

April 30, 1935.

W. M. HOLLOWAY
BAIL INSERTING MACHINE

1,999,192

Filed June 24, 1933

21 Sheets-Sheet 1

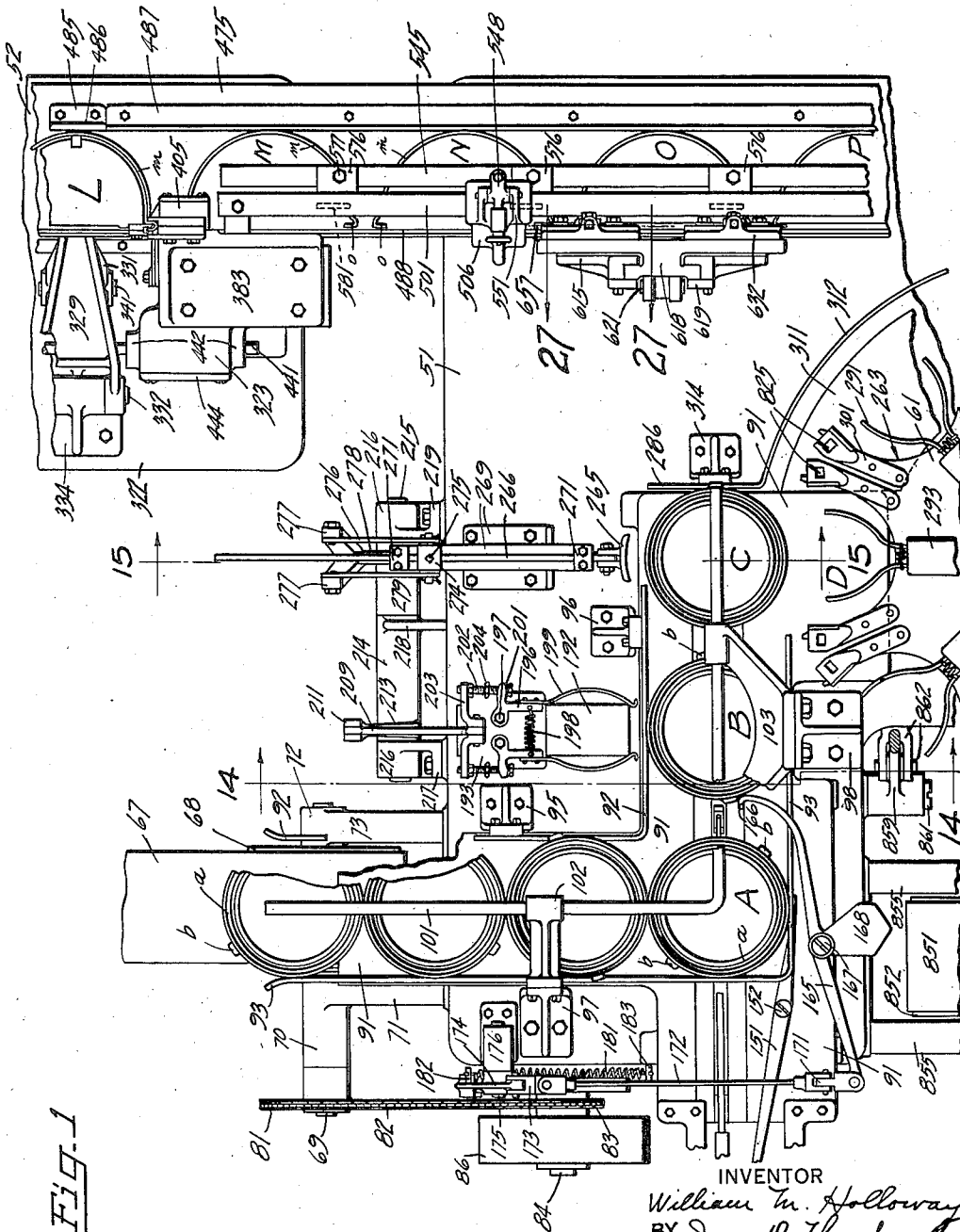


Fig. 1

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April 30, 1935.

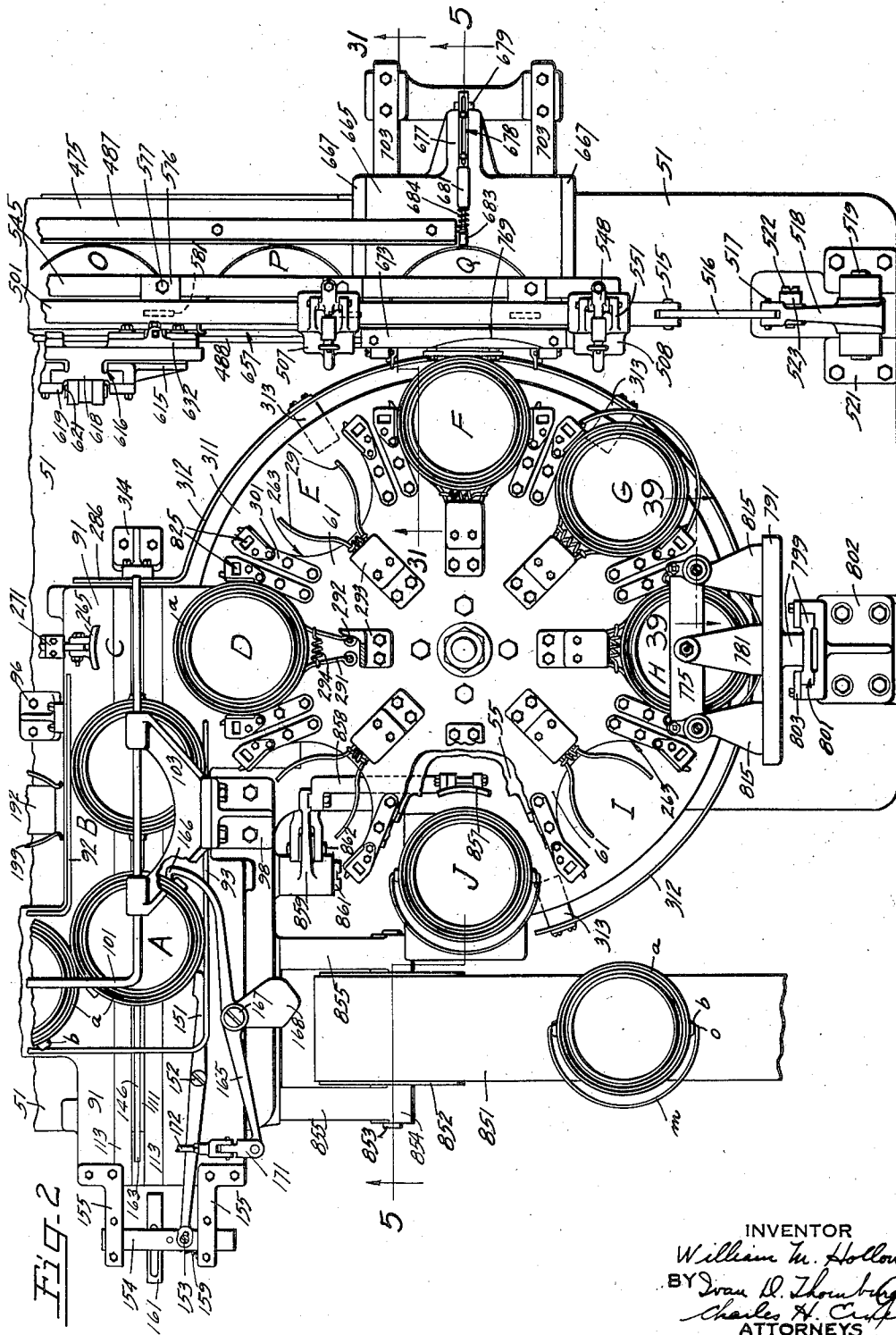
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BAIL INSERTING MACHINE

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21 Sheets-Sheet 2



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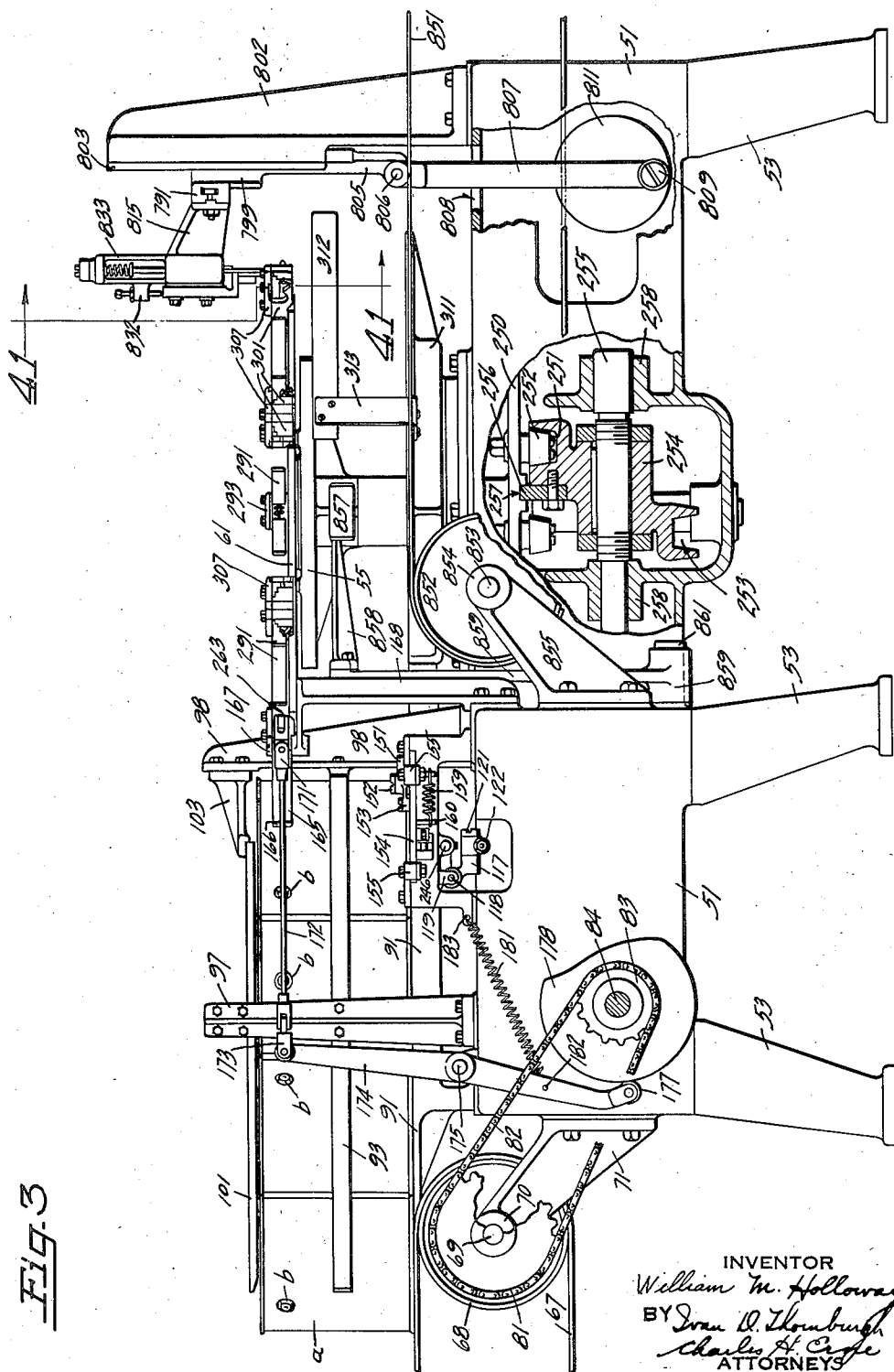
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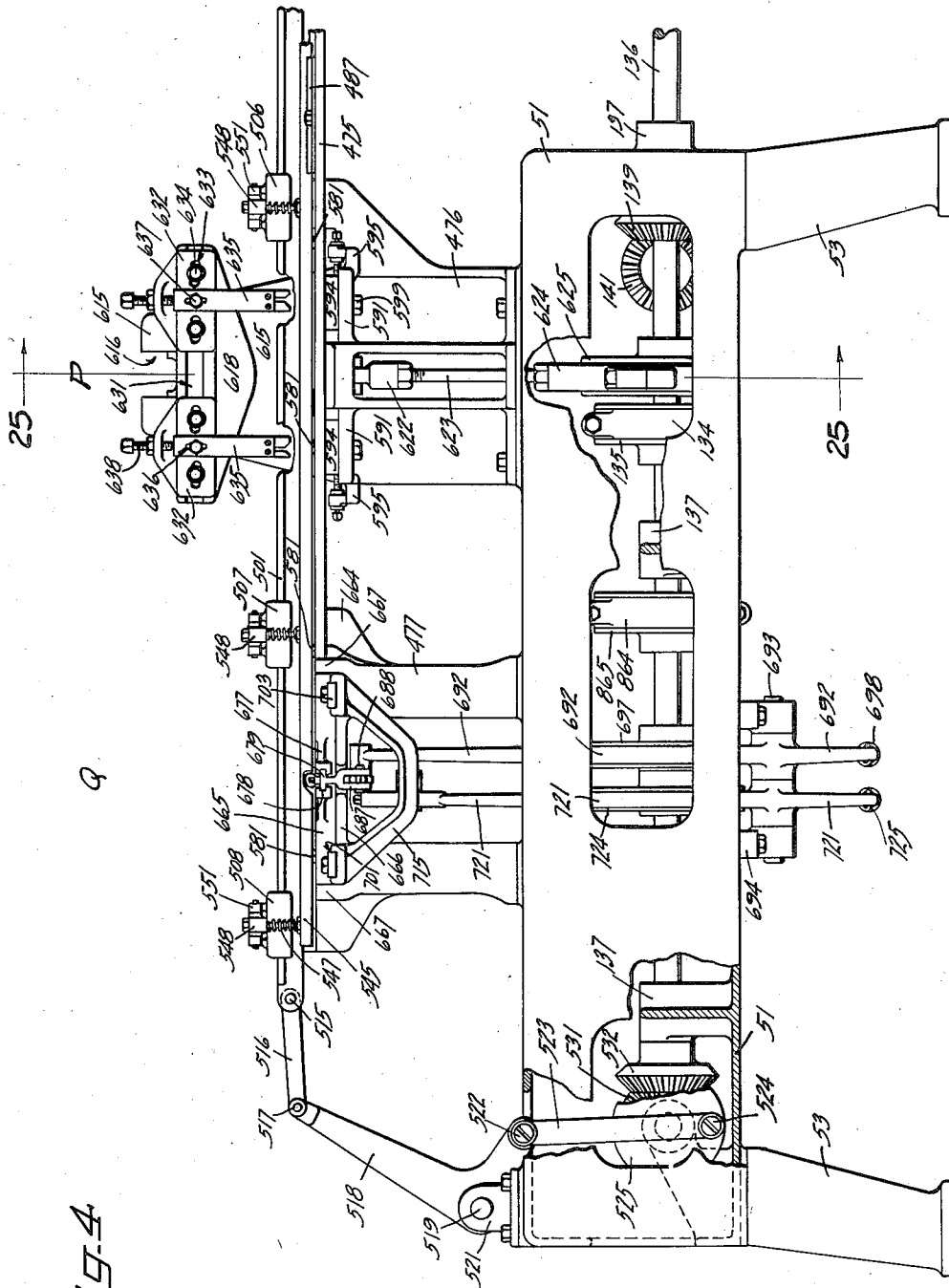


Fig. 4

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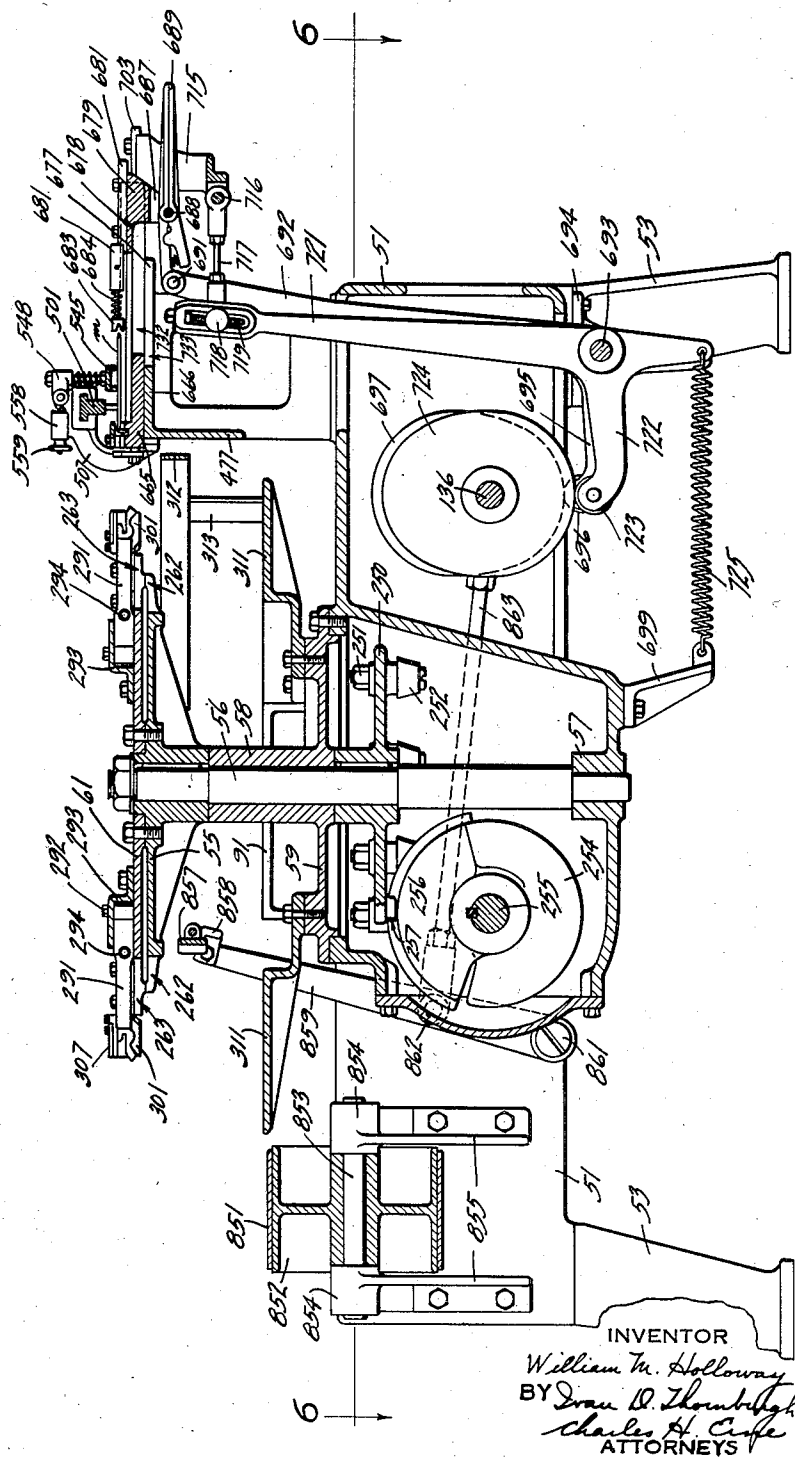
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BAIL INSERTING MACHINE

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Fig. 5



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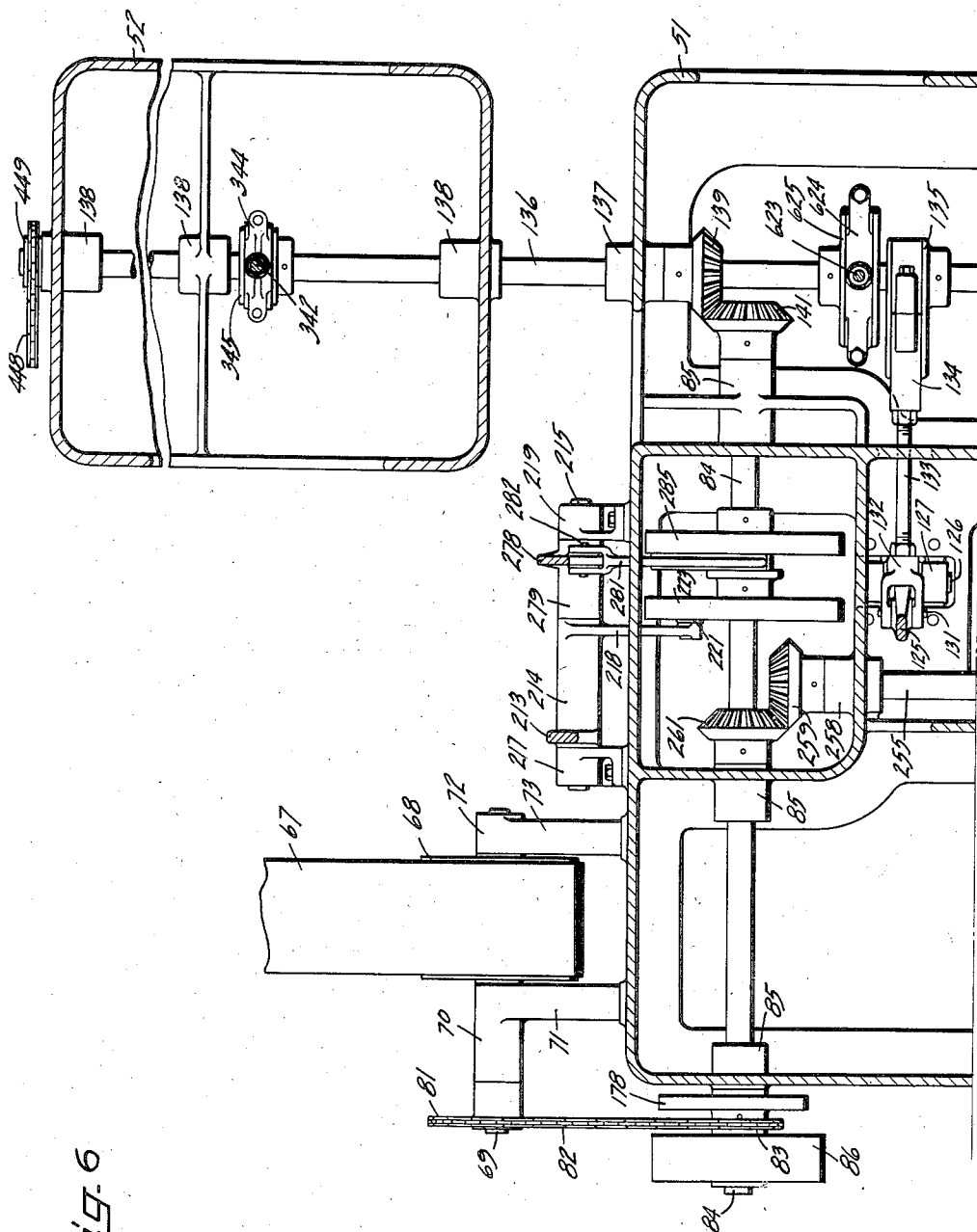
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BAIL INSERTING MACHINE

