41 journaled in bearings 42 formed in the press 55

frame 32. The shaft 41 is intermittently rotated in any suitable manner, the turret 35 being caused to rotate in steps through successive arcs of 72 degrees between which movable periods it is held at rest while successive operations take place on the tubular body.

The turret 35 carries five internal die units indicated generally by the numeral 45, each unit being secured to the upper surface of the turret by bolts 46. The tubular body 21 to be reformed is placed by hand or in any suitable manner over each die unit which, upon rotation of the turret, presents the unit and its tubular body first to the necking-in and reforming station and thence to the curling station after which it moves beyond the operating stations where the completed body 23 is removed from the unit by hand or in any suitable manner.

Each die unit 45 comprises a base 51 (Figs. 2, 4 and 5) which rests directly on the turret 35 to which is secured a tubular body member 52. This member is provided with spaced upwardly projecting tongues 53 having vertical side walls defining slots 54 therebetween.

An annular flanging ring die 56 is mounted in a groove 57 formed in the upper surface of the base 51 and in a groove 58 formed in the member 52 the latter holding the die in position. The die 56 is provided with an annular curved wall 59 which has a vertical surface flush with the outer surface of the member 52 and which merges into a horizontal wall section. The wall 59 is thus curved downwardly and outwardly. A stop ring 61, also carried in the groove 57 of the base 51, surrounds the die 56. These parts constitute the stationary elements of the internal die units since they have no vertical movement relative to the turret. They are bodily carried by the turret however, in its step rotation.

An upper telescoping member 65 (Figs. 2 and 5) is located directly above the member 52 and has vertical movement relative thereto, parts of each upper member telescoping within the other. For this purpose the member 65 is provided with downwardly extending tongues 66 having vertical walls setting off slots 67. Each tongue 66 engages and slides within a corresponding slot 54 of the member 52 while each tongue 53 similarly moves within a corresponding slot 67. The member 65 is also provided with a downwardly cylindrical section 68 which has a sliding fit within the interior wall of the member 52. A bolt 69 passing loosely through a vertical bore 71 in the part 68 is threadedly secured at 72 to the lower part of the member 52. This bolt with its head 73 prevents accidental displacement of the member 65.

Each member 65 (Figs. 4 and 5) is supported on vertical pins 75 normally held in raised position by springs 76. The upper ends of the pins and the springs extend within vertical bores 77 formed in the section 68 of the member 65, each pin 75 having a head 78 on which the member 65 rests.

The springs 76 are interposed between the heads 78 of the pins and the lower horizontal wall of the member 52. With the member 65 supported by the springs 76 as in normal position, rounded lower ends 79 of the pins are in line or slightly above the upper surface of the bed 34 and the pins are thus freely carried over the bed 34 with each step rotation of the turret.

With the turret 35 at rest, a tubular body 21 is inserted over the internal die units 45 which is then located at a feeding station A (Fig. 3).

The bottom edge of the body at such time rests upon the flanging die member 56 just above the curved wall of the surface 59. This tubular body must also be brought into an exact position circumferentially of the members 52, 65 so that its side seam, designated by the numeral 81, (Figs. 8, 9 and 11) is brought into engagement with a locating button 85 (Fig. 9) extending through a radial slot 86 cut in the wall of the member 65.

The outer end of the button 85 is tapered at 87 to permit this positioning of the body 21 over the member 65, the inner lap of the side seam 81 being brought against the side wall of the button. The button 85 is formed with an enlarged head 88 which has sliding movement within a counterbore 89 cut radially of the wall of the member 65 adjacent the slot 86.

A spring 91 is also located within the bore 89 and rests against the button head 88, this spring being held under compression by a threaded cap screw 92 secured in the wall of the member 65 and closing the inner end of the counterbore 89. This spring 91 normally forces the button 85 into its extended position but allows for the necessary yielding movement for insertion of the tubular body 21.

Following the first step rotation of the turret 35 the die unit 45 with its body 21 is brought to rest at the first operating station designated by the letter B in Fig. 3. At this station the lower edge of the body is flanged outwardly to produce the flange 26 and its upper edge is reformed by being caused to traverse a necking-in pass or forming path of sinuous contour to shape the curved shoulder 24 and the reduced neck 25.

At this station B the die unit 45 and body 21 is in direct alignment and positioned beneath an upper movable die unit designated generally by the numeral 101 (Figs. 1, 2, 5 and 6). This upper die unit comprises a shell 102 of cup shape form which is threaded at 103 to a head 104 extending upwardly in a stem 105. The stem 105 is clamped to a base 106 of a press slide 107, a clamping cap 108 held by bolts 109 being used for this purpose. The shell 102 is further engaged with base 106 by bolts 111.

The slide 107 has vertical sliding movement within guideways 115 (Fig. 2) formed in extensions 116 of the press frame 33. Slide 107 has vertical movement in the usual manner being actuated by pivotal connection with a pitman 117 connecting with a suitable crankshaft associated with the press mechanism.

