

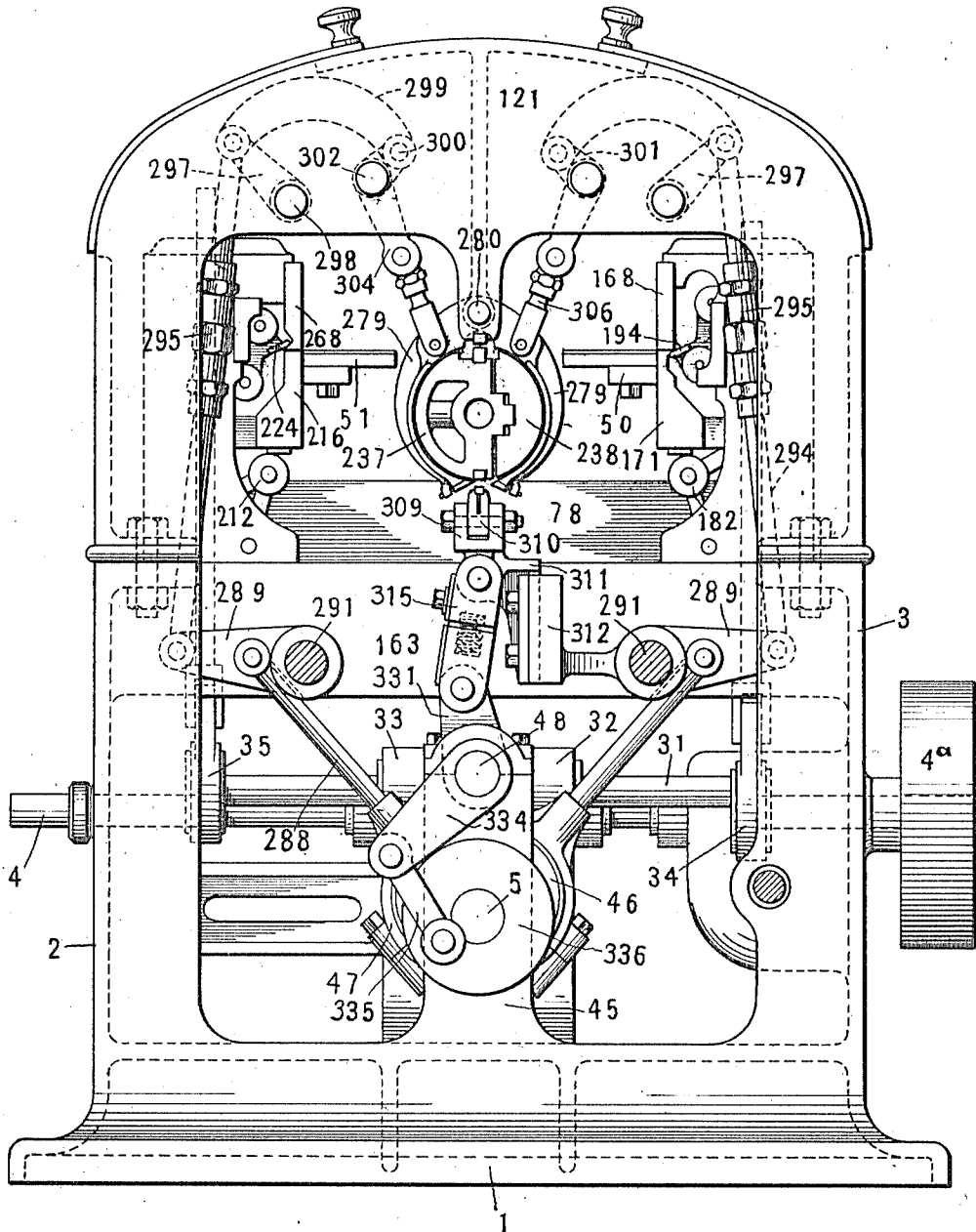
C. W. GRAHAM.
CAN BODY FORMING MACHINE.
APPLICATION FILED JAN. 28, 1910.