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21 Sheets-Sheet 6



INVENTOR
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Fig. 7

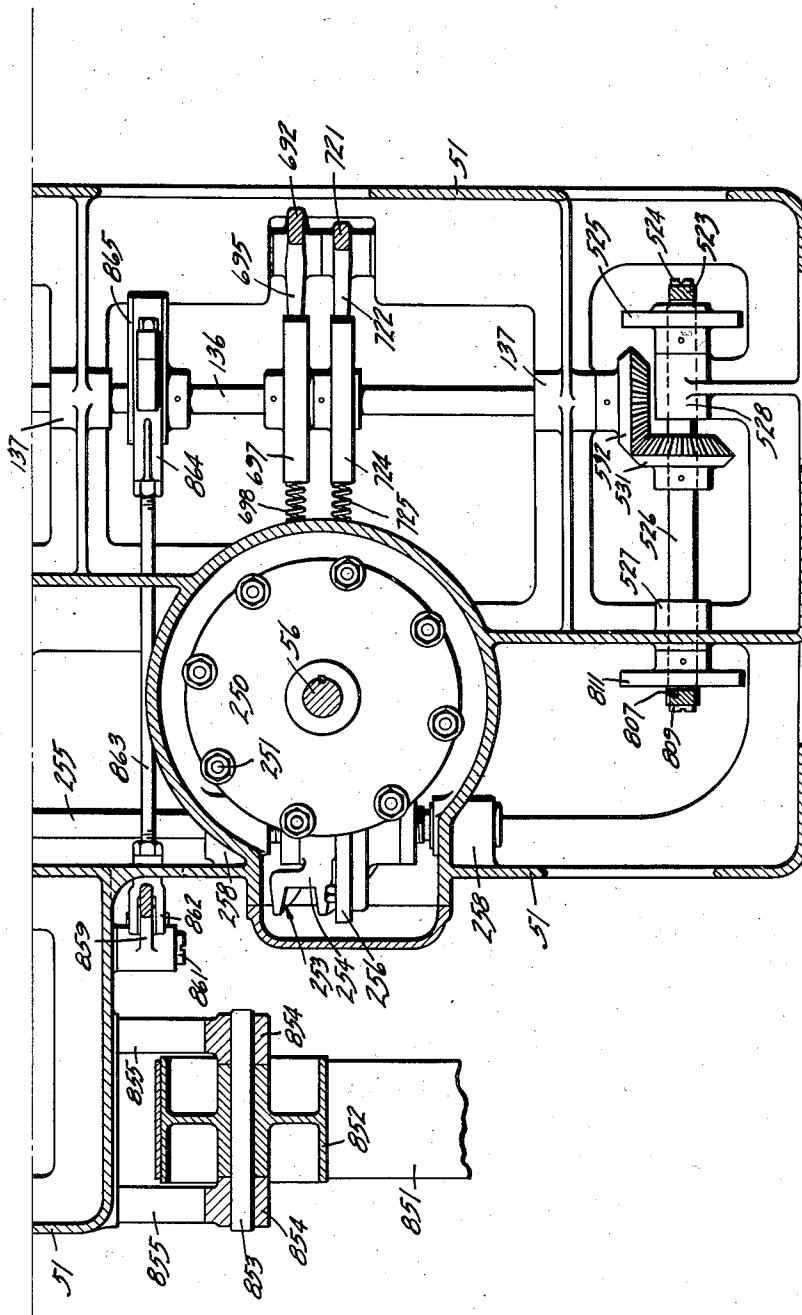
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W. M. HOLLOWAY
BAIL INSERTING MACHINE

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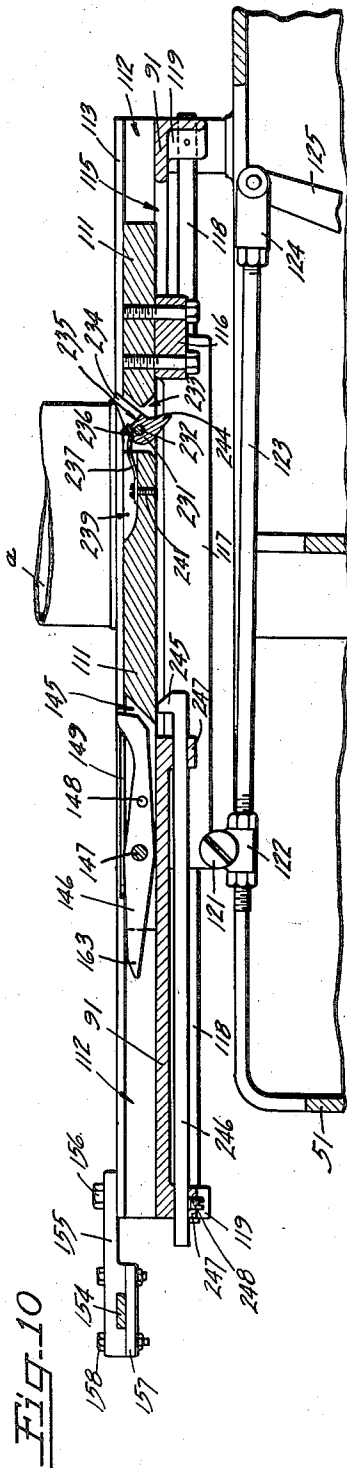


Fig. 13

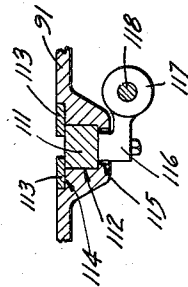
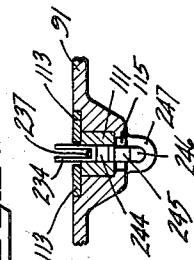


Fig. 12



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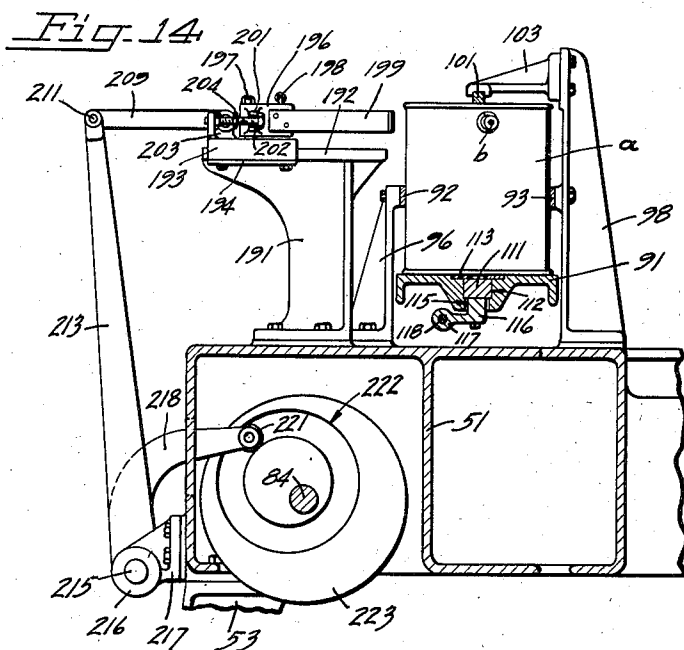
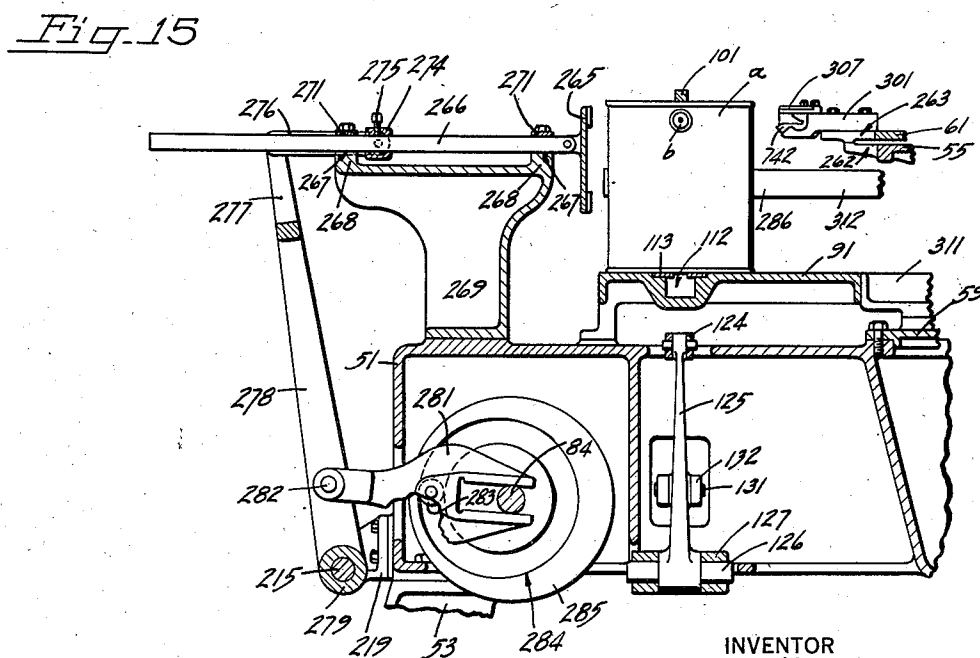
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BAIL INSERTING MACHINE

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21 Sheets-Sheet 10



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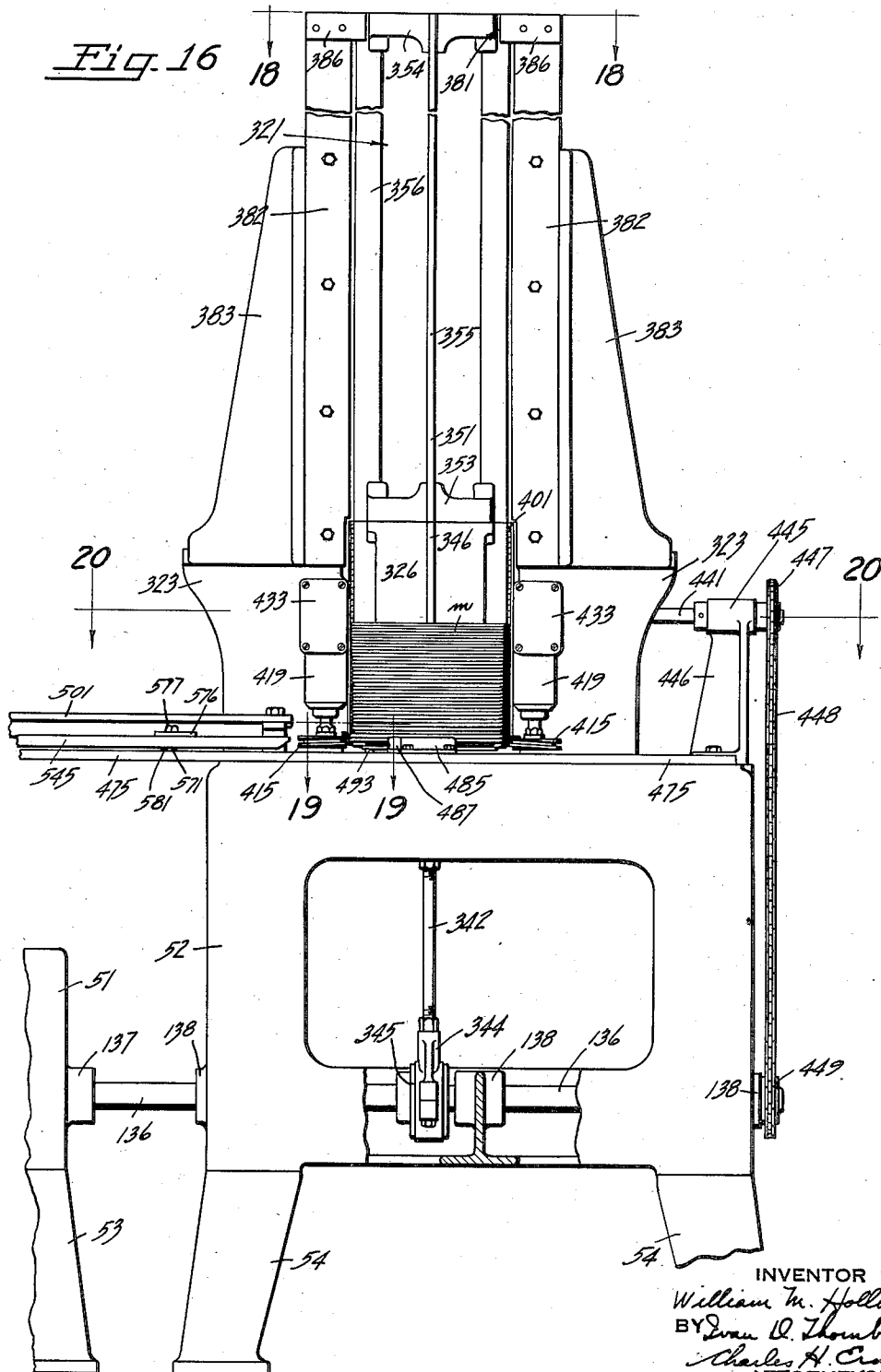
W. M. HOLLOWAY

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BAIL INSERTING MACHINE

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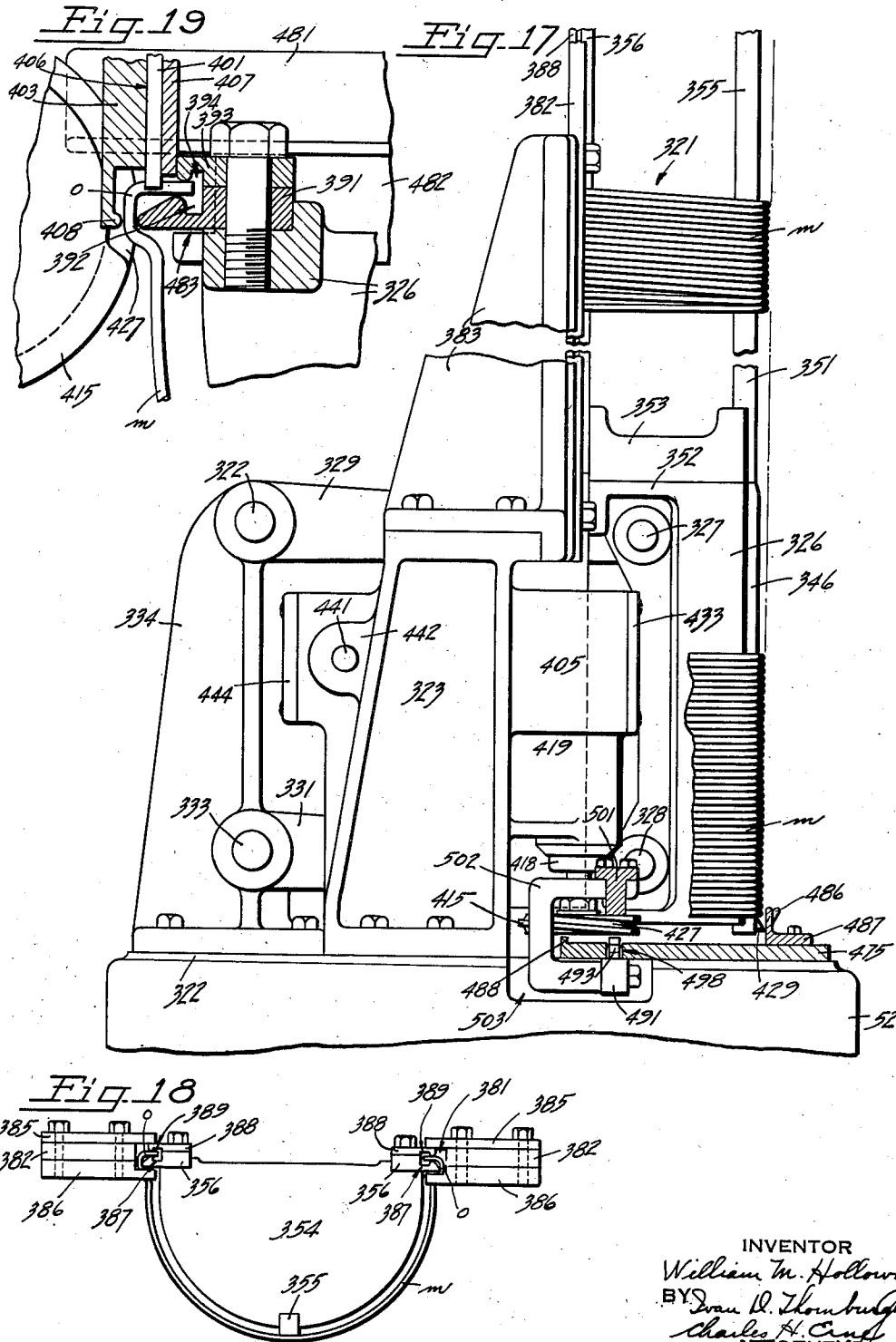
April 30, 1935.

W. M. HOLLOWAY
BAIL INSERTING MACHINE

1,999,192

Filed June 24, 1933

21 Sheets-Sheet 12



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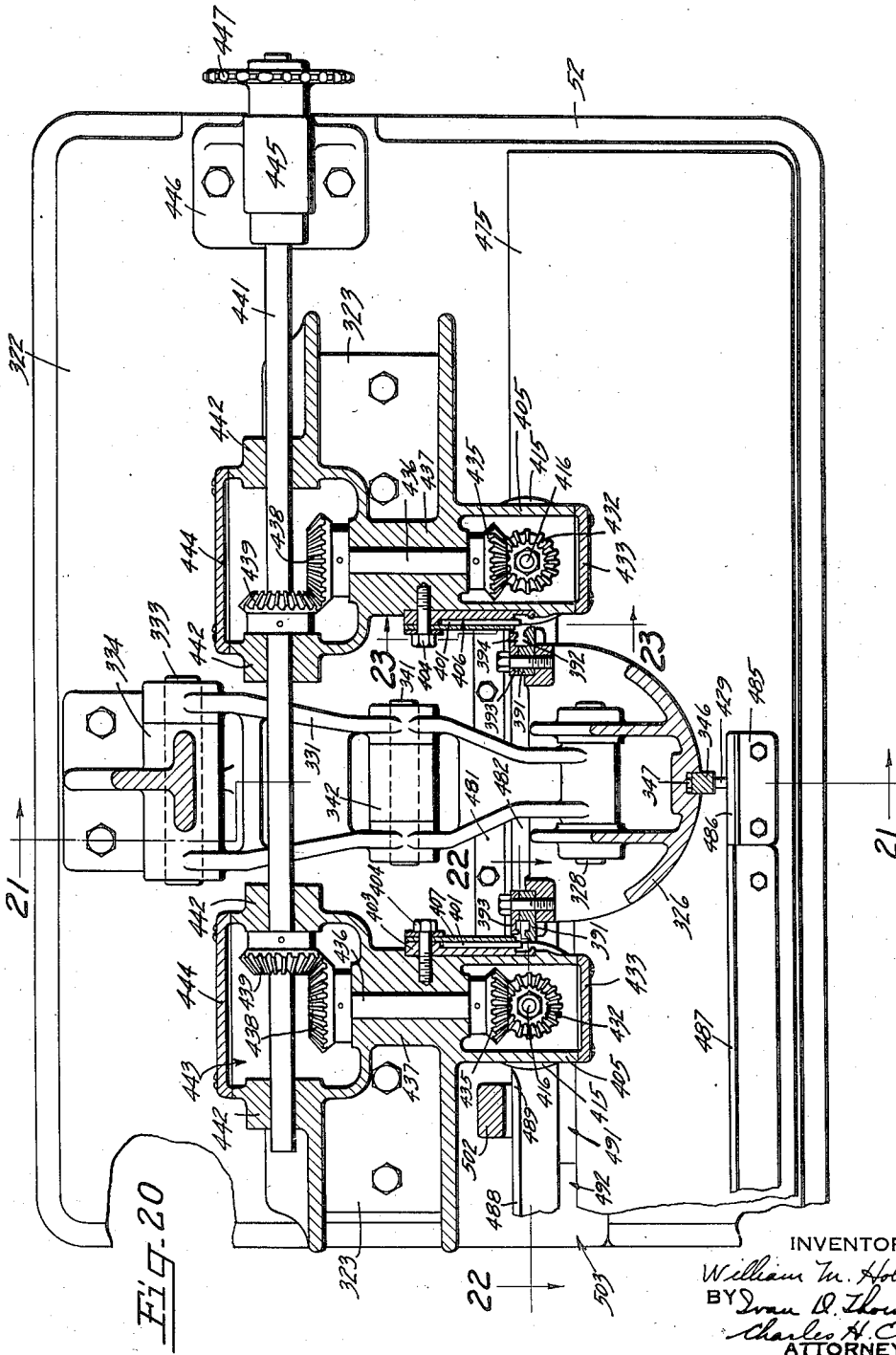
April 30, 1935.