A knockout rod 121 (Fig. 6) extends vertically through a bore 122 formed in the stem 105, the upper end of the rod carrying locknuts 123 which confine a spring 124 in position on the end of the rod, the spring extending within a counterbore 125 formed in the upper end of the stem 105. The knockout rod 121 carries at its lower end a knockout pad 126 having vertical movement within the member 102. Both rod and pad are in raised position normally held by the spring 124, the pad being in engagement with the head 104 at such time. The side walls of the pad 126 are cut back at 127 to provide a shoulder 128 (Fig. 6).

The inner wall of the shell 102 adjacent its lower edge is cut back at 131 and is of smoothly curved sinuous contour, and this provides the external pass forming element for the necking-in operation. This curved wall communicates directly with a tapered wall 132 formed adjacent the lower edge of the shell. The wall 132 provides a lead or guiding element to insure proper

positioning of the upper edge of the body 21 inside of the wall 131 as the member 102 moves downwardly. The external pass-forming member is thus circumferentially rigid or continuous, and the pass is formed by longitudinal movement. When the pad 126 engages the upper surface of the member 65, it depresses the latter against the action of a resistance unit which will now be described.

Directly beneath the pins 75 of the die unit 45 at the station B, are vertically disposed pins 135 (Figs. 4 and 6) which are located within vertical bores 136 formed in the bed 34. The upper surface of the pins 135 are substantially in the horizontal plane of the upper surface of the bed 34 and thus allow for freedom of movement of the turret 35 as the pins 75 carried thereby are brought directly above the pins in the bed.

These pins 135 rest upon a washer 137 of a drawing rubber unit carried on a vertically disposed bolt 138 threadedly secured at 139 into the bed 34. A head 141 of the bolt 138 supports a lower washer 142 which carries a drawing rubber 143. This rubber loosely surrounds the bolt 138 and its upper surface engages the washer 137 and normally holds the pins 135 in the position illustrated in Fig. 4. In this position the upper face of the washer 137 is against the lower surface of the bed 34. Resistance of the drawing rubber 143 transmitted through the pins 135, 75 is effective through the member 65.

The upper outer wall of the member 65 is formed as a curved surface 145 of smoothly sinuous contour (Figs. 5 and 6) which provides the internal pass forming element for the reforming operation. With the pad 126 solidly against the head 104 above and against the member 65 below, the curved walls 131, 145 are in proper cooperation to provide the forming pass for the necking-in operation, see Figs. 7 to 11 inclusive. At the center of the bend of the walls 131, 145 these walls are spaced apart one thickness of the metal of the tubular body being reformed.

Above and below this central bend the distance between the walls is substantially a thickness and a half of metal. Adjacent the side seam 81, this single thickness, the distance between walls at the center of the bend, is increased by a vertical groove 146 which provides a channel for the double-walled lap of the side seam. The total depth of this channel is also one and one-half the metal thickness. The reasons for this will be clearer when consideration is given to the reforming operation which will now be described.

The member 65, after being engaged by the descending pad 126, is forced downwardly telescoping the members 65, 52 and shortening the distance between the upper surface of the member 65 and the flanging ring or die 56. This shortening of the inner die unit 45 forces the upper end of the tubular body 21 through the forming pass between the walls 131, 145, the said pass having an elongated sinuous detour the body wall taking the position within the pass as shown in Fig. 10. At the side seam and along the groove 146 the double metal thickness of the body is forced along a pass which is only one and a half the metal thickness as shown in Fig. 11. During such a passage, therefore, the lapped part of the side seam throughout the reformed wall of the body is reduced or squeezed into a thickness equal to only one and one-half the metal thickness.

Simultaneously with this reforming action on the upper end of the body 21, a flanging of the

lower end takes place. To effect this operation the tubular body 21 bodily moves downwardly with the descending member 65, and its lower edge slides along the curved annular wall 59 of the flanging die 56 and outwardly until its outer edge strikes against the stop ring 61, as illustrated in Fig. 6. The container body 22 is the final result of this operation, the necked-in wall 24, the neck 25 and the flange 26 being formed at this time.

The turret 35 is then advanced another step in its rotation and the die unit 45 with the body 22 is moved from station B into a station C (Fig. 3) where the next operation of curling takes place. This die unit and its body is brought to rest directly beneath and in axial alignment with a second upper die unit designated generally by the numeral 161 and shown on the right-hand side of Figs. 2, 5 and 6.

This die unit comprises a head 163 having a stem 164 which is engaged in the base 106 of the press slide 107 being held firmly in position with a clamping cap 165 bolted in place as at 166. A clamping ring 167 is supported on bolts 168 carried by the head 163, each bolt head 169 resting within a channel 171 cut out in the head. The shank of each bolt 168 has some sliding movement within a vertical opening 172 formed in the head and its lower end is threadedly secured at 173 to the ring 167.

Springs 175 are interposed between the members 163, 167 being partially located in recesses 176, 177 formed respectively in the members 163, 167. These springs when in extended position hold the ring 167 downwardly and spaced from the head 163, as illustrated in Fig. 5, the heads 169 of the bolts limiting this downward position of the ring.