Patented June 3, 1913.

18 SHEETS—SHEET 1.

1,063,918.

Fig. 1.



WITNESSES
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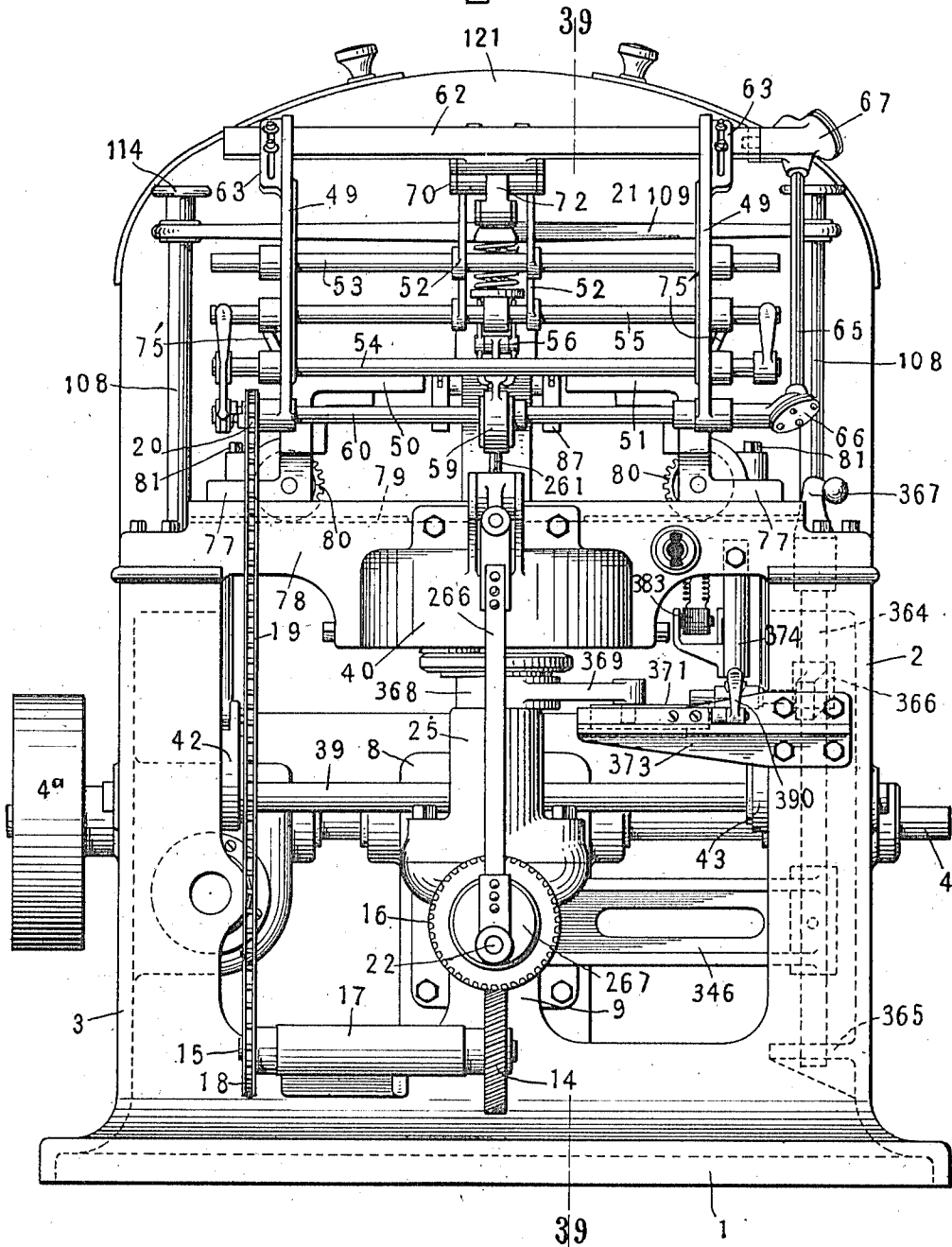
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18 SHEETS—SHEET 2.