W. M. HOLLOWAY
BAIL INSERTING MACHINE

1,999,192

Filed June 24, 1933

21 Sheets-Sheet 13



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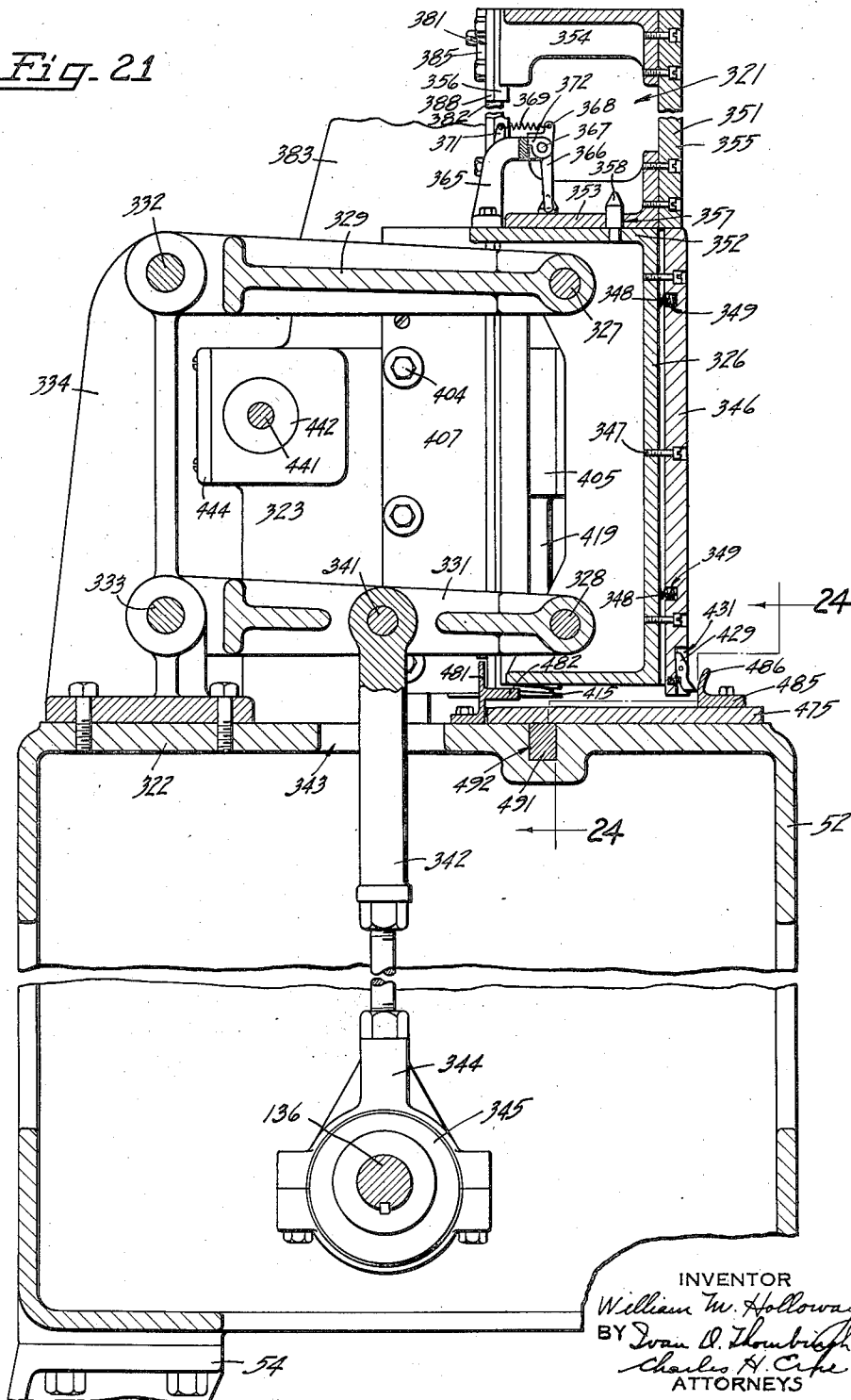
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BAIL INSERTING MACHINE

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Fig. 21



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W. M. HOLLOWAY
BAIL INSERTING MACHINE

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Fig. 22

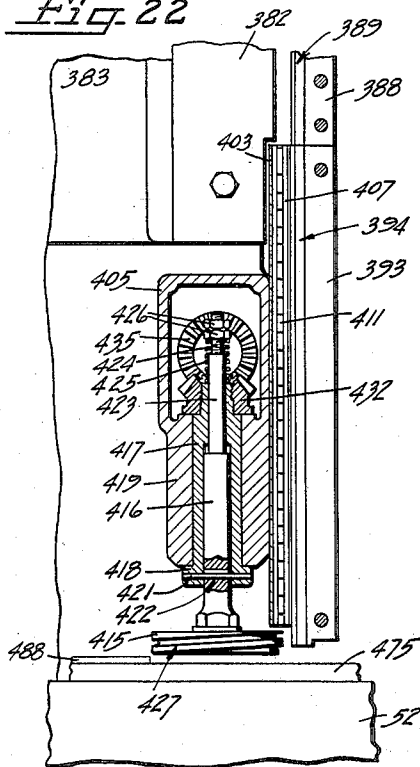


Fig. 23

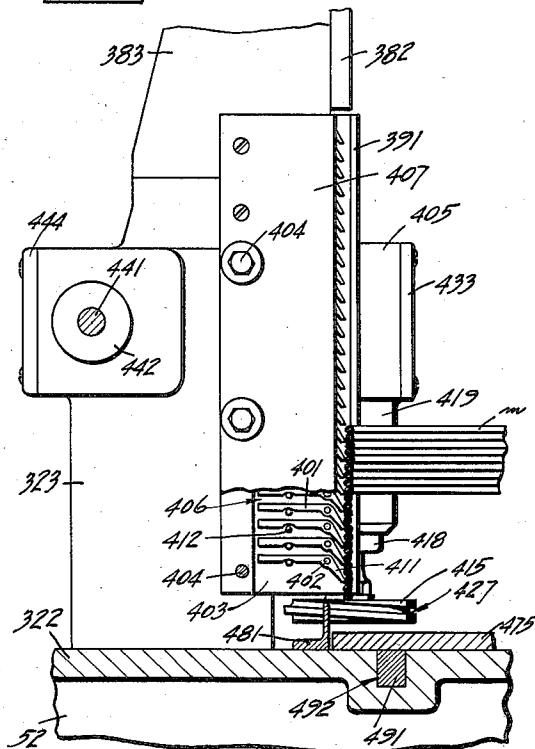
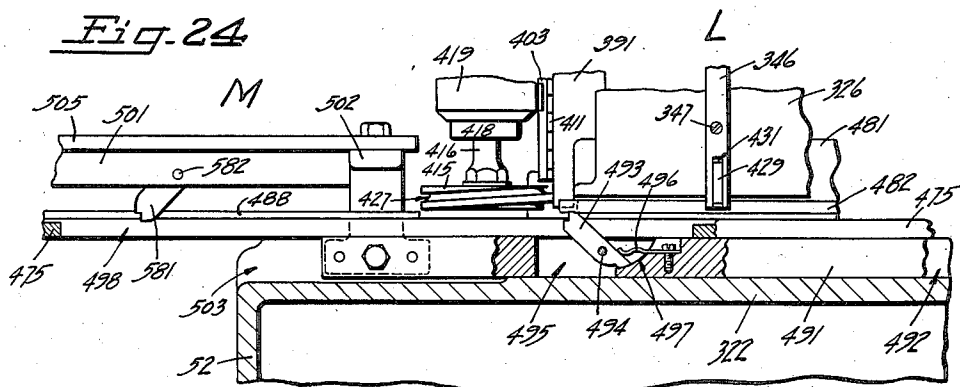


Fig. 24



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W. M. HOLLOWAY
BAIL INSERTING MACHINE

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Fig. 25

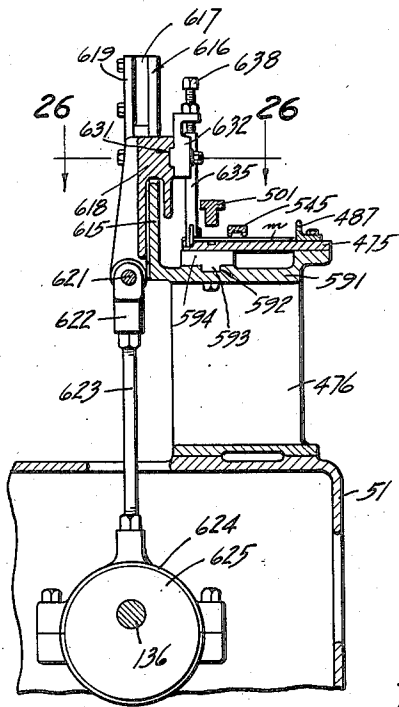


Fig. 26

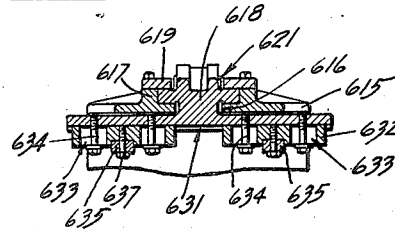


Fig. 30

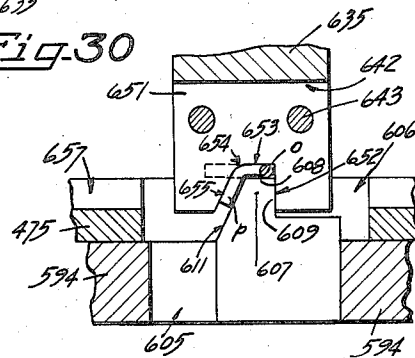


Fig. 29

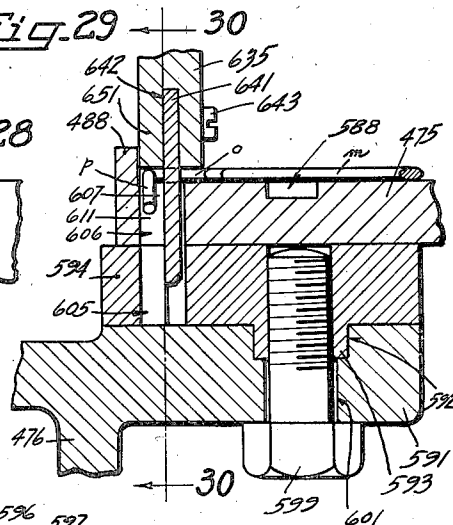


Fig. 28

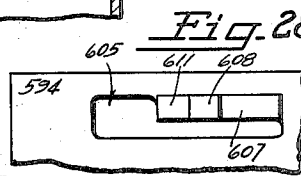
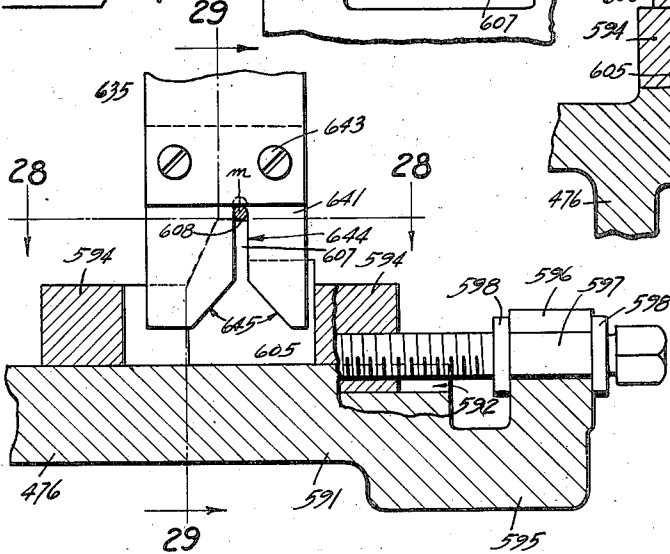


Fig. 27



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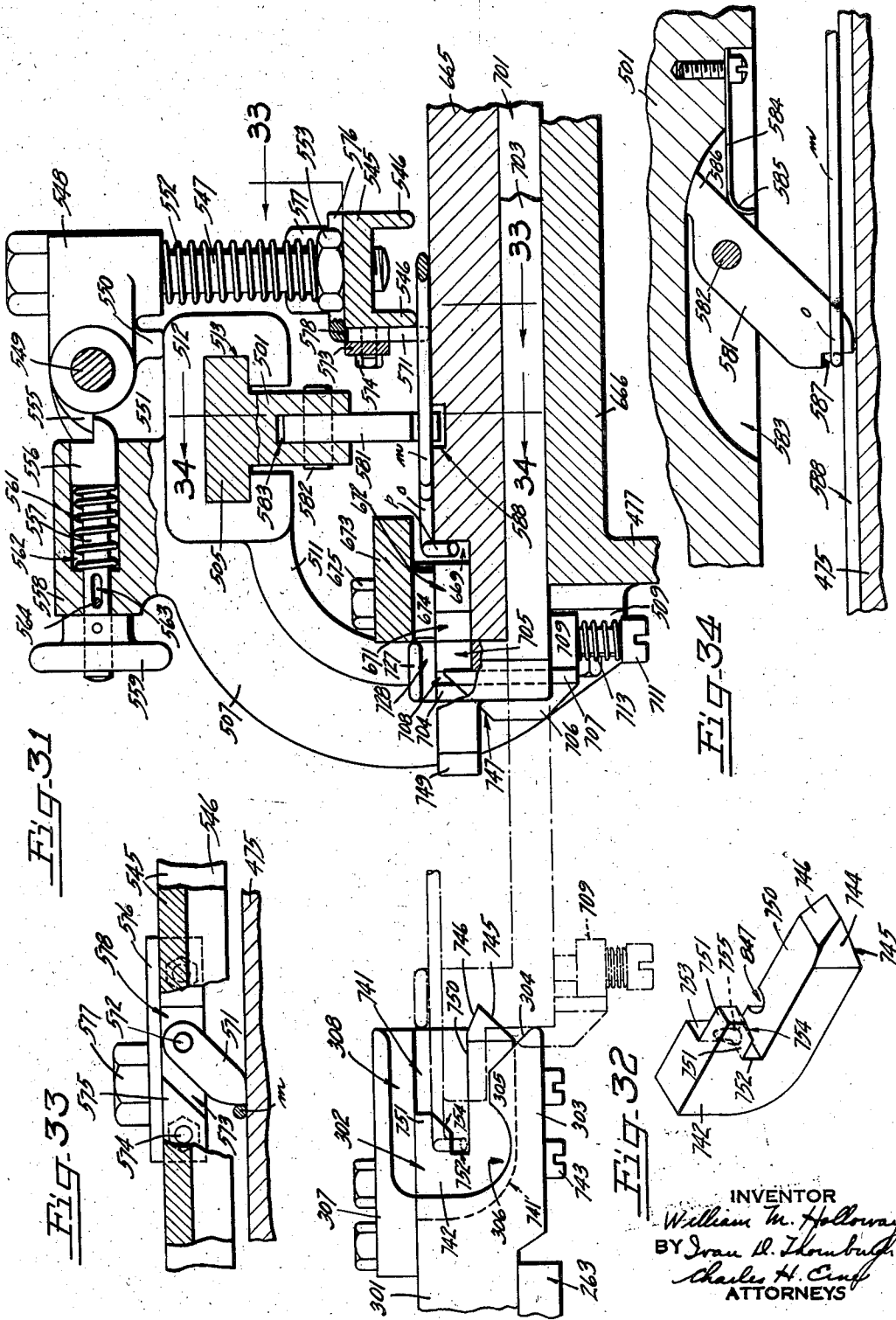
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W. M. HOLLOWAY
BAIL INSERTING MACHINE

1,999,192

Filed June 24, 1933

21 Sheets-Sheet 17



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BAIL INSERTING MACHINE

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Fig. 35

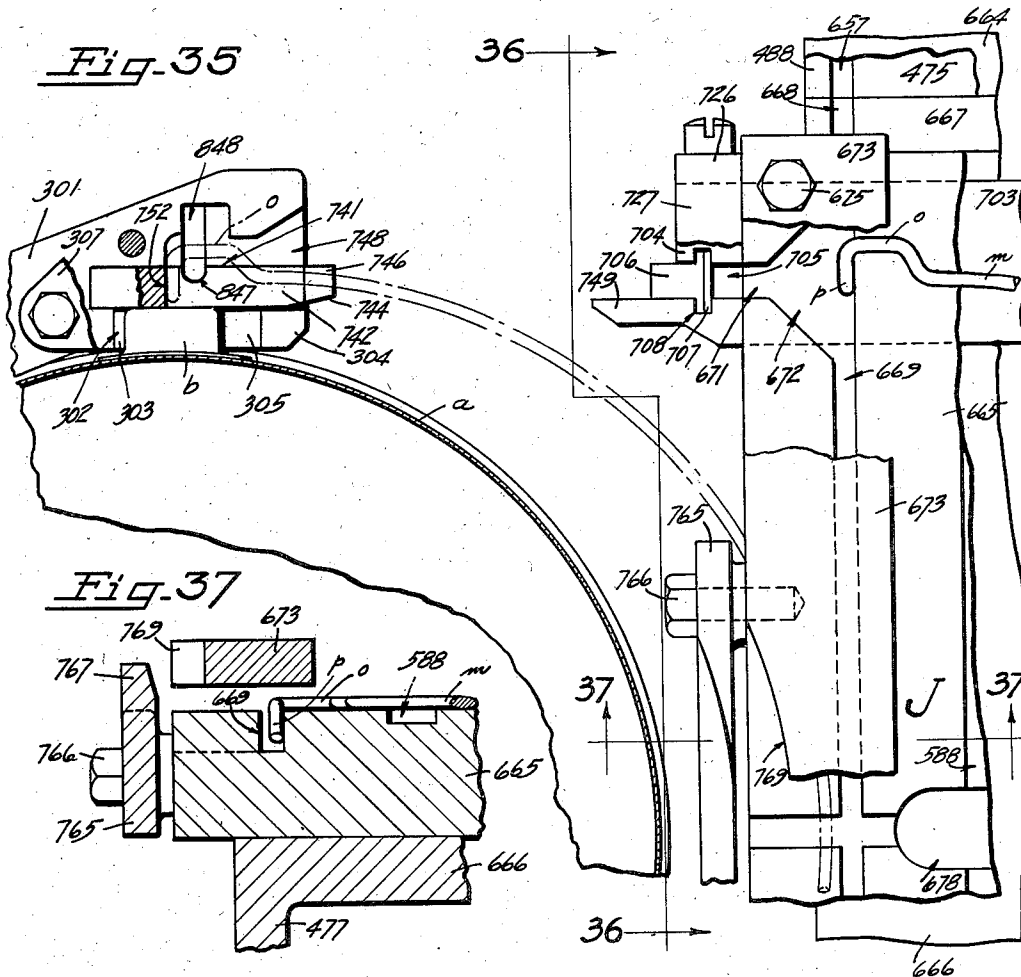


Fig. 37

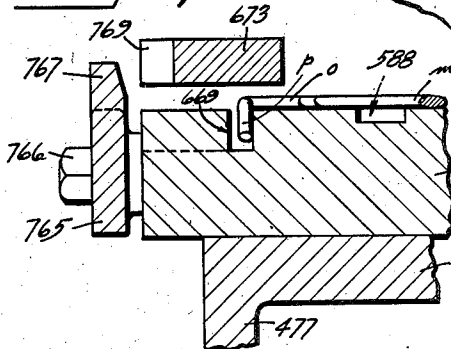
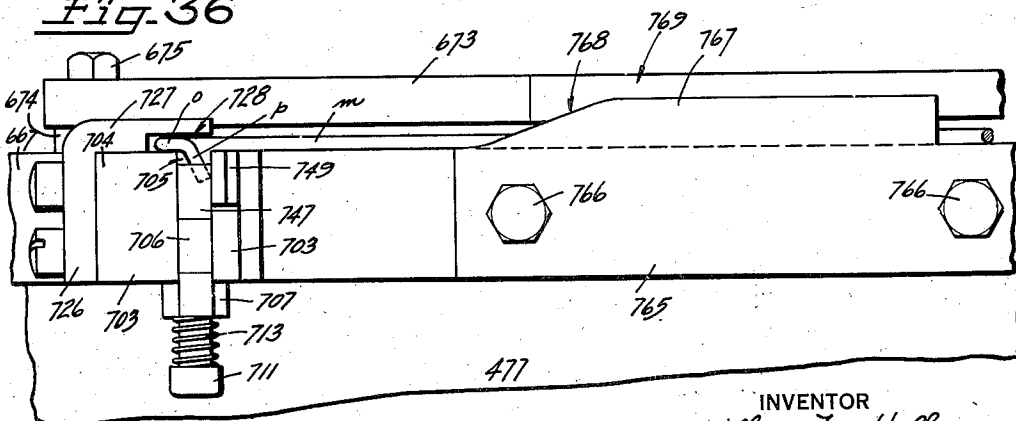