As the slide 107 moves downwardly and while its die unit 101 at station B is performing the operations just described on a body 21, the ring 167 is lowered over the neck 25 of the reformed tubular body 22 as it rests upon and is supported by the member 65 at the station C. The inner wall of the ring 167, adjacent the bottom, is shaped at 181 to correspond to the bend 24 of the tubular body, the lower edge of the wall joining a tapered annular wall 182 which guides the neck 25 of the body 22 into position. The formed surface 181 of the ring 167 engages the bend 24 of the body and clamps it tightly against the wall 145 of the member 65.

The lower die unit 45 as it rests at the station C, has the pins 75 thereof directly above and in vertical alignment with other pins 185 (Figs. 4 and 6) which are located in vertical bores 186 formed in the bed 34. These pins rest upon a washer 187 of a drawing rubber unit similar to but smaller than the unit at station B, this unit being carried on a bolt 188 having threaded engagement at 189 within the bed 34. The bolt 188 extends downwardly through the washer 187 and also through a lower washer 191 resting against a head 192 of the bolt and supports a drawing rubber 193 loosely surrounding the bolt and interposed between the washers 187, 191.

Resistance of the drawing rubber 193, transmitted through the pins 185, 75 is again effective in the member 65 on which the body 22 rests. This resistance assists in providing for the clamping of the body between the walls 145, 181. The upper edge of the neck 25 of the tubular body 22 when this clamping takes place passes into an annular groove 195 formed in the lower face

of the head 163, the upper part of the groove being formed as a semi-circular wall 196.

The downwardly moving head 163, through the springs 175 and ring 167, and acting against the body wall 24 clamped in place, depresses the member 65 which again telescopes within the member 52, this being against the resistance of the drawing rubber 193 and the resistance of the springs 76. The tubular body 22, together with the member 65 is moved down until its flange 26 again enters into the flanging die 56 and its outer edge engages against the stop ring 61.

During this downward movement the upper edge of the neck 25 which extends into the groove 195 is bent outwardly, downwardly and inwardly along the wall 196, the tubular body 22 at such time being firmly clamped on the member 65 while moving therewith. In order to accomplish this bending the springs 175 yield and the ring 167 moves into engagement with the head 163. It will be understood that this is done by reason of the increasing resistance delivered by the rubber 193 and springs 76 which resistance increases as rubber and spring are brought under greater compression.

When the combined resistance builds up to a point where it is greater than the resistance of the springs 175 and the resistance in the metal against bending, the bending action takes place. The curl 27 is thus developed and the tubular body 23 is the final result of this curling operation.

During the rising movement of the slide 107 which immediately follows, the head 163 and the ring 167 moves upwardly permitting the upward movement of the member 65 under the action of the drawing rubber 193 until this member reaches its normal raised position. Head 163 then moves away from the ring 167, the springs 175 at such time separating the ring 167 from the head and thereby stripping or removing the tubular body 23 from the groove 195. Continued raising of the head thereafter picks up the ring 167 and restores the parts to normal position, as illustrated in Fig. 5.

The turret 35 following this curling operation advances another step in its step rotation and the tubular body 23 on its die unit 45 is brought into station D (Fig. 3) where it is removed in any suitable manner.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts with-

out departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. An apparatus for altering the shape and dimensions of the ends of a metal tubular body comprising in combination, external and internal pass forming members arranged to provide a pass of the shape and dimension desired in the reformation of one end of the body, a flanging die member arranged to flange the opposite end of the body to produce a reformed tubular body, a curling die member for curling the edge of said reformed body, and actuating means causing relative approach first of said pass forming members and said flanging member and secondly of said curling member and said flanging member.

2. In an apparatus for altering the shape and dimensions of tubular bodies, the combination of 20 a movable turret, internal pass forming members carried by said turret, external pass forming members mounted adjacent said turret, said internal and external members forming an elongated sinuous pass, lower die units having telescopic engagement with said internal pass forming members and cooperating therewith to internally support the tubular bodies, and means for presenting tubular bodies positioned on said turret members to said external pass forming members to neck-in the ends of said bodies.

3. In an apparatus for altering the shape and dimensions of tubular bodies, the combination of a movable turret, internal pass forming members carried by said turret, external pass forming members mounted adjacent said turret, a curling die member also mounted adjacent said turret, and means for simultaneously operating on two of said tubular bodies while on said turret members, by presenting one to the said external pass forming members and the other to the said curling die member to neck-in and curl said bodies.

4. An apparatus for altering the shape and dimensions of the ends of a metal tubular body comprising in combination, a movable turret, internal pass forming and flanging members carried by said turret, external pass forming members mounted adjacent said turret, a curling die member also mounted adjacent said turret, and means for presenting a tubular body positioned on said turret members first to said external pass forming members and then to said curling member to flange one end of said tubular body and neck-in and curl its opposite end.

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