FIG. 2—



WITNESSES
J. A. Kipley
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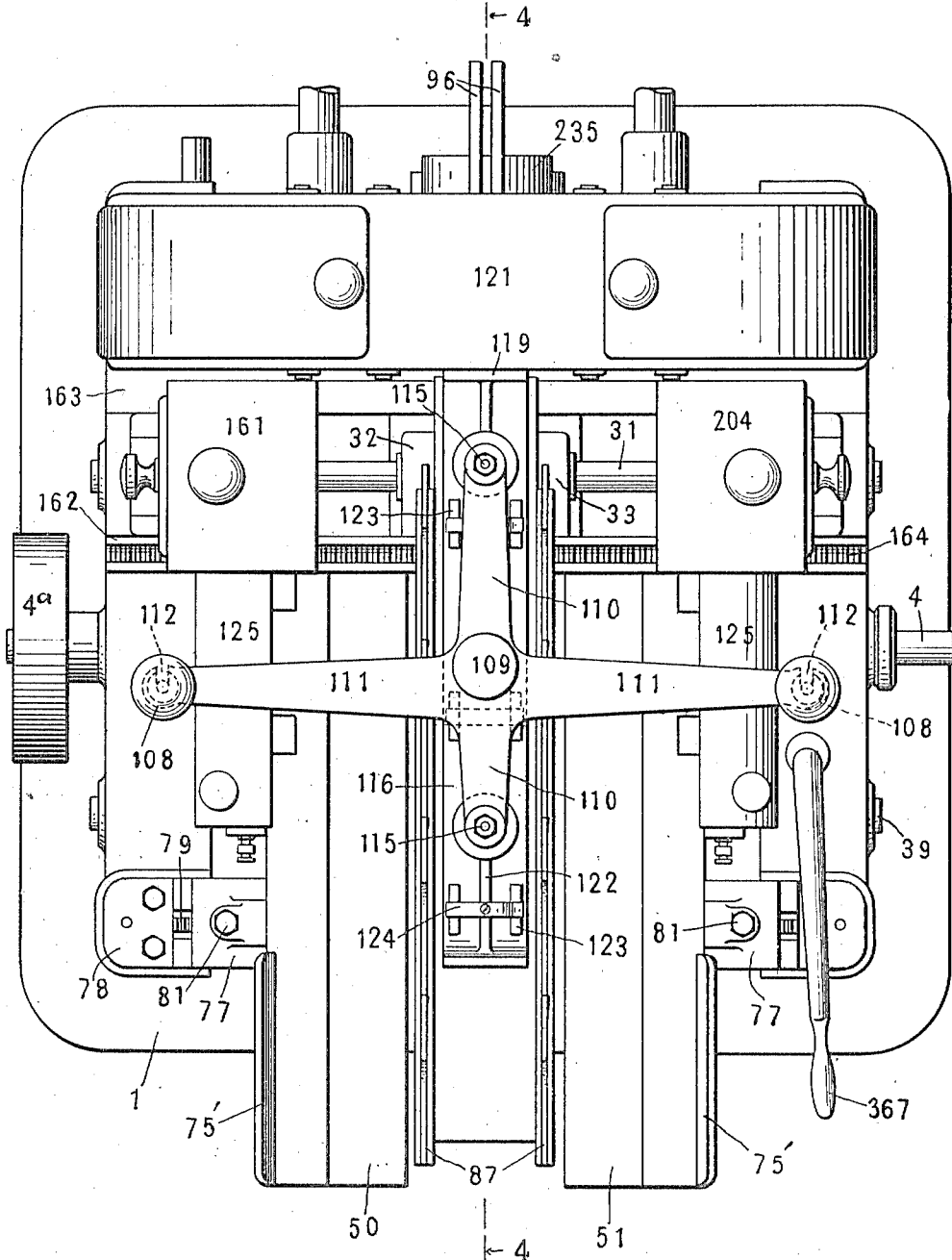
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Patented June 3, 1913.