Fig. 36



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W. M. HOLLOWAY
BAIL INSERTING MACHINE

1,999,192

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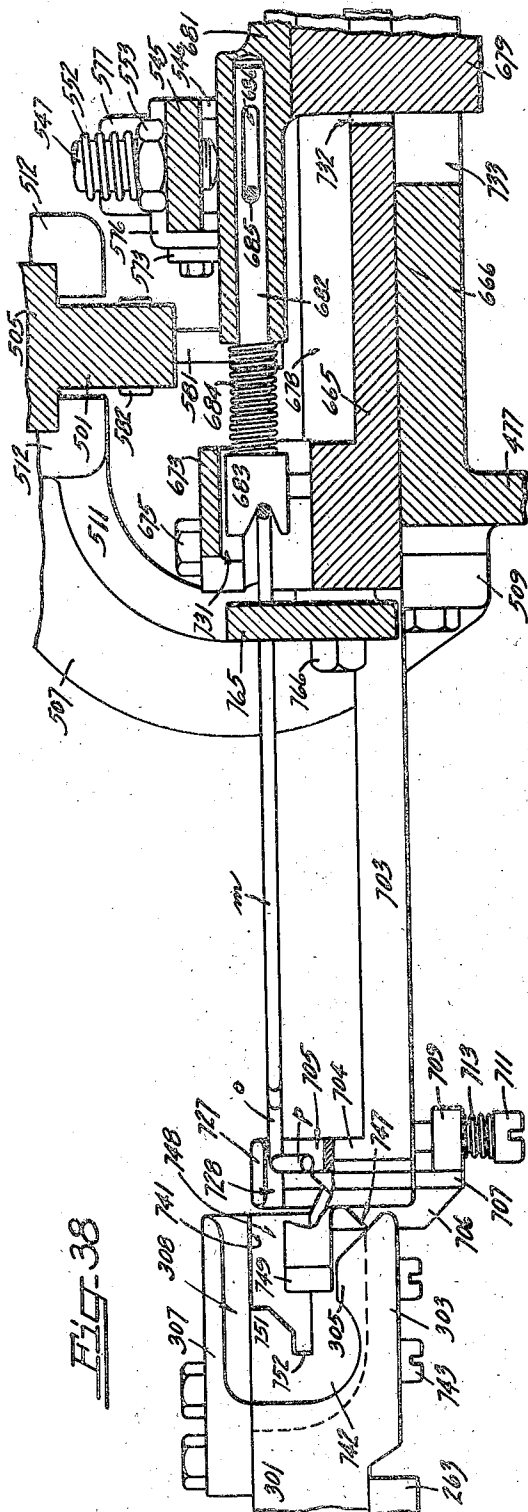


FIG-38

FIG-40

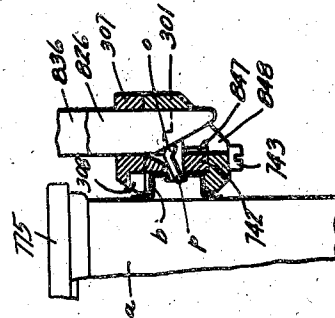
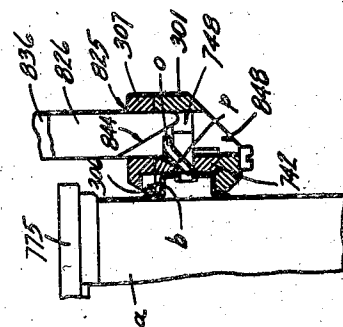


FIG-39



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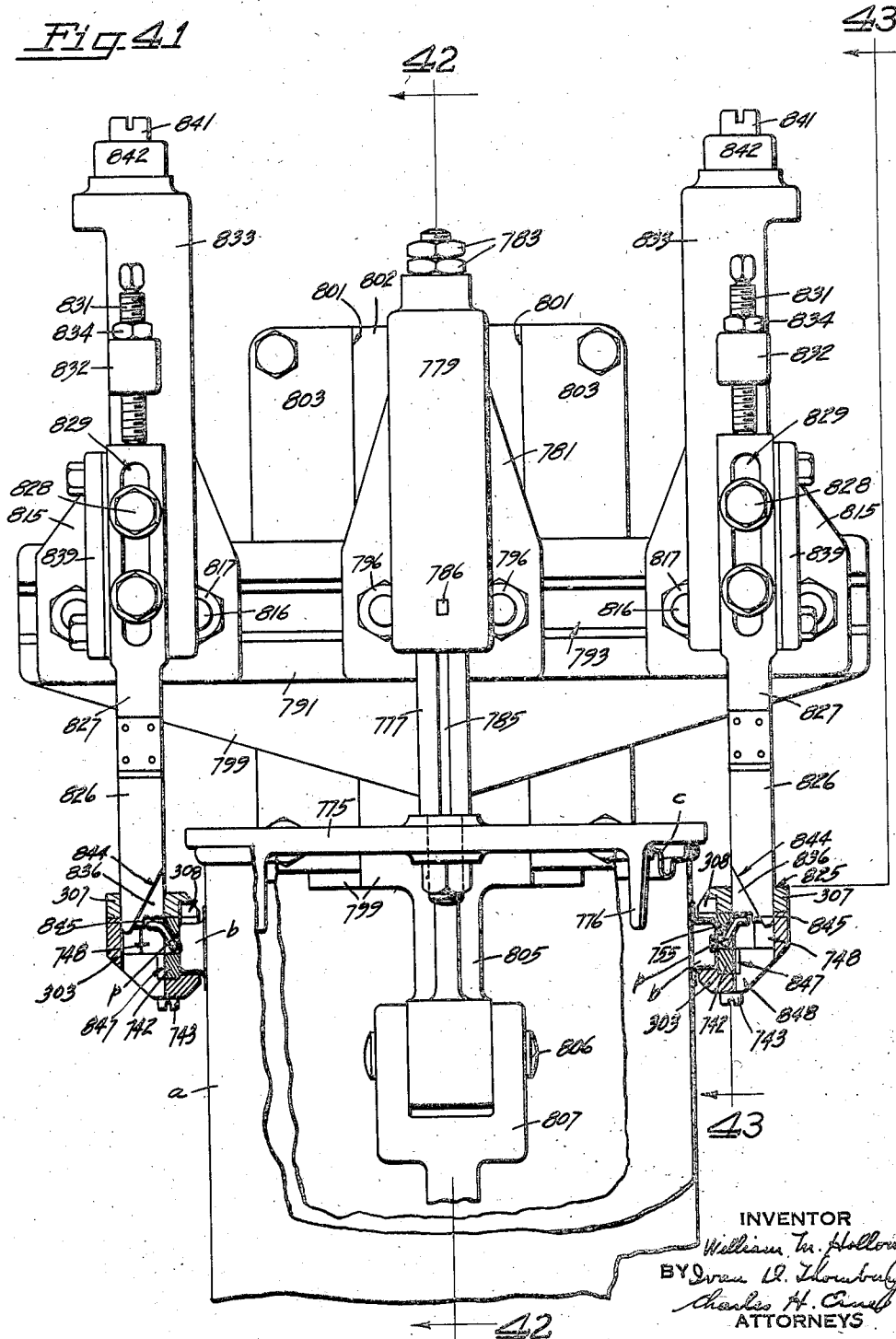
W. M. HOLLOWAY
BAIL INSERTING MACHINE

1,999,192

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21 Sheets-Sheet 20.

Fig. 41



April 30, 1935.

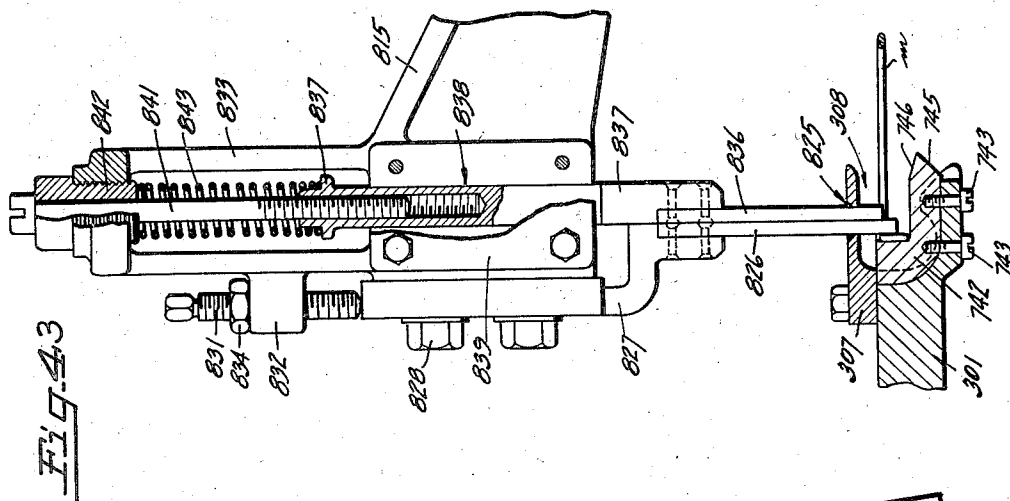
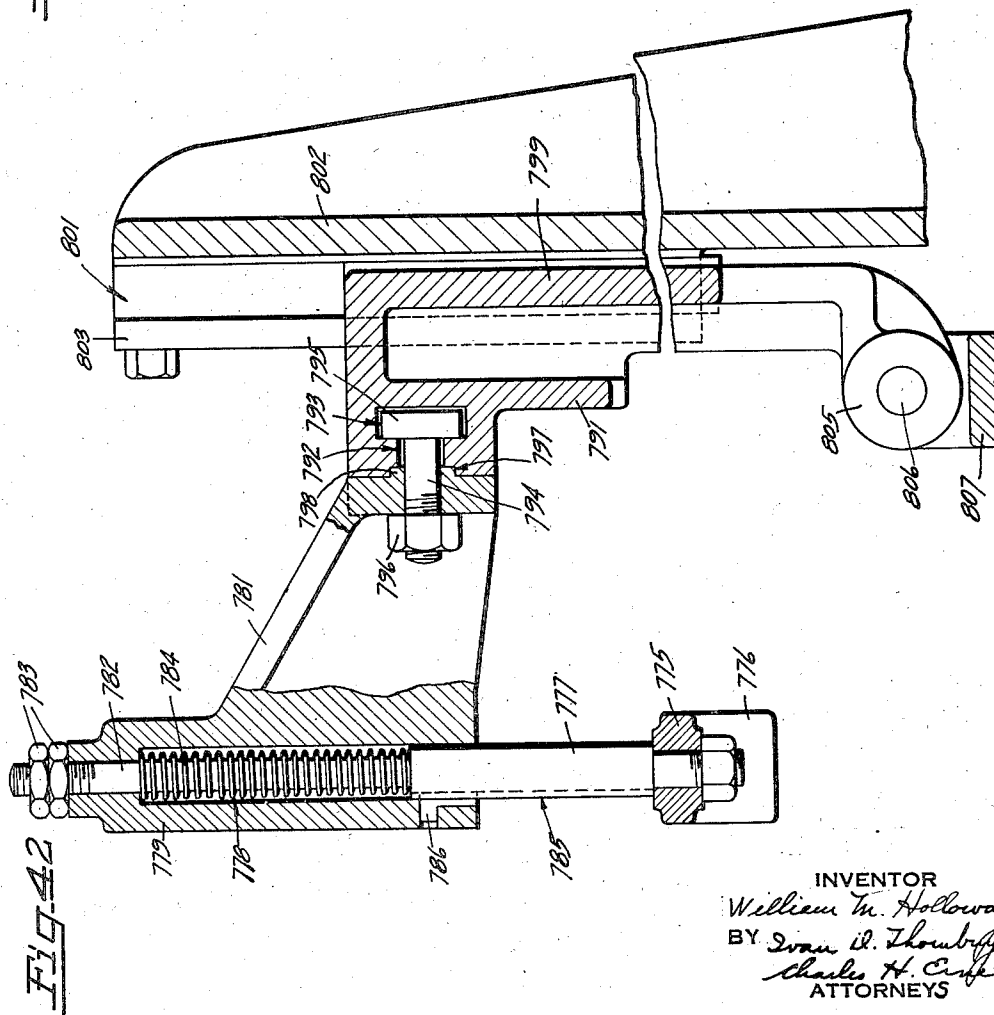
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BAIL INSERTING MACHINE

Filed June 24, 1933

21 Sheets-Sheet 21



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UNITED STATES PATENT OFFICE

1,999,192

BAIL INSERTING MACHINE

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Application June 24, 1933, Serial No. 677,495

32 Claims. (Cl. 140—93)

The present invention relates to bail inserting machines and has particular reference to associated devices in such machines for receiving cans having bail ears and supplying each can with a bail, all operations being performed automatically and without manual intervention.

The principal object of the present invention is the provision of an apparatus for receiving, in untimed order, cans having bail ears and for feeding bails from a stack of bails, the cans being positioned for the reception of the fed bails, the latter being prepared for insertion and brought to the positioned can, after which the bail is united with the can.

An important object of the invention is the provision of bail inserting devices for an apparatus of the character described which hold and spring the ends of the bails while pushing against them so that the bail ends snap into the bail ears and when fully inserted spring back to normal, thus preventing removal.

A further important object of the invention is the provision of bail handling devices for bail inserting machines which remove a flat bail from the bottom of a stack within a magazine and prepare the bail ends for insertion into can bail ears prior to assembling of bail and can.

An important object of the invention is the provision of a bail magazine and bail feeding devices for a bail inserting machine which permit replenishing of the bail supply by a new charge of bails without interrupting the bail feeding action.

Numerous other objects and advantages 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:

Figures 1 and 2 are plan views of an apparatus embodying the present invention, the first figure illustrating the rear half of the machine with parts broken away, the other figure illustrating the front end;

Fig. 3 is a side elevation of the apparatus as viewed from the left side of Figs. 1 and 2;

Fig. 4 is a side elevation of the apparatus as viewed from the right hand side of Figs. 1 and 2, part of the front end being broken away;

Fig. 5 is a transverse sectional view taken substantially along the broken line 5—5 in Fig. 2;

Figs. 6 and 7 are sectional plan views of the machine being taken from a horizontal plane designated by the line 6—6 in Fig. 5, the two fig-

ures when joined along their dot and dash lines collectively showing the full section;

Fig. 8 is an enlarged plan detail of that part of the can feed which is shown in the upper left hand corner of Fig. 2;

Fig. 9 is a cross section of the feed as viewed substantially along the line 9—9 in Fig. 8;

Fig. 10 is a view similar to the upper part of Fig. 9 illustrating the can feed parts in other positions;

Figs. 11, 12 and 13 are transverse sectional details taken respectively along the lines 11—11, 12—12 and 13—13 in Fig. 9;

Figs. 14 and 15 are transverse sectional views, partly broken away, taken respectively along the lines 14—14 and 15—15 in Fig. 1;

Fig. 16 is a front elevation of the bail magazine;

Fig. 17 is a side elevation of the middle portion of the mechanism illustrated in Fig. 16 parts being broken back;

Fig. 18 is a top plan view of the bail magazine as viewed substantially from a position along the line 18—18 in Fig. 16.

Fig. 19 is an enlarged plan sectional detail taken substantially along the line 19—19 in Fig. 16;

Fig. 20 is an enlarged plan sectional view taken substantially along the line 20—20 in Fig. 16;

Fig. 21 is a transverse sectional view taken substantially along the broken line 21—21 in Fig. 20;

Fig. 22 is a sectional view at right angles, being taken substantially along the line 22—22 in Fig. 20;

Fig. 23 is a sectional detail taken substantially along the broken line 23—23 in Fig. 20, parts being broken back;

Fig. 24 is a sectional detail taken substantially along the broken line 24—24 in Fig. 21;

Fig. 25 is a transverse sectional view taken substantially along the line 25—25 in Fig. 4;

Fig. 26 is a plan sectional detail taken substantially along the line 26—26 in Fig. 25;

Fig. 27 is an enlarged detail of one of the bail end bending devices as viewed from a position indicated by the line 27—27 in Fig. 1;

Fig. 28 is a fragmentary plan detail of a part of the bending die disclosed in section in Fig. 27, the line 28—28 in that figure indicating the position of view-point;

Fig. 29 is a transverse sectional view taken substantially along the broken line 29—29 in Fig. 27;

Fig. 30 is a sectional detail taken substantially along the line 30—30 in Fig. 29;

Fig. 31 is an enlarged sectional view taken substantially along the broken line 31—31 in Fig. 2,

parts being broken away, an alternate position of certain parts being indicated by dot-and-dash lines;

Fig. 32 is a perspective view of an insert block which is also shown in the left hand end of Fig. 31;

Figs. 33 and 34 are sectional details taken substantially along the respective section lines 33—33 and 34—34 in Fig. 31;

Fig. 35 is an enlarged fragmentary plan view partly in section of parts of the mechanism associated with the bail and can assembling station;

Fig. 36 is a side elevation of a portion of these parts as viewed substantially along the broken line 36—36 in Fig. 35;

Fig. 37 is a transverse sectional detail taken substantially along the line 37—37 in Fig. 35;

Fig. 38 is a view similar to Fig. 31 showing a slightly different section and a different position of some of the parts;

Figs. 39 and 40 are enlarged sectional details taken substantially along the line 39—39 in Fig. 2 and showing different positions of the bail and the bail inserting elements relative to the can bail receiving ears;

Fig. 41 is an enlarged elevation of the bail inserting devices, parts being broken away, the position of viewpoint being indicated by the broken line 41—41 in Fig. 3, this view embodying the same elements as are shown in the two preceding figures; and

Figs. 42 and 43 are transverse sectional views taken substantially along the respective straight and broken lines 42—42 and 43—43 in Fig. 41.

The apparatus illustrated in the drawings comprises a turret on which are mounted can ear holding and bail holding devices. Cans having bail ears are brought into the machine on an endless belt conveyor and are timed with the operations of the machine by being positioned into a transverse bar feed. This bar feed moves a can only when it is in proper timed position, a can trip device being used for the purpose.

The can is brought into a centering station by the bar feed and during its passage moves adjacent a positioning hook device. This device acts to initially and partially center the can by engaging one ear and turning the can on its vertical axis while it is still advancing so that the ears of each can come into substantially the same position at the centering station.

At the centering station reciprocating fingers operate and engage the bail ears and further shift the can on its vertical axis, this action bringing its ears into an exact position. From this station the can is again advanced by the bar feed which moves it into a can inserting position which is in direct alignment with one of the holding pockets of the turret.

The turret is intermittently moved and while at rest the can is transferred from its inserting position into the pocket of the turret. A reciprocating pusher head, engaging the can wall, effects this transfer of the can, its ears being positioned into ear holding pockets carried in the turret.

Balls having partially formed ends are held in stacked position within a magazine which is located at one side of and separated a slight distance from the turret. The supporting members for the balls include a lower and an upper unit, the latter being removable.

During the operation of the machine two or more upper units are used, one in the magazine, acting as a bail supply for the lower unit, the other upper units being used as auxiliary supply units. These are filled with bails outside of the

machine. A filled unit is substituted for the empty unit in the machine as soon as the bails are exhausted from the latter. This permits keeping a supply of bails in the magazine without interfering with the operations in the machine.

Bail feeding devices comprising threaded worm discs remove the lowermost bail from the magazine, there being a worm disc located at each side and these discs separate the lowermost bail at its two ends. The separated lowermost bail is brought down upon a feed plate which provides a track leading toward the turret.

Bail feeding devices operating in a slot in the plate move the separated bail with a step by step motion through two idle stations and bring it into a third or bending station. At the bending station the opposite ends of the bail are slightly bent by means of cooperating dies. The bail is thence transferred by the same feeding devices through a further idle station and is thence brought into position adjacent to the turret.

The cross-feed device which next comes into play operates to transfer the bent bail into bail holding devices associated with the can ear pockets on the turret. This cross feed first brings the bail ends into retaining members carried in the feeding device and then the bail is moved into assembled position with the can in the turret pocket. Such a movement of the cross feed brings the opposite ends of the bail so that it is spread around the can wall, the ends of the bail being adjacent the bail ears.

Both bail and can are now moved at the next step advance of the turret, first into an idle station and at the second step movement into a bail inserting station. The inserting mechanism includes devices for accurately registering a bail ear with an end of the bail, a locating member descending into and holding the can.

While holding both ears and bail in proper position the inserting elements spring the ends of the bail without distorting them so that they will enter the ears and while holding the ends under tension force them into the ears. As the bail comes into inserted position its ends snap into place within the ears. The natural spring of the metal in the bail brings the ends back into the bent shape given them in the bending dies and the bail is then securely and permanently in place on the can end and cannot be displaced or pulled out.

The next step rotation of the turret carries the can with its attached bail into an idle station and on the second movement it is carried into a discharge station. An arm carried on the upper end of a reciprocating lever moves against the body of the can and transfers it laterally from out of the turret pocket and onto a continually moving discharge belt which carries it out of the machine.

General construction

In further detail, the bail inserting machine illustrated in the drawings comprises a series of operating, supporting and associated parts which are carried within or mounted upon two main frames or housing sections 51, 52 (Figs. 1, 2, 6 and 7). The housing 51 (Figs. 3, 4 and 5) is carried upon legs 53 and the housing 52 (Fig. 16) is similarly carried upon legs 54.

The housing 51 (Figs. 2 and 5) supports an assembly turret 55 which is keyed to the upper end of a vertical shaft 56 journaled at its lower end in a bearing 57 formed in the housing 51 and also journaled just beneath the turret 55 in a

bearing 50 formed in a cover plate 59 resting upon and bolted to the housing 51. The turret 55 carries a turret plate 61 which is bolted on top of the turret and which supports certain holding devices which will be hereinafter described.

In the description that follows the various parts of the apparatus will be roughly grouped according to functions performed by the various units and these units will be interassociated as nearly as practical to bring out the natural sequence of operations performed upon the can and the bail as they are individually and collectively passed through the machine.

Can feed

Cans *a* (Figs. 1 and 3) having bail receiving ears *b* soldered or otherwise secured to the side wall are brought into the machine on an entrance belt 67 which passes at the machine end over a drive pulley 68 mounted on a horizontal shaft 69 journaled in a bearing 70 formed in a bracket 71 and in a bearing 72 formed in a bracket 73. The brackets 71, 73 are bolted to a vertical wall of the housing 51.

The pulley 68 and shaft 69 are adapted to be continually rotated so that the upper run of the belt 67 moves toward the machine and conveys the cans in untimed order into the first machine position. The rotations of shaft and pulley are effected by a chain drive which comprises a sprocket 81 (Figs. 3 and 6) which is fastened to one end of the shaft 69. A chain 82 operates over the sprocket and over a second sprocket 83 carried on a horizontal drive shaft 84 journaled in three different bearings 85 formed in the housing 51.

This drive shaft is continually rotated by suitable power applied to a drive pulley 86 carried on one end of the shaft. As the cans *a* pass over the pulley 68, they leave the belt 67 and move onto the upper surface of a table 91 (Figs. 1, 3 and 15). Table 91 is mounted upon and carried by the housing 51.

The cans during their passage over the table 91 are guided between side guide bars 92, 93. The bar 92 is bent near its center to provide two right angled legs, one leg being carried in a bracket 95, the other in a bracket 96. Both brackets rest upon and are supported by the housing 51. The bar 93 is likewise bent, one leg being supported in a bracket 97, the other in a bracket 98 and both brackets 97, 98 are supported by the housing 51.

A can *a* after passing over the pulley and after coming onto the upper surface of the table is no longer moved by the belt 67 but succeeding cans while still on the belt push against the cans in front and move them along the table. The cans are prevented from upward movement by a top rail 101 which, like the bars 92, 93 is bent into right angled legs, one leg being supported on a bracket 102 carried in a bracket 97, and the other in a double bracket 103 bolted to and supported by the bracket 98.

A can *a* leaving the belt 67 is pushed along until it strikes against the farther right angled leg of the guide rail 93 at a position marked A (Fig. 1). In such position it is directly over a cross feed bar unit which operates in the table 91. This feed unit is adapted to move the can at right angles or toward the right as viewed in Fig. 1.

This unit comprises a feed bar 111 (Figs. 8, 9 and 13) which has sliding movement within a

groove 112 formed in the table 91. The feed bar is held in the table groove and in sliding position by two spaced plates 113 seated in slots 114 cut in the table, these plates extending over the bar.

The table 91 beneath the groove 112 is cut away as at 115 and this opening in the table allows for clearance of an arm 116 which is bolted below and at one end of the feed bar 111. This block 116 is preferably an integral part of a sleeve 117 which is located below and to one side of the bar 111, the sleeve having sliding support on a horizontal rod 118 carried in bosses 119 formed in the table 91.

The feed bar is moved back and forth by movement of the sleeve 117 and for this purpose the latter is pivotally connected at 121 (Figs. 9 and 11) to a block 122 adjustably secured on one end of a connecting rod 123. The opposite end of the rod is threadedly secured to a block 124. Block 124 is pivotally connected to the upper end of an arm 125 which is pivotally supported on a stub shaft 126 carried in a bracket 127 bolted to the housing 51.

The arm 125 is rocked back and forth and for this purpose is pivotally connected at 131 (Figs. 6 and 9) to a block 132 which is threadedly engaged on one end of a connecting rod 133. This rod connects at its other end with an eccentric strap 134 which surrounds an eccentric 135 carried on a horizontal main shaft 136.

The main shaft 136 is at right angles to the drive shaft 84 and extends into the two housings 51, 52. It is journaled in three bearings 137 (Figs. 6 and 7) formed in the housing 51 and in a like number of bearings 138 formed in the housing 52. This main shaft actuates a number of the mechanisms of the apparatus, as will be hereinafter described. It is driven from the drive shaft 84. A pair of bevel gears 139, 141 mounted respectively on the shafts 136, 84 are utilized for this purpose.

The feed bar 111 is slotted at one end at 145 (Figs. 10 and 11) and a feed finger 146 is located in the slot, being pivoted on a pin 147 carried in the feed bar. This feed finger carries a felt button 148 the ends of which press against the walls of the slot 145 so that the feed finger is frictionally retained in one of two positions.

In one position it projects above the feed bar, this being a can feeding position, in its other position it is below the surface of the table 91, a non-feeding position. It is positively lowered, if in raised position, each time the feed bar comes back preparatory to a feeding stroke, and if already down it stays down at such a time. This lowering action will first be considered.

Reference should be had to Figs. 8 and 10. A spring pressed plate 149 is located in a slot formed in the under side of one of the plates 113 and is backed up by a spring 150. Its inner edge projects into the path of travel of the finger 146. When the finger moves back with the feed bar 111 it strikes the sharp forward corner of the plate 149 (if it is in raised position). Continued backward movement of the finger carries it under what in that direction is an unyielding plate 149 and the finger rocks on its pivot 147 as it passes beneath the plate. It thus entirely disappears within the bar slot 145 (Fig. 10). It will be understood that the spring 150 does not yield at such time as its yielding action is transverse and not longitudinal of the plate 149.

Whether the finger 146 will remain depressed as the feed bar 111 again carries it forward or will be raised into can feeding position depends

upon whether a can is in proper position to be advanced. A trip device is utilized to raise the finger for feeding when desired.

Can trip

A can *a*, in coming into position A (Fig. 1), strikes against a lever 151 (Figs. 2 and 8) which is pivoted on a pin 152 carried in the table 91. The moving can rocks the lever on its pivot. The opposite end of the lever is loosely connected at 153 to a slide bar 154 which is slidably engaged in grooves cut in the under surface of a pair of spaced brackets 155 which are bolted at 156 to the table 91. A retaining plate 157 is secured to each bracket 155 by bolts 158 and this holds the bar within its groove.

The bar 154 is normally held as shown in Fig. 2 so that the free end of the lever 151 extends into the path of travel of the can. A spring 159 interposed between one of the bracket bolts 158 (see also Figs. 3 and 8) and a pin 160 carried on the bar 154 holds the latter in its non-operated position. When a can engages the lever 151 and rocks it on its pivot 152, bar 154 is moved into operated position (Fig. 8) against the force of the spring 159.

The bar 154 (Figs. 8 and 9) carries a slotted strap 161 which is adjustably secured to the bar and the strap is formed with an inclined head 162. When the bar 154 is in operated or shifted position the inclined head of the strap is in the path of travel of the finger 146.

When the feed bar 111 approaches the end of its backward stroke an inclined rear end 163 of the finger 146 engages the inclined head 162 of the strap 161 and the finger 146 is rocked on its pivot and its forward end is raised above the surface of the table as illustrated in Fig. 9. The can still crowding against the end of the lever 151 holds the strap 161 in its finger engaging position throughout such finger rocking movement.

Upon the next forward stroke of the feed bar the finger engages behind the can and slides it toward the right (Fig. 1) over the upper surface of the table 91 from station A to a centering station B. In this travel the can is guided between the bars 32, 33 and under the top rail 101.

Referring again to Fig. 8 it will be observed that the projecting inner edge of the plate 149 is in the path of the advancing finger 146. The near corner of this plate, however, is cut away at 164 and the inclined wall so formed, when engaged by the finger, moves back under the yielding action of the spring 150 and the plate 149 moves back out of the path of the raised feed finger. It will be understood that the incline wall at the corner 164 of the plate when engaged by the feed finger permits sufficient sidewise movement of the plate at the engaged end to move alongside of the feed finger and after that the finger itself pushes the plate back against the spring.

Bail ear locating

Provision is made for engaging one of the bail ears *b* of the can during this travel from station A, such engagement taking place irrespective of the position of the ear. For this purpose a lever 165 (Figs. 1, 2 and 3) having a hooked front end 166 is located at one side of the can path, its hooked end 166 extending into the can path.

Lever 165 is pivotally mounted on a vertical pin 167 which is carried in a bracket 168 bolted on the housing 51. The opposite end of the lever 165 is connected, by a universal joint unit 171,

to a connecting rod 172. The opposite end of the rod is similarly connected, by a universal joint unit 173, to the upper end of a lever 174, which is pivoted at 175 on a bracket 176 carried by the table 91.

The lower end of the lever 174 rotatably supports a cam roller 177 which engages a peripheral cam surface of a cam 178 (Figs. 3 and 6) mounted on the drive shaft 34 adjacent the sprocket 33. A spring 181 (Figs. 1 and 3) is connected to a pin 182 carried in the lever 174 and a pin 183 carried in the wall of the table 91.

This spring holds the cam roller 177 against the face of the cam 178 most of the time. The tendency of the spring 181, in its action on the lever 165, is to pull the hooked end 166 of the latter out of the path of travel of the can. The cam 178 prevents such action except at the proper time.

The shape of the cam is such that as soon as the moving can engages the lever end, the latter is pulled around the wall of the can while the can continues its forward movement. The hook part of the hooked end engages the can wall until the center of the can passes the end and after that the adjacent back or rounded part of the end follows around, remaining in engagement with the can wall.

In other words, when the can center passes the forward end of the lever, the latter moves back into place within the runway, at all times keeping in engagement with the can wall. Somewhere between the time the end of the lever 165 first engages the can wall and until it leaves the wall, the lever hook engages one of the bail ears *b* of the can. The actual time of such engagement depends upon the position of the can ears when the can first begins its cross travel from station A. Fig. 2 illustrates an initial bail ear engagement.

As soon as an engagement with an ear takes place, the can begins to rotate on its axis while still moving forward, the engaged ear being held by the lever 165. After the center of the can passes, the back or rounded edge of the end 166 (if an ear has been engaged by that time) pushes inwardly against the ear continuing the rotation of the can as it moves forward until it comes to final position at station B.

Fig. 1 illustrates such a final engagement of the lever end 166 with a bail ear. Some of the cans, when the ear is forward, must be turned on their axis through nearly a half turn. Some, when the ear is behind as the can advances need be turned through only a few degrees and in an extreme case not at all.

Irrespective of where the bail ear *b* first engages the end 166 of the lever 165 each can comes into the centering station B with its ears in substantially the same relative position. While the action just described is in a sense a can centering action, the final centering of the can and the exact positioning of its ears is accomplished after the can has come into station B. This will now be described.

Can centering

The can *a* at the centering station B is further shifted on its vertical axis to bring the two ears in direct alignment over the feed bar 111. This takes place while the feed bar is moving back into position and while the can remains in place at the station.

A bracket 191 (Figs. 1 and 14) is carried upon the housing 51 and is formed at the top with a

flat horizontal wall 192 which provides a sliding support for a slide 193. This slide is wider than the wall 192 of the bracket and extends down over the sides, slide gibs 194 bolted to the edges of the slide from below, retaining it in sliding position. The bracket 191 is in alignment with the can at station B, this can being confined between the table 91 and the upper guide rail 101 and between the side guide bars 92, 93.

The slide 193 carries a pair of bell crank levers 196 which are pivotally mounted on vertical studs 197, an arm of each bell crank lever extending forward or toward station B. These arms are normally parallel to the side edges of the bracket top 192 as in Fig. 1. A spring 198 is connected to the two arms.

A flexible blade 199 is secured to an arm of each bell crank lever and projects forwardly beyond the lever arm. An opposite arm of each lever 196 is bifurcated at 201 (Fig. 14) and an adjusting bolt 202 is located between the spaced parts of the arm. The head of the bolt forms a stop against the lever arm and its shank is threadedly connected in a bracket 203. The two brackets are carried on the slide 193.

A stop nut 204 is threaded on each bolt 202 and provides a stop for its associated arm 201 when its bell crank lever moves on its pivot 197 in one direction, this being against the action of the spring 198. The head of each bolt 202 forms the stop for limiting its lever movement in the opposite direction.

A link 209 connected with the brackets 203 extends rearwardly and its end is pivotally connected at 211 to the upper end of an arm 213. This arm is preferably formed as an integral part of a sleeve 214 which is loosely mounted on a horizontal shaft 215. Shaft 215 is mounted in bearings 216 of brackets 217 which are bolted on the side of the housing 51.

A curved arm 218 (Figs. 1, 6 and 14) extends upwardly from the sleeve 214, being preferably an integral part of the sleeve. This arm carries a cam roller 221 which operates in a cam groove 222 formed in the face of a cam 223 secured to the drive shaft 84. The action of the cam 223 upon the slide 193 and parts associated therewith is such as to move the blades 199 toward the stationary can *a* as it rests at station B.

In this movement the spring-like, flexible blades first engage the can wall and then spread apart as they pass around on either side of the can. In spreading they rock their bell crank levers 196 on the pivots 197. Bifurcated ends 201 of the levers strike against the nuts 204 and while the slide 193 continues to move inwardly the elasticity in the blades 199 permits them further spreading apart at their forward ends while they continue to move along the body wall.

One blade end first engages the closest bail ear *b*, this ear being in front of the can, as considered in its previous travel into station B. The slide member 193 continues moving and the engaged ear is forced back, this action rotating or shifting the can on its vertical center until the opposite ear (in the rear of the can) is brought against the end of the other blade. When both ears are so engaged the slide member is in its forward position.

The ends of the blades 199 always engage and locate the bail ears as just described since the ears are always positioned crosswise of the travel of the slide 193 by the pre-centering action of the hooked end 166 of the lever 165. If this provision was not made it would be possible for

the blades to entirely miss the ears if they were positioned inside of lines of travel of the blades.

This accurately centers each can so that its bail ears are in alignment over the center of the feed bar 111. The blades 199 with the slide 193, are then withdrawn from the can leaving it in its centered position and ready for transfer into the next station C (Fig. 1). This station is located adjacent the station B and is a can positioning station.

During the return movement of the bar 111 with its feed finger 146, a second feed finger 231 (Figs. 10 and 12) ahead of finger 146, is moving under the can being centered at station B. Finger 231 is pivotally mounted on a stud 232 carried in the feed bar 111, the bar being slotted at 233 for its clearance. This finger is also slotted in its upper end 234, this end constituting the can feeding element.

During the backward movement of the feed bar 111 this end 234 of the finger 231 engages the bottom of the can and is moved in a clockwise direction (as viewed in Fig. 10). The finger end is thus depressed and brought within the slot 233, allowing the finger to pass under the can.

Two inclined surfaces 235, 236 are formed in this part of the finger at the base of the slot and one end of a leaf spring 237 extends into the slot of the finger, the bar being cut away at 239 adjacent the slot 233 for clearance of the spring. A screw 241 holds the opposite end of the spring on the feed bar.

With the finger 231 in the depressed position illustrated in Fig. 10, the end of the spring 237 engages the surface 236 and holds the finger depressed. The surface 235 is similarly used to hold the finger 231 in its raised can feeding position.

The lower end of finger 231 extends downwardly below the surface of the bar 111 as a projection 244 and as the finger approaches its rearmost position (toward the left Figs. 9 and 10) this part 244 engages an inclined head 245 of a positioning bar 246 which is carried in lugs 247 formed in the table 91 directly below the slot 112. This bar 246 is held in a fixed adjusted position by a set-screw 248 threadedly engaged in one lug 247.

The feed bar 111 moves further and the finger 231 is rocked in a counter-clockwise direction, its slotted end 234 coming into raised position (Fig. 9). The end 234 is directly back of the can at the centering station B at such a time.

The end of the spring 237 now rests upon the surface 235 of the finger 231 and this holds the finger in its feeding position. In the raised position of the finger, its projection 244 engages an inclined surface 249 formed in the bar 111 as a part of the wall of the slot 233. This forms a limit stop and prevents any further counter-clockwise movement of the finger as the bar 111 begins its forward feeding travel.

During the following feeding stroke of the feed bar 111 (Fig. 1) the can *a* is moved from station B into the can positioning station C where it is in position for removal into the turret 55. The turret and its manner of rotation will now be considered.

Turret actuation

The turret 55 is advanced in a step by step movement by means of a type of Geneva drive. This is best illustrated in Figs. 3, 5 and 7 and constitutes a disc 250 which is keyed to the turret shaft 56 just beneath its bearing 58. This disc carries a series of spaced vertically disposed bolts 251, there being a bolt for each turret pocket

formed in the turret proper just above, the bolts being spaced in alignment with such pockets. Eight bolts 251 are disclosed in the drawings.

A tapered roller 252 is rotatably mounted on the lower end of each bolt 251 and each roller is successively engaged within a peripheral cam groove 253 of a barrel cam 254 which is keyed to and mounted upon a horizontal Geneva shaft 255. The cam groove 253 extends substantially through a circumferential distance of 180°, one end of the groove being spaced longitudinally of the shaft 255 a distance from the opposite end equal to the distance between two adjacent rollers 252.

Rotation of the cam 254 with its shaft 255 brings one end of its groove 253 to one of the rollers 252, whereupon continued rotation of the cam, its groove then operating on the roller, moves the disc 250 and turret shaft 56 around the axis of the latter, this step moving the turret 55. The engaged roller passes out of the opposite end of the cam groove after an approximate half revolution of the cam shaft 255 and further movement of the turret ceases.

A flat sector locking plate 256 is bolted on one side of the cam 254 and is so arranged relative to the cam groove that one peripheral edge of the plate passes into a radially disposed groove 257 formed on the under surface of the disc 250 immediately the cam groove 253 leaves the roller 252. This locking plate holds the disc 250, the turret shaft 56 and the turret 55 in stationary position throughout the completion of the one rotation of the cam 254. There is a groove 257 cut in the disc for each of the bolts 251.

The Geneva shaft 255 is journaled in bearings 258 (Figs. 3, 6 and 7) formed in the housing 51. A bevel gear 259 is secured to one end of the shaft 255 and meshes with a similar gear 261 which is secured to the drive shaft 84. In this manner the shaft 255 and cam 254 are constantly rotated and this rotation through the Geneva unit just described intermittently advances the turret in a step by step movement.

The turret 55 and the turret plate or disc 61 (Figs. 2 and 5) are respectively formed with aligned can receiving pockets 262, 263 there being eight of these double pockets. The centered can *a* resting in station C is now fed into an aligned turret double pocket which at such time is at a position or station D (Figs. 1 and 2).

Can fed into turret

The can inserting apparatus is located, generally, in alignment with stations D and C and comprises a pusher head 265 (Figs. 1 and 15) which is located on the forward end of a horizontal slide bar 266. This bar slides in grooves 267 cut in lugs 268 of a bracket 269 mounted upon and bolted to the housing 51. Plates 271 rest on top of and are bolted to the lugs 268 and retain the bar 266 in its sliding position.

Bar 266 and head 265 are moved back and forth by cam action and for this purpose a connecting block 274 is adjustably secured to the bar between the lugs 268, a set screw 275 being used for this purpose.

The block 274 is pivotally connected to the ends of a pair of links 276, the opposite link ends connecting to the sections of an upper bifurcated end 277 of an arm 278 (see also Fig. 6). The arm 278 is preferably an integral part of a sleeve 279 which is mounted on the shaft 215 adjacent the sleeve 214.

The arm 278, like the arm 213, is rocked back

and forth and for this purpose a yoke 281 is pivotally connected at 282 to the arm. The forked end of the yoke slides on the drive shaft 84 and a cam roller 283, carried by the yoke, operates in a cam groove 284 formed in a face cam 285 secured to the drive shaft 84 adjacent the cam 223.

Sliding of the bar 266 under the cam controlled movement of the arm 278 pushes the can *a* from station C into a waiting double turret pocket 262, 263 at station D. In this travel of the can, a straight leg 286 (Figs. 1, 2 and 5) of a circular guide rail, hereinafter described, guides the can in a straight line and places it into a pair of spring held flexible clamping jaws or blades 291 associated with each turret pocket and carried by the turret.

Each blade 291 is pivotally mounted on a pin 292 which is supported by the turret plate 61, each pin and the end of the blade being held in a bracket 293 bolted to and resting upon the turret plate. The two flexible blades 291 of each pair of blades are connected by a spring 294 which normally hold their free ends in partially opened position, these blade ends extending above the associated turret pocket 263.

When a can is forced into the turret pocket the blades are first spread apart, the yielding action of the spring 294 permitting this. As the can moves further into and comes to rest within the turret pocket the blades spring slightly, clamping around the outer wall of the can, holding it in fully inserted position within the turret.

The bail ears *b* of the can *a*, which is thus positioned into the turret pocket 262, 263, pass into ear holding seats or pockets located at the sides of the can turret pocket. These seats are carried in bars 301 (Figs. 2, 15, 31 and 35) bolted on the turret plate 61. Such a bar is located on each side of a turret pocket 263, one end of the bar extending beyond the periphery of the turret plate.