18 SHEETS—SHEET 3.

Fig. 3.



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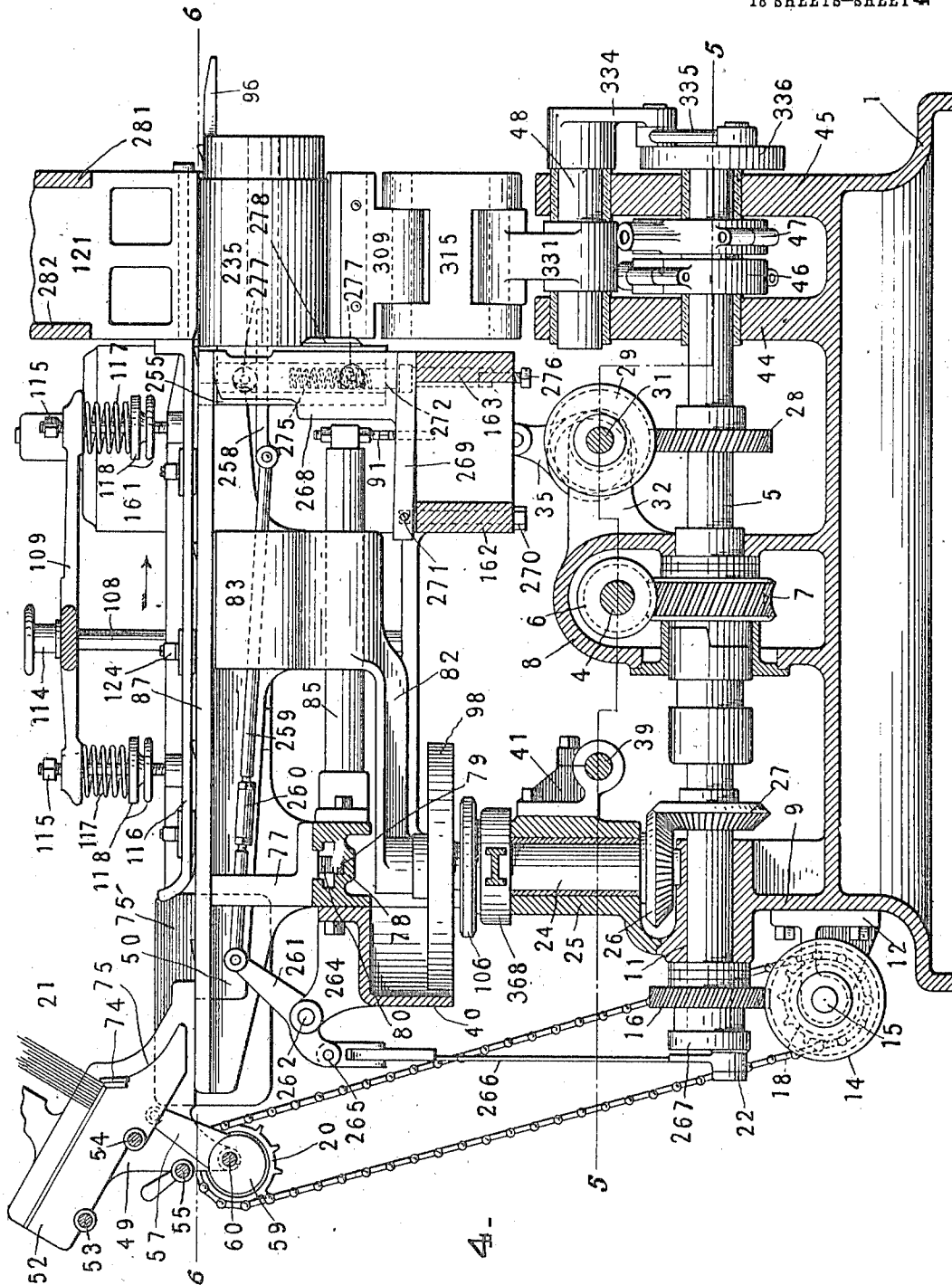


FIG. 4.