The outer end of each bar 301 is cut away at 302 along its inner side wall. The portion of the bar below the cut away section is designated by the numeral 303 in Figs. 31 and 35 and the can wall moves along this section as the can is being inserted into the turret pocket. The top surface of this bar section 303 is formed with an inclined wall 304 which merges into a flattened crest 305 dropping into the ear pockets 306. A cover plate 307 (Figs. 2 and 3) is bolted on top of the end of each bar 301 and these plates cover the ear pockets 306, the ears *b* moving under the plates. A side recess 308 cut in each overhanging plate 307 joins with the recess 302 in each bar 301 and provides clearance for the bail ears.

The two ears *b* now remain seated in the pockets 306 and the can remains clamped in place between the blades 291 throughout a number of step movements of the turret which follow. In this way the can is presented to the various operating stations arranged along the periphery of the turret.

The station adjacent station D is an idle station E (Fig. 2). Adjacent this is a bail receiving station F, thence a second idle station G, a bail inserting station H, a third idle station I and lastly a discharge station J. From station J the can, having at that time a bail, is removed from the turret. The operations performed at the active stations F, H and J will be fully described in their proper order in the pages that follow.

In leaving station D, the can *a* is slid from the table 91 (Figs. 2 and 5) onto the upper surface of a circular table 311 which is bolted to and mount-

ed upon the cover plate 59. In passing through the stations E to J, inclusive, the can is slid over the surface of the circular table, a circular guide rail 312 keeping the can within its proper path of travel. This guide rail cooperates with the clamping plates 291 and the holding bars 301 with their ear pockets 336, to maintain the can in proper position within its turret pocket. The circular guide rail 312 is carried on brackets 313 mounted on the table 311, and is an integral part of the straight leg 286 previously referred to. This leg section is secured to a bracket 314 (Figs. 1 and 2) mounted on the housing 51.

It is at station F that a bail is received into the turret with its ends brought adjacent the bail ears b of the can a held in the turret pocket at that station. The operations connected with the supplying of bails to the positioned cans will next be described.

Bail magazine

Bails *m* are placed in stack formation in a bail magazine located at a station L (Fig. 1) and are individually separated from the bottom of the stack. Each bail *m* is then intermittently advanced along a straight line of travel successively through idle stations M then N and into a bending station O. From station O the bail is then further advanced through an idle station P (Fig. 2) and thence into a station Q where it is directly opposite the turret station F. A transverse feeding of the bail thereupon brings it to the can in the turret pocket at the latter station. This bail movement will be fully described hereinafter but first the bail magazine and the parts located at station L will be considered.

The bail magazine, designated generally by the numeral 321, is located on the supplemental housing section 52. The top of this housing (Figs. 1, 20 and 21) is formed as a horizontal table 322. Parts of the apparatus associated with the magazine 321 are carried in a pair of bracket housings 323 (see also Fig. 17), a housing being spaced on each side of the stack of bails and bolted on the table 322.

The bails *m* rest in the magazine with their bowed central sections extending outwardly toward one edge of the table 322. The complete magazine extends vertically for a substantial distance, being composed generally of two sections, one above the other. The bails in the lower section extend up slightly above the top of the housings 323 and loosely engage around a semi-circular shell 326 in the lower section.

Shell 326 is moved up and down within the stack and helps keep the proper stack form. On its downward movement it positively moves the bails in the lower section down into the separating elements as will be hereinafter fully described.

To provide for this movement the shell 326 is pivotally connected at 327, 328 (Fig. 21) to the forward ends of an upper arm 329 and a lower arm 331 (see also Fig. 20), these arms being pivoted on horizontal shafts 332, 333 carried in a bracket 334. Bracket 334 is bolted to the table 322 and is located back and centrally of the two housings 323.

The lower arm 331 is pivotally connected at 341 to the upper end of an adjustable connecting rod 342 which extends downwardly through an opening 343 cut in the table 322. Its lower end is connected with an eccentric strap 344 which surrounds an eccentric 345 keyed on the main shaft 136 (see also Fig. 6). Eccentric strap, eccentric

and connecting rod are all located inside of the housing 52.

The shell 326 (Figs. 20 and 21) carries a bar 346 which is loosely mounted in a vertical groove formed in the front wall of the shell. It is held against vertical movement by bolts 347. Springs 348 are located in counter-bores 349 cut in the bar so that one end of each spring bears against the forward circular face of the shell at the base of the groove and normally forces the bar outwardly where it rests against the inside of the bails and helps preserve their stacked form (Fig. 17).

An auxiliary magazine shell 351 is mounted upon and carried by the upper end of the shell 326 and forms in part the upper magazine section previously referred to. The shell 326 (Figs. 17 and 21) is provided with a top plate 352 and the auxiliary shell 351 has a bottom member 353 which engages this top plate when the auxiliary shell is in place.

This auxiliary shell is removable and so that it may be as light as possible it is formed as a mere skeleton with a top member 354 (Figs. 13 and 21) similar to its bottom member 353 and these members are connected together by a front bar 355 and a pair of side bars 356. This skeleton or auxiliary shell is held on the shell 326 by a latch device located in the bottom part of the former.

The bottom 353 of the auxiliary shell is apertured at 357 for the reception of taper head posts 358 which are carried in the top wall 352. The wall 352 is extended rearwardly and supports a bracket 365 which projects vertically and is just back of the rear edge of the member 353 when the shells 326, 351 are assembled.

The bracket 365 carries the locking element which is a finger 366 pivotally connected at 367. The locking position of the finger is illustrated in Fig. 21, its lower end engaging the shell member 353 and holding the auxiliary shell 351 down over the posts 358. The upper end of the finger 366 is extended at 368 and a spring 369 connects between this point and a post 371 carried by the bracket 365. This holds the finger in locking position, a stop 372 on the finger being held against the bracket 365.

When the auxiliary shell 351 becomes empty, i. e., when the bail stack, feeding from the magazine, is depleted to a position where its top bail passes from the bar 355 of the top section onto the bar 346 of the bottom section, it is time for the upper shell to be lifted off so that its bail supply may be replenished.

The top ends of the two side bars 356 of the auxiliary shell 351 rest in pockets 381 (Figs. 16, 18 and 21) provided by two spaced guide bars 382 mounted on brackets 383 which in turn are carried by the bracket housings 323. Each bar 382 at its upper end carries two plates, one a plate 385 bolted to it in back and the other a plate 386 similarly bolted in front. These plates and their associated bar 382 provide pockets 381.

To remove the auxiliary shell 351 the finger 366 is drawn back against the action of the spring 369 so that its lower end will clear the member 353. Shell 351 is then lifted vertically until its bottom 353 is clear of the posts 358, after which its lower end is rocked forward sufficiently to disengage it entirely from the lower shell 326. It can then be pulled down out of the pockets 381 and lifted entirely free of the machine.

This removal of the auxiliary shell 351 from

the magazine is done without interrupting the operations of the machine and without affecting the bails being fed from the bottom of the stack. In practice, two or more auxiliary shells 351

are kept on hand and one is being loaded with a supply of bails while bails are passing along the auxiliary shell in the magazine. As soon as an empty shell is taken out a new one is positioned in place with a new supply of bails.

All of the time this removal and replacement of auxiliary shells is taking place, the lower magazine shell 326 is bumping up and down and the bails *m* are constantly moving down as they maintain stacked form and as they are being fed individually from the bottom of the stack at the lower end of the magazine. During their passage through the magazine their hooked ends are accurately guided, as will now be explained.

The two ends of each bail *m* are bent at right angles into hooked form as designated by the letter *o* (Figs. 18 and 19), all parts of the bail at this time being in the same plane. It is these two ends *o* that provide the accurate register for the bails as they are guided downwardly in between the guide bars 392 (see also Fig. 16) and also as they are further advanced in their passage beyond the lower ends of these bars and in between the housings 323.

When in the auxiliary magazine 351 the bail ends *o* are guided in vertical passageways formed in part in the side bars 356. For this purpose the rear face of each bar is notched at 397 (Fig. 18) and a plate 388 is similarly notched at 399 and is bolted on the back of each of the side bars. When the bails in passing downwardly through the magazine come to the end of the upper section or auxiliary magazine 351 their ends *o* pass from the passageways formed in the bars 356 and plates 388 and enter other similar aligned passageways associated with the lower section of the magazine.

The shell 326 carries a pair of side bars 391 (Figs. 19 and 20) which are directly in alignment with and beneath the side bars 356 and which are similarly notched at 392 to provide a part of the passageways. A rear plate 393 is bolted on the face of each bar 391 and is also notched at 394. The notches 392, 394 thus provide the lower passageways for the bail ends *o* as they come from above and these ends are retained in the lower passageways until the bails *m* are removed from the magazine.

Not only are the bail ends guided in the lower passageways of the side bars 391 but they are maintained in even stacked position during their downward travel through this section of the magazine. The up and down movement of the shell 326 cooperates with holding elements mounted in the path of travel of the bail ends and this co-operation produces the desired results. The holding elements prevent the bails *m* being carried up when the shell moves up.

The holding elements comprise a series of gravity fingers 401 (Figs. 19, 20, 22 and 23) mounted on each side of the magazine. The fingers on each side are arranged in a vertical alignment, one above the other. Each finger is pivoted on a horizontal pin 402 which is held in a plate 403 bolted at 404 alongside of an extension housing 405 of the bracket housing 323.

Each plate 403 is formed with a vertical channel 406 in which the fingers 401 are located and a cover plate 407, secured in place by the same bolts 404, provides a protecting wall for the fingers. The plate 403 may also be extended at 408

(Fig. 19) and its end rounded, as shown, to further guide the bail end *o* as it moves downwardly along the fingers 401.

Each finger 401 (Fig. 23) is formed with a short downwardly extending pointed end 411 which projects into the path of travel of the bail ends *o* as the bails *m* move downwardly along the grooves 392, 394. When the shell 326 is raised within the stack of bails in the lower section of the magazine, these pointed ends 411 engage the ends *o* of alternate bails *m* and prevent any upward bail movement with the shell. This bail engagement at each lifting of the shell maintains a smooth stack of bails and keeps the bails in a horizontal position. The spring held bar 346 assists in this stacking by frictionally holding the bails outwardly at their center portions.

Stop pins 412 carried in the plate 403 form rests for the long arms of the fingers and prevent excessive rocking during the lifting of the shell 326. As the shell moves downwardly the bails move with it, the bail ends snapping by the pointed ends 411 of the fingers 401 as the latter rock on their pivots 402, their long arms moving up and away from the stop pins 412. A bail *m* is removed from the bottom of the magazine 321 each time the stack is carried down with the shell 326 and this feature of bail movement will next be considered.

Bail separation from magazine

The two ends *o* of the lowermost bail *m* within the magazine 321 drop down upon the upper surface of a pair of feed discs 415 (Figs. 19, 20, 22 and 23), there being a disc on each side of the magazine. Each disc 415 is carried on the lower end of a vertical shaft 416 which is located in a vertically disposed sleeve 417. Each sleeve is provided with an enlarged foot 418 and is rotatably mounted in a bearing 419 formed in the extension housing 405. The shaft 416 has slight vertical movement within its sleeve 417 but is prevented from turning in the sleeve by a pin 421 which extends laterally across the sleeve foot 418 and through a slot 422 cut in the shaft 416.

The upper end of each shaft 416 is reduced at 423 and its upper extremity is extended at 424 beyond the upper end of the sleeve 417. A spring 425 is located on the upper end of the reduced part 423 and the bottom end rests on the upper end of the sleeve 417. The upper end of the spring is engaged by lock nuts 426 which are threadedly secured to the stem 424. The spring action normally holds the shaft 416 in raised position within the sleeve 417, the pin 421 forming a stop against excessive upward movement.

An inclined worm groove 427 is formed in the periphery of each disc 415 and rotation of the latter presents the upper end of its groove to one of the bail ends *o*. These ends simultaneously drop into the grooves of the two discs and are wormed or screwed downwardly by rotation of the discs. On the front part of the magazine the central bowed section of the lowermost bail rests against a spring held dog 429 (Figs. 21 and 24) pivotally mounted in a slot 431 cut in the lower end of the bar 346. As the shell 326 moves up after or about the time the feed discs 415 are releasing the bail ends, the bail snaps off of the dog 429.

Each disc 415 is rotated by means of rotation applied through its shaft 416 and sleeve 417 and for this purpose the sleeve carries a bevel gear 432. This gear is threadedly secured upon the upper end of the sleeve, an overhanging hub of the gear resting on the bearing 419, as best illustrated in

Fig. 22. This construction supports sleeve, shaft and disc, the gear 432 being held within the open upper part of the extension housing 405. A cover plate 433 (Figs. 17 and 20) is used to enclose the gear 432 within the housing.

Each gear 432 meshes with a similar gear 435 (Figs. 20 and 22) which is pinned to the forward end of a horizontal stub shaft 436 journaled in a bearing 437 formed in the bracket housing 323. Shaft 436 at its opposite end carries a bevel gear 438 which meshes with a similar gear 439 carried on a horizontal shaft 441 journaled in bearings 442 formed in each bracket housing 323. Each housing is formed with a chamber 443 in which the gears 438, 439 are located and this chamber is closed by a cover plate 444 secured to the housing wall.

The shaft 441 in addition to its bearings 442 in the bracket housings 323, is also journaled in a bearing 445 formed in a bracket 446 carried upon and bolted to the table 322. The shaft 441 is continually rotated from the main shaft 136 and for this purpose carries a sprocket 447 (Figs. 16 and 20). A chain 448 operates over the sprocket 447 and over a second sprocket 449 carried on the end of the main shaft 136 (see also Fig. 6). By means of this connection the main shaft which drives the operating parts carried in the housing 51 also provides rotation for the feed discs 415, the turning of which removes the lowermost bail from the magazine, as just described.

Bail feed

A bail *m*, upon leaving the feed discs 415 in the bottom of the magazine, falls upon a feed plate 475 (Figs. 1, 2, 4 and 16) which extends across the space between and which connects with the two housings 51, 52. This plate provides the support and pathway for the bail as it is advanced into and through the various stations M to Q, inclusive. The end of the plate adjacent the magazine rests directly upon the housing 52 and its opposite end is carried upon a bracket 476 at the bending station O. Bracket 476 is mounted upon and carried by the housing 51 and beyond this bracket the support plate extends into a second bracket 477 at station Q also mounted upon and carried by the housing.

An angle iron 481 (Figs. 19, 20, 21 and 23) is mounted upon the table surface 322 of the housing 52 just back of the plate 475 and is formed with a horizontal shelf 482 which projects forward and beneath the rear edge of the magazine shell 326. This shelf lays in between the feed discs 415, each end being slotted at 483 to clear the ends *o* of the bail *m* as the latter moves down in the feed discs.

A short angle iron 485 is mounted on the feed plate 475 in front of and beneath the magazine and when the bail leaves the spring dog 429 and falls onto the feed plate its central bowed edge is guided down along an inclined wall 486 formed as the upright leg of this short angle iron. The bail is then held against lateral shifting between the angle iron members 481, 485 while it begins its movement along the feed plate 475.

The central rounded portion of the bail *m* is thereafter guided along its pathway as far as station Q by an angle iron guide bar 487 (Figs. 1, 2, 17 and 20) which is bolted upon the feed plate 475. Guide bar 487 aligns with the shorter angle iron 485 and the bail easily passes from the short to the long guide rail 487.

On the bent ends side of the bail *m* a guide wall 488 provides the guiding element for the moving

bail. This wall 488 is formed as an upwardly extending edge of the table 475 and extends substantially as far along as station Q. The bail bent ends *o* move along the wall upon leaving the angle iron 481, the wall 488 being rounded off at 489 (Fig. 20) to insure easy guiding of the bail against the guide wall.

For transferring the bail *m* along the feed plate as far as station M its forward bent end *o* is engaged by a feeding finger device which pulls the bail from the magazine station L. This feeding device comprises a slide bar 491 (Figs. 17, 21 and 24) which moves in a slot 492 formed in the table 322. The slide bar carries a feed finger 493 which is pivoted at 494 on the bar, the latter being slotted at 495 for clearance. The finger 493 is normally held in raised position by a spring 496 one end of which rests upon the rear end of the finger and holds the engaged finger end against a stop wall 497 cut in the slide bar.

The feed plate 475 is slotted at 498 for clearance of the finger 493 as it moves forward and back with the slide bar. When the finger is in its raised position (Fig. 24) its upper end, which is preferably notched, engages behind the forward end *o* of the bail *m* during the feeding stroke.

The slide bar 491 is moved back and forth by an upper feed bar 501 (Figs. 1, 4, 17 and 24) which extends along and above the feed plate 475 and effects the succeeding step advances of the bail as far as station Q. Connection is made between the bars 491, 501 by a U-strap 502, one leg of which is bolted to the forward end of the bar 491 and the other leg is bolted to the rear end of the bar 501. The table 322 of the housing 52 is cut away at 503 to provide a clearance for the member 502.

The feed bar 501 is formed as a T-section with a head 505 and is slidably supported within brackets 506, 507 and 508 (Figs. 1, 2 and 4), its rear end being supported by the bar 491. The bracket 506 is carried upon the bracket 476 and brackets 507, 508 are both similarly carried upon the bracket 477.

The general construction of the three supporting brackets is the same, a detail of bracket 507 being illustrated in Fig. 31. Bracket 507 is secured to one side wall of the bracket 477 as at 509 and extends upwardly in a curved arm 511. The upper end of this arm terminates in a hooked section 512 which is cut across laterally with a slot 513 in which the head 505 of the feed bar 501 has sliding engagement. In like manner the brackets 506 and 508 have slotted supporting sections for the feed bar 501.

The sliding movement of the bar 501 (Figs. 2 and 4) will now be considered. Its forward end is pivotally connected at 515 to a link 516 which in turn is pivotally connected at 517 to the upper end of a bell crank lever 518 which is adapted for rocking movement on a horizontal pin 519 supported in brackets 521 mounted on the housing 51. The lower end of the bell crank lever is pivotally connected at 522 to a link 523, the lower end of which is pivotally connected on a pin 524 (Figs. 4 and 7) which is carried on the face of a crank disc 525.

Crank disc 525 is mounted on one end of a horizontal shaft 526 which is journaled in bearings 527, 528 formed in the housing 51. The shaft 526 is continually rotated with the main shaft 136 and for this purpose carries a bevel gear 531 which meshes with a similar gear 532 carried on one end of the main shaft 136. Reciprocation of the feed bar 501 and movement of

the slide bar 491 connected therewith are thus effected.

At the idle station M, into which the bail *m* is brought by the feed finger 493, as has been described, and at the other stations N to Q, inclusive a hold-back device engages the bail at each of these stations and prevents its backward movement when feed bars 491, 501 are returning on a non-feeding stroke. A horizontal bar 545 (Figs. 1, 4 and 31) extends along and above the feed plate 475, being parallel to the feed bar 501.

Bar 545 is formed as a channel iron and its spaced walls 546 are rounded at their lower edges to provide a top guide for the bails during their passage along the feed plate. The bail first comes under this top guide when it leaves the guiding influence of the angle iron shell 432 at station L. The bar 545 is supported on the lower ends of bolts 547 which are threadedly locked in the bar and extend upwardly through blocks 548.

There are three of these supports, each block 548 being pivotally connected on a pin 549 which is held in a pair of spaced lugs 551 formed as an integral part of the hooked section 512 of the brackets 506, 507, 508. A spring 552 surrounds each bolt 547 and is interposed between a lock nut 553 threaded on the lower end of the bolt and the block 548.

Each block 548 (Fig. 31) is formed with a stop lug 550 which normally rests on the section 512 of its particular bracket and this holds the bar 545 spaced above the feed plate 475 and in its bail retaining position. The springs 547 provide yielding elements for the horizontal bar 545 and permit slight upward movement in the event of an abnormal feeding condition in the travel of the bail.

Provision is made for lifting the horizontal bar 545 entirely out of bail holding position so that access may be had to all of the bails resting on the feed plate 475. This is done by a hinging movement of the three blocks 548 on their pivots 549 and is accomplished by pulling the guide bar 545 outwardly and upwardly. This cannot be done, however, until latch devices associated with the blocks 548 have been manually unlatched.

Each block 548 is formed with a hook 555 which is engaged, when latched, by a hooked latch part 556 formed on the forward end of a sliding pin 557. Each pin is located within a boss 558 formed on the bracket section 512 adjacent the associated lugs 551. When in latched position, as illustrated in Fig. 31, the bar 545 cannot be raised but when the latch parts 556 are withdrawn from engagement with their lugs 555 hinging action of the bar can take place.

Each pin 557 carries a hand knob 559 to permit ease of operation. A spring 561 surrounds each pin 557 and holds it yieldingly latched, being located in a bore 562 cut in each lug 558. The pin may be slotted as at 563 to limit its sliding movements, a holding pin 564 being passed through the slot and held in the boss 558.

The horizontal bar 545 carries the hold-back device previously mentioned which includes a series of spaced fingers 571 (Figs. 1, 4, 31 and 33). It is these fingers which hold the bails *m* against backward movement when the feed bars 491, 501 are returning on a non-feeding stroke. Each finger 571 is pivoted on a stud 572 carried in a strap 573. This strap is secured by a pair of bolts 574 on the outside of a vertical wall 575 of a right angled plate 576. The horizontal leg of the plate rests on the top of the horizontal bar 545, a bolt 577 holding the plate 576 in position. The

vertical wall of the plate 576 is cut away at 578 and the finger 571 is located in this opening as best shown in Figs. 31 and 33.

It is when the feed finger 493 is moving the bail *m* into the idle station M that the first of the fingers 571 comes into action. At such time the forward section of the bail moves against and lifts the lower end of the finger and passes into a position directly in front of it. When the slide bar 491 moves back and returns its finger 493 into position under the magazine, this first finger 571 holds the bail at its engaged front section. The other holding fingers 571 act in similar manner and hold the bails at their particular stations during return of the feed bar 501.