WITNESSES

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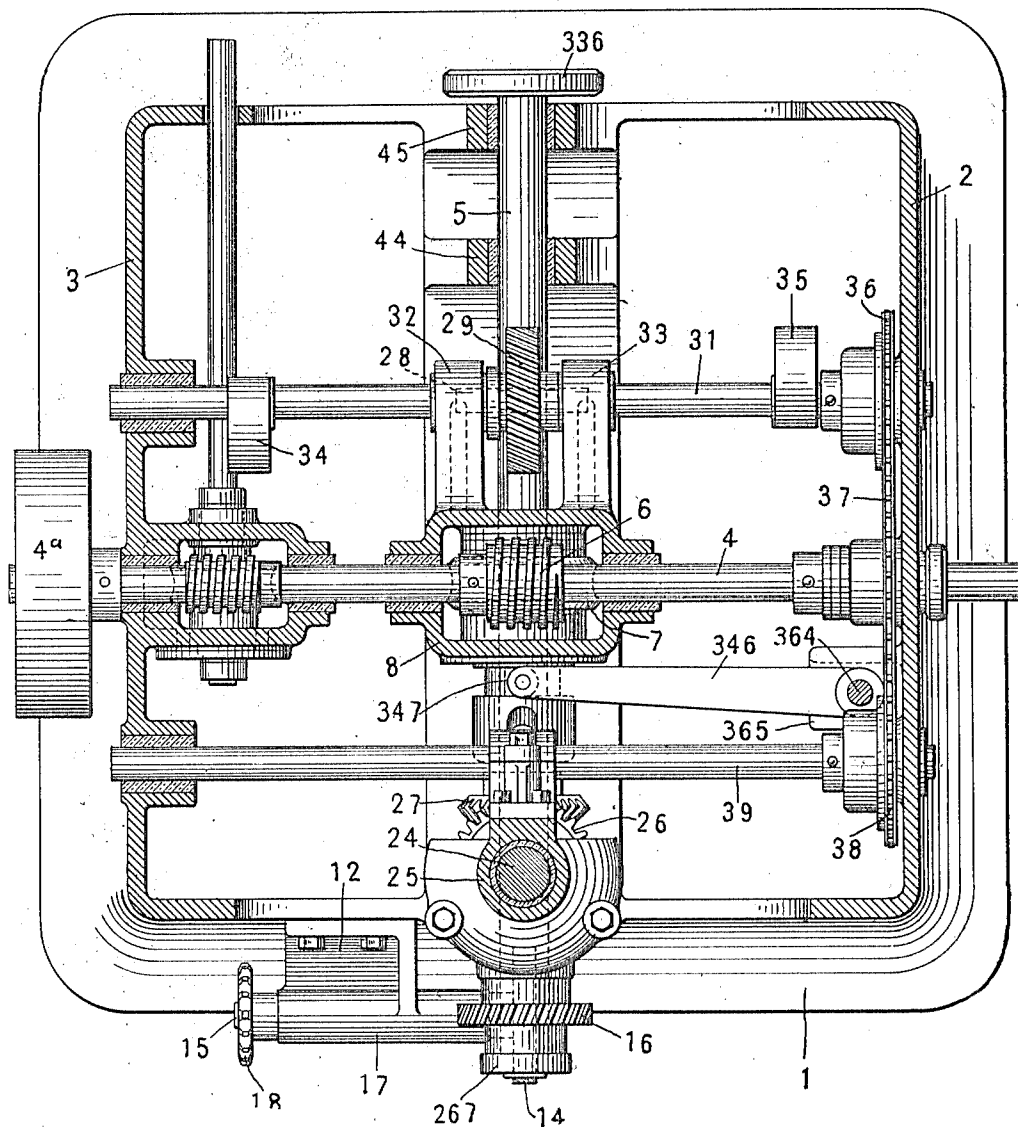
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18 SHEETS—SHEET 5.

Fig. 5.