Feed fingers 581 carried in the feed bar 501 (Figs. 1, 31 and 34) provide the bail engaging elements for further bail movement from station M to station Q. Adjacent feed fingers 581 are spaced along the feed bar a distance equal to the amount of step advance of the bail from station to station and each finger is pivotally mounted on a pin 582 carried by the bar.

The feed bar 501 is slotted at 583 (Figs. 31 and 34) to provide a pocket for each finger 581. A leaf spring 584 is located in the pocket 583 and a bent end 585 of the spring engages one side of the finger 581 and normally holds a curved upper projection 586 of the finger against the wall of the slot 583. This position is illustrated in Fig. 34.

The lower forward corner of each finger 581 is cut out or notched at 587 and the forward bail end *o* of a bail is engaged in this notch when the feed bar 501 carries its fingers 581 backward, on the non-feeding stroke and over the held bails at the various stations. On the forward movement of the feed bar 501, the fingers 581 advance the bails along the feed plate 475 and into the next succeeding station, the bail each time snapping under a hold back finger 571. A groove 588 is cut in the surface of the feed plate 475 for clearance of the lower ends of the fingers 581.

Bending of bail ends

At the bending station O (Fig. 1) the outer legs of the bent ends *o* of the bails *m* are subjected to a die action as the bail remains stationary on the feed plate 475. That part of the feed plate 475 on which the bail rests is over the bracket 476 (Figs. 4, 25 and 29), the latter being formed with a horizontal supporting wall 591.

The wall 591 is formed with a groove 592 adjacent its rear edge and a tongue 593 of a die block 594 rests in the groove. There are two of these die blocks 594, one at each side of the station and each block is adapted to be moved longitudinally of the feed plate 475 and the wall 591 to adjust it for position relative to vertically movable bending die members located above the bracket wall.

This adjustment of the die blocks 594 will now be further considered. At each side of the bracket 476 the wall 591 is extended in a right angle section 595 (Figs. 4 and 27) and the outer upper part of each section is slotted at 596. An adjusting bolt 597 threadedly engages each die block 594 and projects outwardly from one side of the block where it rests within the slot 596. Each bolt is formed with spaced, enlarged shoulders 598 adjacent its head, a shoulder being on each side of the outer upper part of the section 595 when the bolt is in the slot 596. This construction prevents longitudinal movement of the bolt when it is turned as by a wrench applied to its head. Turning of its threaded stem in its seat

in the block draws the latter back or forth to desired position.

When a die block 594 has been accurately located by this drawing back or forth along the wall 591, it is tightly clamped in place by a clamping bolt 599 (Figs. 4 and 29). This bolt is threadedly engaged in the die block from below, the bolt extending through a slot 601 cut in the wall 591. When the bolt is loosened it slides freely within the slot while the die block is being adjusted in position.

Each die block 594 is formed with a vertically disposed slot 605 (Figs. 27, 28, 29 and 30) and each outer leg of the bent ends *o* of the bail as it rests in the bending station is directly above the associated die slot. The feed plate 475 is also cut away at 606 and a die element 607 formed in the die block 594 extends up into the opening.

This die element 607 is formed with a top horizontal wall 608 which is in alignment with the upper surface of the feed plate 475. The die element has a vertical wall 609 formed on one side and an inclined wall 611 on the opposite side. Each free end of the bail as it rests on the feed plate 475 at station Q projects beyond and over this inclined wall (see the dotted line position indicated in Fig. 30).

Each die element 607 cooperates with an upper movable die element which is adapted to be brought down on the positioned bail *m* and hold its ends *o* firmly upon the feed plate 475 during which time each end is bent over the inclined wall 611. For this purpose the wall 591 of the bracket 476 is extended upwardly in a vertical wall 615 (Figs. 4, 25 and 26). Wall 615 is centrally slotted at 616 and on each side of the slot the wall is projected rearwardly at 617 to provide guideways for a cross head 618 located in the opening 616. Plates 619 are bolted to the projecting wall parts 617 and hold the cross head 618 in sliding position upon the bracket wall.

The cross head 618 carries the movable die elements for the bending operation and is raised and lowered by an eccentric connection. It is pivotally connected at 621 to a block 622 joined by a connecting rod 623 to an eccentric strap 624. The eccentric strap is operated by an eccentric 625 fixed to the main shaft 136 (see also Fig. 6).

The two movable die units for the bending operation carried by the cross head 618 may also be adjusted both laterally of the cross head and up and down. Cross head 618 is formed with a horizontal slot 631 (Figs. 4, 25 and 26) extending its full width and a block 632, having a cooperating tongued surface engages the slot on each side of the cross head. Two horizontal slots 633 are cut in each block 632 and bolts 634 extend through the slots and into the cross head and hold the block in adjusted position.

A die holder 635 is formed as a vertically disposed bar and rests in a vertical groove formed in the face of each block 632, each holder bar 635 being vertically slotted at 636 for a clamping bolt 637. The upper end of the holder bar is backed up by an adjusting bolt 638 which is threadedly engaged in the upper part of the block 632.

Each die holder bar 635 carries a bail holding plate 641 (Figs. 27 and 29) which is inserted in a transverse slot 642 cut in its lower end. This insert is held securely in position by screws 643. The plate 641 is provided with a vertical slot 644, the walls forming the lower open mouth of the slot being inclined outwardly at 645.

When the cross head 618 is lowered the insert

plates 641 move down over the bail ends *o*, the flared walls 645 guiding the bail ends properly into the slots 644. These slots are long enough to positively confine the bail *m* while the cross head completes its downward movement, this being the bail end bending cycle as will now be described.

The lower end of each die holder 635 back of the plate 641 is formed as a bending die element 651 (Figs. 29 and 30). This die part is formed with a vertical wall 652 which joins with a horizontal wall 653 merging on the opposite side first into a curved section 654 and thence into an inclined wall 655. The projecting end of the bail (dotted lines in Fig. 30) is engaged by these walls 655, 654 when the cross head 618 moves down and the engaged bail end is bent over the inclined die surface 611 beneath forming an offset hooked bail end *p* (full lines in Fig. 30).

Immediately following the formation of the hooked offsets *p* on the bail *m* the cross head 618 is raised and the bail is freed from the die holding members 635. It is now ready for further advancement over the feed plate 475. A groove 657 (Figs. 1, 2 and 35) is cut in the upper surface of the feed plate and extends from the bending station O to the end of the feed plate at station Q. The hooked ends *p* of the bail extend down into and pass along this groove as the bail is moved from station O through station P and into station Q.

The feed plate 475 terminates at station Q, its end resting upon an extension 664 (Figs. 4 and 35) formed on one side of the bracket 477. This bracket carries a feed table 665 which is secured to an upper horizontal wall 666 of the bracket (see also Figs. 31 and 37). The table 665 seats within the wall of the bracket and rests between two transverse projections 667. The end of the feed plate 475 abuts one of these projections.

The upper surfaces of the plate 475, the projections 667 and the feed table 665 are all in the same horizontal plane and form a smooth supporting surface for the bail *m* as it is moved between stations. With this flush surface the bail moves easily from the feed plate 475 onto the table 665 and into station Q.

A groove 668 is cut across one of the projections 667 and registers with the groove 657 cut in the surface of the forward plate 475. The table 665 is similarly grooved at 669 and this aligns with the groove 668. In this way an uninterrupted passage is provided for the hooked ends *p* coming into station Q. From station Q the bail *m* is moved at right angles into the turret station F where it meets the can *a* resting in the turret pocket at that station. It is the transverse feeding of the bail that will now be described.

Feeding bail to can

The short section of the bail *m* shown in full lines in Fig. 35 illustrates the relative position of this part of the bail as it rests at station Q preparatory to its transverse movement. Each hooked end *p* of the bail as it rests in this position within the table slot 669 is in alignment with a transverse slot 671 also cut in the surface of the table 665. Each slot 671 is formed with a flared mouth section 672 as shown.

A strap 673 (Figs. 35, 36 and 37) is carried on the table 665 and projects over and covers the slots 669, 671 and the flared mouth 672 of the latter. This prevents upward displacement of the

bail. The central bowed part of the bail at such time is still held against upward movement by the horizontal bar 545.

The strap 613 is held in its elevated position above the surface of the table 665 by end bosses 674. Bolts 675 passing vertically through these bosses hold the strap on the table.

In the transverse feeding of the bail *m* into station F it is first moved only a short distance to bring its bent ends *o* into position within retaining members carried by slide bars, this being done by one set of feeding devices. The bail is then moved with the slide bars until its held ends are brought into bail holding pockets in the turret bars 301, the bail ends then being adjacent and outside of the can bail ears. Bringing the bail ends into the retaining members on the feed bars will first be considered.

The table 665 is extended rearwardly in a projection 677 (Figs. 2, 4 and 5) and this projection is centrally slotted and provides a guideway 678 in which a slide block 679 is located. This block moves forward during the initial feeding step and carries a slotted bar 681. The latter may be adjustably secured to the block by bolts passing through the slot.

The forward end of the bar 681 is recessed and carries a horizontally disposed pin 682 (see also Fig. 38) which has slight horizontal movement within the recess. The outer end of the pin carries a notched head 683 which is adapted to engage the bail *m* at its center portion when the slide block 679 is moved forward. A spring 684 surrounds the forward end of the pin 682 and provides a yielding element for the head 683. This spring, which is interposed between the head 683 and the bar 681 also provides for a bail movement at a later time, which will be hereinafter set forth.

The pin 682 is prevented from rotation on its own axis by a small pin 685 held in the bar 681 and extending through a slot 686 formed in the pin. This construction also limits the longitudinal movement of the pin 682 in either direction.

The slide block 679 is formed with downwardly extending lugs 687 (Figs. 4 and 5) which carry a pin 688 through which connection is made with a spring pressed safety clutch member 689. This clutch member is pivotally connected at 691, to the upper end of a lever 692 which is loosely mounted on a horizontal shaft 693 held in brackets 694 bolted to the housing 51.

The lever 692 functions as a bell crank lever and has an arm 695 extending out to one side. A cam roller 696 is rotatably mounted on the end of the arm 695 and engages the periphery of a cam 697 which is secured to the main shaft 136 (see also Fig. 7). The lower end of the lever 692 is connected to one end of a spring 698 the other end of which is connected to a bracket 699 secured to the housing 51.

The spring 698 holds the cam roller 696 against the periphery of the cam 697 and the latter, forcing against the roller and exerting a counter-force to the spring, moves the slide block 679 toward the left (Figs. 5 and 38) so that the grooved head 683 of the spring pressed pin 682 engages and slides the bail *m* across the table 665 in the first part of its transverse feeding movement. This moves the bent terminal ends *p* of the bail through the flared mouths 672 (Fig. 35) of the slots 671 and on into the retaining members of the slide bars previously mentioned.

The table 665 is transversely recessed in its undersurface to form two grooves 701 (Figs. 4

and 31), each groove being parallel to an edge of the table and adjacent one of the bracket projections 667. The slide bars previously mentioned in this connection are designated by the numeral 703 and each bar is located within one of the grooves 701.

The forward end of each slide bar 703 (Figs. 31, 35 and 36) is formed with a head 704 which in the backward position of the bar is just in front of the front edge of the strap 613. The top part of the head extends up and in front of the slot 671 of the table 665 on that side. A slot 705 is cut across the top of each bar head 704 in direct alignment with the table slot 671. The bail ends *p* during their initial movement advance without pause through their table slots 671 and into the aligned bar slots 705.

The bar heads 704 constitute a part of the bail retaining members previously mentioned and vertically movable bail retaining blocks 706 carried in the bar heads constitute another part. The bail ends *p* come to rest against the back wall of these blocks 706 and remain in the slots 705, the forward bail ends *o* resting on the tops of the bar heads.

Each block 706 is formed with side ribs 707 which project into and have slight vertical movement within vertical grooves 708 cut in the bar heads 704. The lower end of each block is extended rearwardly under its bar 703 as a lug 709. A bolt 711 extends loosely through each lug and is threadably engaged in its associated bar. A spring 713 surrounds each bolt 711 and is confined between the bolt head and the under surface of the lug 709. The spring holds its retaining block 706 in raised position (shown in full lines in Fig. 31) with its lug 709 held against the under surface of the bar.

Should the bail *m* become jammed in its passage before it reaches its position against the blocks 706, the spring held safety clutch member 689 (Fig. 5) opens and permits unseating of the pin 688. The lever in such event makes the complete forward stroke without moving the slide block 679 or the pin 682. Upon the return stroke the safety clutch 689 again picks up or seats the pin 688 in proper time with the machine movements if the jammed condition has been rectified by that time. If not, the pin 688 will not stay in its seat within the clutch 689.

With the bail *m* in located position, that is, with its ends *o* on the bar heads and its terminal ends *p* against the blocks 706, the feed bars 703 move forward and carry the bail from station Q toward station F. This movement of the two bars 703 constitutes the second part of the transverse feeding of the bail.

Simultaneously with this bar movement, the slide block 679 is also moving forward, the central part of the bail *m* still being retained in the notched head 683 of the pin 682. The joint movements of the feed bars and the slide block are substantially uniform but the latter preferably gains a little so that when the feed bars reach the position indicated in Fig. 38 the spring 684 has been compressed as shown, the bail ends *p* still being in place at the rear walls of the blocks 706 but being just ready to leave this position. Before considering further the results of further movement of the bail into station F the manner of actuating the feed bars 703 will be described.

The rear ends of the feed bars 703 are bolted to a crosshead 715 (Figs. 4 and 5). This crosshead is formed as a U-shape to clear the safety clutch member 689 connected with the slide block 706

679. The center part of the crosshead is pivotally connected at 716 to one end of an adjustable connecting link 717. The other end is connected to a pin 718 adjustably secured by an adjusting bolt 719 in the upper slotted end of the lever 721.

Lever 721 is also loosely mounted on the shaft 693 adjacent the lever 692 and like the latter functions as a bell crank lever. It also has a laterally extending arm 722. A cam roller 723 is rotatably mounted upon the end of the arm 722 and engages the periphery of a cam 724 secured to the shaft 136 adjacent the cam 697. The lower end of the lever 721 also connects with a spring 725, the opposite end of which is secured to the bracket 699. The cam 724 moves the crosshead 715 and the feed bars 703 first for the initial feeding movement now being considered and later for the second step of feeding as will be fully set forth in the succeeding description.

A right angled holding plate 726 (Figs. 35, 36 and 38) is secured along side of each feed bar head 704 and an upper arm 727 cut away or notched at 728 extends over each forward end of the bail *m* as it rests on the bar head. This prevents upward displacement of the bail end during its movement onto the bail head and while it is being carried forward by the feed bars.

The strap 673 (Fig. 38) is cut away on its under surface at 731 to provide a clearance for the head 683 and the table 665 is similarly cut away at 732 to allow for clearance of the slide block 679. The horizontal wall 666 of the bracket 477 is also relieved at 733 for clearance purposes. The forward ends of each feed bar 703 move toward the turret bars 301 during the second stage of transverse bail feeding. The bars 301 and associated parts will now be considered more in detail as a preparatory step to a fuller description of this second bail movement.

The outer end of each bar 301 adjacent its associated bail pocket 306 is cut away at 741 (Figs. 31, 35 and 43) and an insert block 742 (shown in detail in Fig. 32) is located within the opening and held on the bar by bolts 743. The block 742 is formed with an outwardly projecting end which is pointed or tapered, this end having an inclined side wall 744, an inclined lower wall 745 and an inclined upper wall 746. The meeting edge of the walls 745, 746 projects beyond the end of the bar 301.

This insert block 742 has two distinct functions. It acts as an actuation device for releasing the bail *m* from the feed bars and as a holding member for receiving and holding the ends of the bail from the time can and bail are brought together at station F until they are fully assembled at station H. The releasing function will first be considered.

Fig. 38 shows the feed bar 703 practically at the end of its forward stroke and it will be observed that the lower inclined wall 745 of the insert block 742 has engaged an upper inclined wall 747 (see also Figs. 31 and 36) formed in the forward face of the retaining blocks 706. When these inclined walls 745, 747 come together, each bar 703 is still moving and the angle of contact of the engaged faces thereupon forces the associated retaining block 706 downwardly against the action of its spring 713.

Both blocks 706 move down at the same time. As soon as the two blocks 706 move far enough the ends *p* of the bail *m* are no longer held by the blocks, the spring 684 working through the head 683, suddenly expands and shoots the bail forward into the holding blocks 742. See the dot

and dash line position of the bail *m* in Fig. 35 for this final position. In this movement the bail ends *o* pass into flared openings 748 cut in the outer ends of the turret bars 301 adjacent the recesses 741.

Simultaneously with this engagement between the wall 745 of the block 742 and the wall 747 of the movable block 706, a forward projection 749 (Figs. 31, 35 and 36) of each bar 703 moves adjacent the side wall 744 of the block 742. The projection passes above the crest 305 of the ear pocket 306 and comes to rest alongside of the block 742 (Fig. 33). The outer faces of the two projections 749, which are flush with the outer faces of the bail ears *b* of the can *a* in station F, form guiding walls for the bail ends *p* as they pass into the blocks 742 as just described.

At the rear of the horizontal wall 750 (Figs. 31 and 32) of each block 742 there is an overhang or projection 751 and a vertical wall 752 joins the under face of this projection with the horizontal wall 750. The projection 751 is substantially half as wide as the block 742 and this leaves a vertically extending channel 753 on the outside of the block and in communication with the opening 748 into which the bail end passes.

The lower front corner of each overhang 751 is cut away in an inclined wall 754 and as the lower extremity of the bent end *p* of the bail *m* strikes the inclined wall during this bail movement, the bail end is held down by the wall as it passes into the channel 753 coming into a final position adjacent the wall 752. Here the bail end snaps into an inclined notch 755 (Figs. 32 and 41) formed in the block 742. The spring in the bail causes this snapping action which also holds the bail ends in inserted position within the blocks 742. They are then in alignment with the openings in the bail ears *b* of the can *a* at station F.

The fully inserted bail *m* at station F still rests with its central bowed section on the table 665 and beneath the strap 673 (Fig. 35). When the turret moves on its next step rotation, this central section of the bail is slid along the table surface and the back or rear leg of the bail rides upon the upper surface of a bar 765 which is secured by bolts 766 to the front of the table 665.

The upper engaged surface of the bar 765 (Figs. 35 and 36) is formed as a raised projection 767 having a gentle inclined wall 768. When the bail rides upon the wall 768 it is slightly lifted and pivots on its ends resting within the grooves 755 of the insert blocks 742. The front edge of the strap 673 (Figs. 2 and 35) is cut away at 769 for clearance and the pivoting bail center moves up to a position above the strap 673. After clearing the strap, the bail falls again into horizontal position and is so carried into the idle station G and thence into the bail inserting station H.

Bail inserting

At station H the can *a* is positively engaged and clamped as it rests on the surface of the circular table 311 and is so held during insertion of the bail ends *p* into the can ears *b*. This clamping is effected by passing a holding member into the upper open end of the can. In the drawings the can *a* is disclosed as having a friction ring *c* double seamed or otherwise secured to the upper end of its body wall, this being a usual type of can employing carrying bails.

The holding device comprises in the present embodiment a horizontal bar 775 (Figs. 2, 41 and 42) which is provided with depending lugs 776

adapted for movement into the opening of the friction ring c. When inserted into the can in clamping or holding position (Fig. 41) these projections 776 engage the inner wall of the friction ring c and the ends of the bar 775 rest upon the upper edge of the can a.

The bar 775 is carried upon the lower end of a vertical rod 777 which extends into a vertical bore 778 formed in a boss 779 of a bracket 781. The upper half section of the rod 777 as at 782, is less in diameter and its upper end projects above the upper end of the boss 779. Lock nuts 783 are threadedly engaged on this upper rod end and a spring 784 surrounds that part of the rod 782 confined within the bore 778.

The lower end of the spring engages the shoulder formed at the junction of the two diameters of the rod and its upper end abuts the upper wall of the bore 778. Spring 784 normally holds the rod down with its nuts 783 against the boss 779. A featherway 785 is formed in the lower rod section and a feather 786 extends into this featherway, being held in the boss. This construction prevents turning of the rod within the boss but permits vertical movement.

The bracket 781 is adjustably mounted in the center and on the face of a cross head 791 (Figs. 3, 41 and 42). This crosshead 791 is considerably wider in part than the diameter of the can a and is formed with a horizontal relatively narrow slot 792 which merges with a horizontal wider slot section 793. Bolts 794 are carried in the bracket 781 and a head 795 of each bolt is located in the wider slot section 793 and its shank extends through the narrow slot 792.

Nuts 796 threadedly secured to the forward ends of the bolts 794 provide a locking means for holding the bracket 781 in adjusted position laterally of the crosshead. To maintain proper vertical alignment the latter is formed with a groove 797 in which a tongue 798 is located, this tongue being formed in the bracket 781.

The crosshead 791 is formed with a rear slide extension 799 (Figs. 2, 3, 41 and 42) which is adapted to move up and down in vertical slots 801 cut in the face of a bracket 802 mounted upon and carried by the housing 51. Slide gibs 803 are bolted on the face of the bracket and retain the crosshead 791 in sliding position.

The slide member 799 is formed with a lower depending lug 805 which is pivotally connected at 806 to the upper end of a link 807 which extends down through an opening 808 formed in the upper surface of the housing 51. The lower end of the link 807 is mounted on a crank pin 809 carried on the face of a crank disc 811 (Figs. 3 and 7) secured to the end of the horizontal shaft 526. Rotation of the shaft 526 raises and lowers the crosshead 791.

Side brackets 815 (Figs. 2, 41 and 43) are carried by the crosshead 791 and each bracket is adjustably secured to the crosshead in the same kind of a connection as is used for the bracket 781. Bolts 816 and nuts 817 are accordingly used to clamp the bracket 815 on the face of the crosshead. Brackets 815 carry the devices which engage the bails m and insert their ends p into the bail ears b of the positioned can a. These bail inserting elements are brought into play when the crosshead is lowered and after the holding bar 775 has clamped the can at station H.

The bail inserting elements comprise a bending element for operating upon the ends o of the bail m, these bail ends being sprung with-

in the limits of their elasticity so that the offset terminal end p of each bail end will pass through the opening within the bail ear b. Other inserting elements then push against the bail ends and move them into the ear openings. After the bail ends are fully inserted the natural spring of the metal in the bail holds it on the can and prevents its ends coming out of the engaged can ears. These springing and inserting actions will now be considered in more detail.

One pushing die and one bending die, constituting these inserting elements are carried in each bracket 815 and move downwardly, with the descending crosshead, through vertical openings 825 (Figs. 2, 41 and 43) cut through the cover plates 307. Each pushing die is formed as a blade 826 which is secured to the lower end of a block 827 adjustably connected by bolts 828 to the face of each bracket 815. The block 827 is slotted vertically at 829 to allow for adjustment and the bolts 828 pass through these slots and when tightened clamp the parts rigidly together.

The upper end of the block 827 is engaged by an adjusting bolt 831 which is threadedly engaged within a lug 832 formed on the face of a vertically extending housing 833 formed as an integral part of the bracket 815. A lock nut 834 threadedly engages the adjusting bolt 831 holding the latter in adjusted position so that it provides a thrust bearing for the block.

The bending die is used for springing the ends of the bail under tension as previously mentioned and each die is formed as a blade 836 which is located alongside of the blade 826. Each blade 836 is secured to the lower end of a slide block 837 which is located in a vertical groove 838 formed in each bracket 815. A cover plate 839 is bolted on the side of the bracket and holds the block 837 in sliding position.

The upper end of the block 837 (Fig. 43) extends into the housing 833 and a bolt 841 extends down through the housing and its lower end is threadedly secured into the top of the block. The bolt passes through a threaded bushing 842 mounted in the top of the housing. A spring 843 is also located within the housing 833 and surrounds the bolt 841, this spring being interposed beneath the lower end of the bushing 842 and the upper end of the block 837. The head of the bolt 841 limits its downward movement under action of the spring.

After both blades 826, 836 pass through the opening 825 of the cover plate 307 they enter into the chamber 748 of the bar 301. The lower edge of the pushing blade 826 is formed into an inclined wall 844 (Fig. 41) but this wall does not immediately come into action but is spaced away from the end o of the bail m as the latter rests in its groove 755.

The lower edge of the bending blade 836 is formed with a horizontal stepped bottom edge 845, the lower section of which is outside of the bail end o as it rests in its block 742. This stepped edge provides a better engaging surface for the bail. In Fig. 41 the bail ends o have not been engaged by the blade 836 but Fig. 39 shows such engagement.

After engagement the continued downward movement of the blades 836 pressing against the terminal ends p of the bail places a tension on these bail ends p which rock outwardly slightly from their terminal points of support on the horizontal walls 750 of the blocks 742. In Fig. 39 this rocking movement has just begun

while in Fig. 40 the bail ends *p* are as near horizontal as is necessary for their insertion into the opening in the bail ears *b* adjacent.

As soon as the bail ends *p* are brought into this full tension position the resistance of the metal of the bail against further torsion is sufficient to momentarily hold the blade 836 against further movement and the spring 843 thereupon yields as the bracket continues its downward travel. The pusher blade 826, however, continues its downward movement, it being fixed to the bracket 815, and this brings its inclined wall 844 against and then along the end *p* of the bail, at the same time sliding it along the blade edge 845 and moving it toward the bail ear *b*.

Each terminal *p* enters into the opening of the bail ear (Fig. 40 shows the beginning of this insertion) and further downward movement of the blade 826 insures full insertion. The tension in the bail assists in this inserting action, for as soon as tip edges of the ends *p* of the bail enter far enough into the bail ears *b* to clear the walls surrounding the opening, the bail springs back to normal and helps snap the bail ends into fully inserted position. Once in place they will not become dislodged.

After the bail ends *p* snap in place as just described there is further downward movement of the crosshead 791 and both blades 826, 836 have further movement. The latter moves under the action of its spring 843 as soon as the bail ends slide out from under its lower edge. Each block 742 is cut away at 847 (Figs. 32, 35 and 41) for clearance of the blade 826 and the end of the bar 301 is similarly recessed at 848 for a like purpose.

During the downward movement of the crosshead 791 and while the pushing and bending die blades 826, 836 are performing their work, and while the bar 775 (Figs. 41 and 42) is resting upon the upper end of the can *a* the spring 784 takes up the movement of the descending bracket 781, the reduced end 782 of the rod projecting out through the end of the boss 779. When the crosshead 791 moves up following the inserting operation, the die blades 826, 836 are first lifted out of the bars 301 and when the top of the boss 779 of the rising bracket 781 comes up again to the nuts 783 the bar 775 is lifted out of clamping position on the can *a*. The can with its now fully inserted bail is then free to be further advanced with the next step rotation of the turret 55. It is then passed first through the idle station I (Fig. 2) and thence into the discharge station J.

Can discharge

From station J the can is swept laterally from the turret pocket 263 and is moved onto the upper run of a discharge conveyor. This conveyor comprises an endless belt 851 (Figs. 2, 3 and 5) which at the machine end passes over an idler pulley 852 mounted on a shaft 853 journaled in bearings 854 formed in side brackets 855 bolted to the side of the housing 51. This discharge belt carries the cans to a suitable place of deposit and may pass over and be driven by any suitable pulley, as desired.

The discharge device for moving the can from station J onto the belt 851 comprises a can engaging plate 857 (Figs. 2 and 5) which is inside of the can path as the can is coming into station J from station I. This plate is bolted on the end of a horizontal arm 858 which is carried on the upper end of a lever 859. The lower end of lever 859 is pivotally mounted on a stud 861 which is

carried in and extends outwardly from a vertical wall of the housing 51.

When the lever 859 is rocked on its mounting 861 in a counter clockwise direction, as viewed in Fig. 5, the plate 857 is brought against the can and then both can and plate move toward the left. This slides the can from its supporting table 311 and moves it onto the discharge belt 851 which is preferably a slight distance below the surface of the table at that place.

The lever 859 is pivotally connected at 862 (Figs. 5 and 7) to one end of a connecting rod 863. The opposite end of rod 863 is connected with an eccentric strap 864 which surrounds and is actuated by an eccentric 865 carried on the shaft 136. In this way the lever 859 is moved into non-interfering position as the can is brought into station J and is then rocked to transfer the can from station J onto the discharge belt 851 as just described.

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 without 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 feeding cans having bail receiving ears, comprising in combination, an assembling turret, can feeding devices for moving cans to said turret, means operating on said can ears as the cans are being moved by said can feeding devices for turning the cans to bring their ears into a predetermined position relative to said turret, and devices for feeding the positioned cans into said turret.

2. An apparatus for feeding cans having bail receiving ears, comprising in combination, an assembling turret, can feeding devices for moving cans to said turret, means disposed in the path of travel of the cans for operating on one of said can ears as the cans are being moved by said can feeding devices for initially positioning the cans, and means operating on both of said can ears for bringing them into a predetermined position relative to said turret.

3. An apparatus for feeding cans having bail receiving ears, comprising in combination, an assembling turret, can feeding devices for moving cans to said turret, a trip device operable by said cans for causing said feeding devices to perform a can feeding operation only when a can is in proper position to be fed, and means operating on said can ears as the cans are being moved by said can feeding devices for shifting the cans to bring their ears into predetermined position relative to said turret.

4. An apparatus for feeding cans having bail receiving ears, comprising in combination, a can holding member, can feeding devices including a feed dog for moving cans to said member, a trip device operable by said cans for moving said feed dog into can engaging position only when it is in proper position to be fed, means for shifting said cans so as to bring their ears in predetermined position when received in said can holding member, and means carried by said member for holding said positioned can against displacement while therein.

5. An apparatus for uniting bails with cans having bail receiving ears, comprising in com-

combination, an assembling turret, can feeding devices for moving cans to said turret, means operating on said can ears as the cans are being moved by said can feeding devices for shifting the cans to bring their ears into predetermined position relative to said turret, a bail magazine located at one side of said turret for holding a stack of bails, and bail feeding devices for transferring bails from said magazine to said turret and adjacent said positioned cans.

6. An apparatus for uniting bails with cans having bail receiving ears, comprising in combination, an assembling turret, can feeding devices for moving cans to said turret, means operating on said can ears as the cans are being moved by said can feeding devices for shifting the cans to bring their ears into predetermined position relative to said turret, a bail magazine located at one side of said turret for holding a stack of bails, bail feeding devices for transferring bails from said magazine to said turret and in alignment with said bail ears, and holders carried by said turret for maintaining alignment between the ends of said bails and said bail ears.

7. An apparatus for uniting bails with cans having bail receiving ears, comprising in combination, an assembling turret, can feeding devices for moving cans to said turret, means operating on said can ears as the cans are being moved by said can feeding devices for shifting the cans to bring their ears into predetermined position relative to said turret, devices for feeding the can into said turret while maintaining the said ears in position, a bail magazine located at one side of said turret for holding a stack of bails, bail feeding devices for transferring bails from said magazine to said turret and into alignment with said bail ears, and holders carried by said turret for maintaining alignment between the ends of said bails and said bail ears.

8. An apparatus for uniting bails with cans having bail receiving ears, comprising in combination, a table, a conveyor for bringing cans onto said table, can feeding devices for moving cans across said table, and means operating above said table and engaging one of the can ears as the cans are being moved by said can feeding devices for shifting the cans on their axes while still moving over said table to bring their ears into a predetermined position.

9. An apparatus for uniting bails with cans having bail receiving ears, comprising in combination, a table, a conveyor for bringing cans onto said table, can feeding devices for moving cans across said table, a trip device operating only when a can is in proper position to be fed for making said feeding devices effective, and means operating above said table and engaging said can ears for shifting the cans on their axes while still on said table to bring their ears into a predetermined position.

10. An apparatus for uniting bails with cans having bail receiving ears, comprising in combination, an assembling turret having can receiving pockets, a table located adjacent said turret, can feeding devices for moving cans over said table and toward said turret, means operating on said can ears as the cans are being moved by said can feeding devices over said table for shifting the cans on their axes to bring their ears into predetermined position relative to said turret pocket, and devices for transferring a positioned can from said can feeding devices into said turret pocket.

11. An apparatus for uniting bails with cans having bail receiving ears, comprising in combination, an assembling turret having can receiving

pockets, a table located adjacent said turret, can feeding devices for moving cans over said table and toward said turret, means operating on said can ears as the cans are being moved by said can feeding devices over said table for shifting the cans on their axes to bring their ears into predetermined position relative to a said turret pocket, devices for transferring a positioned can from said can feeding devices into said turret pocket, and holders carried by said turret and associated with a said turret pocket for maintaining the position of said bail ears while the cans is in said turret pocket.

12. An apparatus for uniting bails with cans having bail receiving ears, comprising in combination, an assembling turret having can receiving pockets, can feeding devices for moving cans toward said turret, devices for transferring cans from said feeding devices into said turret pockets the while locating their bail ears in predetermined position, a bail magazine located at one side of said turret for holding a stack of bails, bail feeding devices for transferring bails from said magazine to said turret, and means for bringing the ends of said bail into alignment with the positioned bail ears of a said can in a said turret pocket.

13. An apparatus for uniting bails with cans having bail receiving ears, comprising in combination, an assembling turret having can receiving pockets, can feeding devices for moving cans toward said turret, devices for transferring cans from said feeding devices into said turret pockets, the while locating their bail ears in predetermined position, a bail magazine located at one side of said turret for holding a stack of bails, bail feeding devices for transferring bails from said magazine to said turret, means for bringing the ends of said bail into alignment with the positioned bail ears of a said can in a said turret pocket, and means for inserting said bail ends into said bail ears.

14. An apparatus for uniting bails with cans having bail receiving ears, comprising in combination, an assembling turret, can feeding devices for moving cans to said turret, a bail magazine located at one side of said turret for holding a stack of bails, bail feeding devices for transferring bails from said magazine to said turret, means operating on said can ears as the cans are being moved by said can feeding devices for shifting the cans to bring their ears into predetermined position relative to said turret, means operating on said bails during their transfer to said turret for shaping their ends to adapt them for insertion into the bail ears of said cans, and means for inserting said formed bail ends into said bail ears while the can is still in said turret pocket.

15. An apparatus for uniting bails with cans having bail receiving ears, comprising in combination, an assembling turret having associated can and bail receiving pockets, can feeding devices for moving cans towards said turret, bail feeding devices for moving bails toward said turret, intermittent turret actuating devices for presenting said can and bail receiving pockets first to said can feeding devices and thence to said bail feeding devices, means for positioning a can into said turret pocket when so presented to said can feeding devices, and means for positioning a bail adjacent said pocketed can with its ends in said bail receiving pockets when so presented to said bail feeding devices.

16. An apparatus for uniting bails with cans

having bail receiving ears, comprising in combination, an assembling turret having associated can and bail receiving pockets, can feeding devices for moving cans towards said turret, bail feeding devices for moving bails toward said turret, intermittent turret actuating devices for presenting said can and bail receiving pockets first to said can feeding devices, thence to said bail feeding devices and thence to a bail inserting station, means for positioning a can into said turret pocket when so presented to said can feeding devices, means for positioning a bail adjacent said pocketed can with its ends in said bail receiving pockets when so presented to said bail feeding devices, and means associated with said bail inserting station for inserting the said bail into the can bail ears when so presented by said turret.

17. An apparatus for uniting bails with cans having bail receiving ears, comprising in combination, an assembling turret having associated can and bail receiving pockets, feeding devices for moving cans into said turret pockets with their bail ears in predetermined position, bail feeding devices for moving bails into said turret pockets with their ends adjacent said can positioned ears, means for springing said bail ends while holding them adjacent said ears, and means associated with said springing means for inserting the said bail ends into the said can bail ears.

18. A bail feeding apparatus for feeding bails to positioned cans having bail receiving ears, comprising in combination, a bail magazine for holding bails in vertically stacked formation, a shell movable up and down inside of said stack for maintaining the bails in superimposed alignment, separating devices for individually removing a bail from the bottom of said stack, and feeding devices for moving said separated bail adjacent a positioned can with its ends in alignment with the bail ears of the can.

19. A bail feeding apparatus for feeding bails to positioned cans having bail receiving ears, comprising in combination, a bail magazine for holding bails in stacked formation, a shell movable up and down inside of said stack, instrumentalities for cooperating with said shell and for preventing upward bail movement while maintaining the bails in superimposed alignment, separating devices for individually removing a bail from the bottom of said stack, and feeding devices for moving said separated bail adjacent a positioned can with its ends in alignment with the bail ears of the can.

20. A bail feeding apparatus for feeding bails to positioned cans having bail receiving ears, comprising in combination a bail magazine for holding bails in stacked formation with their bent ends confined in vertically disposed trackways, instrumentalities for maintaining the bails in superimposed alignment while in said magazine, grooved separating discs located at the sides and bottom of said magazine and operating on the said bail ends for individually removing bails from said stack, and feeding devices for moving said separated bail into position with its ends in alignment with the bail ears of the said positioned can.

21. A bail feeding apparatus for feeding bails to positioned cans having bail receiving ears, comprising in combination, a bail magazine for holding bails in stacked formation, with their bent ends confined in vertically disposed trackways, instrumentalities arranged alongside of

said trackways and operating on said bail ends as they pass through the magazine for maintaining them in superposed alignment, separating devices for individually removing a bail from the bottom of said stack, and feeding devices for moving said separated bail adjacent a positioned can with its ends in alignment with the bail ears of the can.

22. A bail feeding apparatus for feeding bails to positioned cans having bail receiving ears, comprising in combination, a bail magazine for holding bails in stacked formation, a lower shell on which said bails rest while in said magazine, separating devices for individually removing a bail from the bottom of said lower shell, devices for bringing said separated bail into engagement with the bail ears of said positioned can, and an auxiliary shell aligning with and carried on said lower shell and providing a supply reservoir for said stacked bails, said auxiliary shell being adapted for removal from the lower shell when it has been exhausted of bails to permit replacement by another filled auxiliary shell without stopping the feeding of bails from said magazine.

23. A bail feeding apparatus for feeding bails to positioned cans having bail receiving ears, comprising in combination, a bail magazine for holding bails in stacked formation, a lower shell on which said bails rest while in said magazine, means for raising said shell within said stacked bails and for lowering it with said bails to effect feeding through said magazine, instrumentalities arranged adjacent said shell for preventing upward movement of said bails, separating devices for individually removing a bail from the bottom of said lower shell, devices for bringing said separated bail into engagement with the bail ears of said positioned can, and an auxiliary shell aligning with and carried on said lower shell and providing a supply reservoir for said stacked bails, said auxiliary shell being adapted for removal from the lower shell when it has been exhausted of bails to permit replacement by another filled auxiliary shell without stopping movement of said lower shell or the feeding of bails from said magazine.

24. An apparatus for uniting bails with cans having bail receiving ears, comprising in combination, an assembling turret having can receiving pockets for holding the cans with their bail ears in a predetermined position, means carried by said turret for holding bails with their ends in alignment with the bail ears of said held can, devices operating on the ends of said held bails for springing them into shape for insertion into said bail ears, and means for pushing against said bail ends while so sprung to insert them into said bail ears.

25. An apparatus for uniting bails with cans having bail receiving ears, comprising in combination, an assembling turret having can receiving pockets, can feeding devices for placing cans into said pockets with their bail ears in a predetermined position, means for feeding a bail with its ends in alignment with the bail ears of a said can in said turret, can clamping devices for holding said can in a bail inserting position, devices operating on the ends of said held bails while the can is so held for springing them into shape for insertion into said bail ears, and means for pushing against said bail ends while so sprung to force them into position within said bail ears.

26. An apparatus for uniting bails with cans having bail receiving ears, comprising in combination

nation, an assembling turret having can receiving pockets for holding said cans with their bail ears in a predetermined position, means carried by said turret for holding a bail with its ends in alignment with the bail ears of a said held can, a holding and bending die operating on each end of said held bail for springing it into shape for insertion into the said aligned bail ear, and a pushing die also operating on each of said bail ends while it is so sprung and forcing it toward its bail ear to insert it into position within the said ear, and means for discharging the bailed can from the turret pocket.

27. An apparatus for uniting bails with cans having bail receiving ears, comprising in combination, an assembling turret having can receiving pockets for holding said cans with their bail ears in a predetermined position and for moving the can into a bail inserting station, means carried by said turret for holding bails with their ends in alignment with the bail ears of said held can at said station, an inserting head at said station and adapted for downward movement toward said held can and its aligned and held bail, clamping devices carried by said head for holding said can in bail inserting position, holding and bending dies yieldingly carried by said head for engaging and springing the ends of the held bail with a predetermined tension into shape for insertion into said bail ears, and pushing dies also carried by said head and operating after the bail ends have been brought into said inserting shape for moving the ends into fully inserted position.

28. An apparatus for uniting bails with cans having bail receiving ears, comprising in combination, an assembling turret having can receiving pockets for holding said cans with their bail ears in a predetermined position, means carried by said turret for retaining bails with their ends in alignment with the bail ears of said held can, an inserting head having vertical movement over said can, holding and bending dies yieldingly mounted on said head and being adapted to engage and spring the ends of the held bail to impart a predetermined tension in the bail during movement of said head, and pushing dies mounted

on said head and operating against the ends of said bail during movement of said head for inserting the sprung bail ends into the aligned bail ears, and means for adjusting the time of operation of said pushing dies relative to said holding and bending dies.

29. An apparatus for uniting bails with cans having bail receiving ears, comprising in combination, an assembly mechanism, means engaging the bail ears of a can for registering the can accurately with respect to said assembly mechanism, and a device engaging said bail ear for arranging the bail ears of said can in position for engagement by said means, and a turret having flexible jaws to hold said can when registered and delivered from said engaging means.

30. An apparatus for feeding cans having bail receiving ears, comprising in combination, an assembly mechanism, can feeding devices for moving cans in predetermined relation with respect to said assembly mechanism, and means for arranging the bail ears of the can in positions extending in the line of the direction of the feeding movement of the can.

31. An apparatus for uniting bails with cans having bail receiving ears, comprising an assembly mechanism having parts for engaging the bail ears of the can and the ends of a bail to be assembled in the ears, means feeding the cans to arrange the ears in said parts, a mechanism for performing a forming operation on the ends of the bail, and conveyor feeding means for transferring the bails from the forming station to said assembly mechanism and arranging the formed ends of said bail in said parts.

32. An apparatus for uniting bails with cans having bail receiving ears, comprising an assembly mechanism having parts for engaging the bail ears of the can and the ends of a bail to be assembled in the ears, means feeding the cans to arrange the ears in said parts, mechanism for performing a forming operation upon said bails, and conveyor feeding means for transferring the bails from the forming station to said assembly mechanism and arranging the ends of said bails in said parts.

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