WITNESSES

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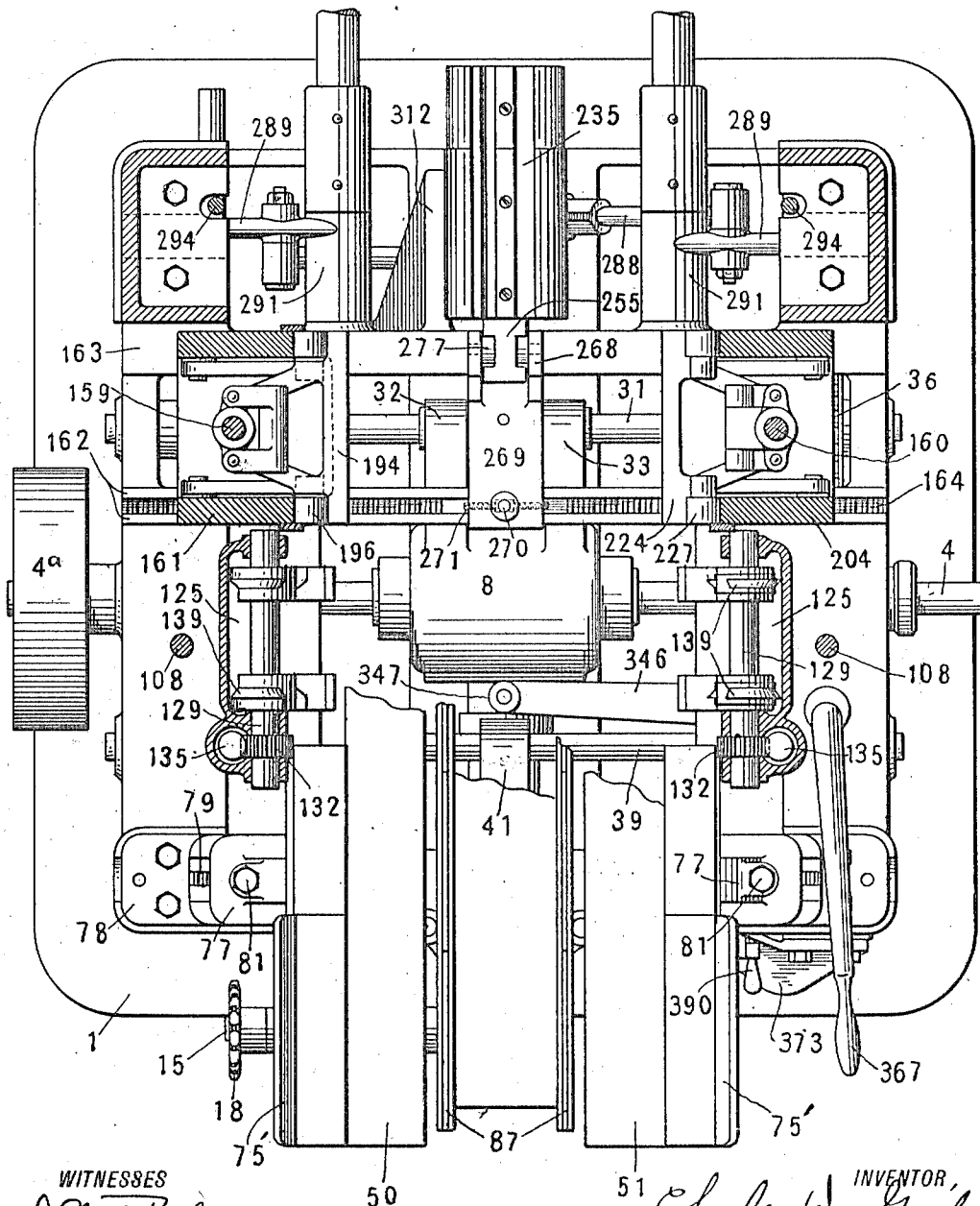
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1,063,918.

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18 SHEETS-SHEET 6.

FIG. 6.



WITNESSES

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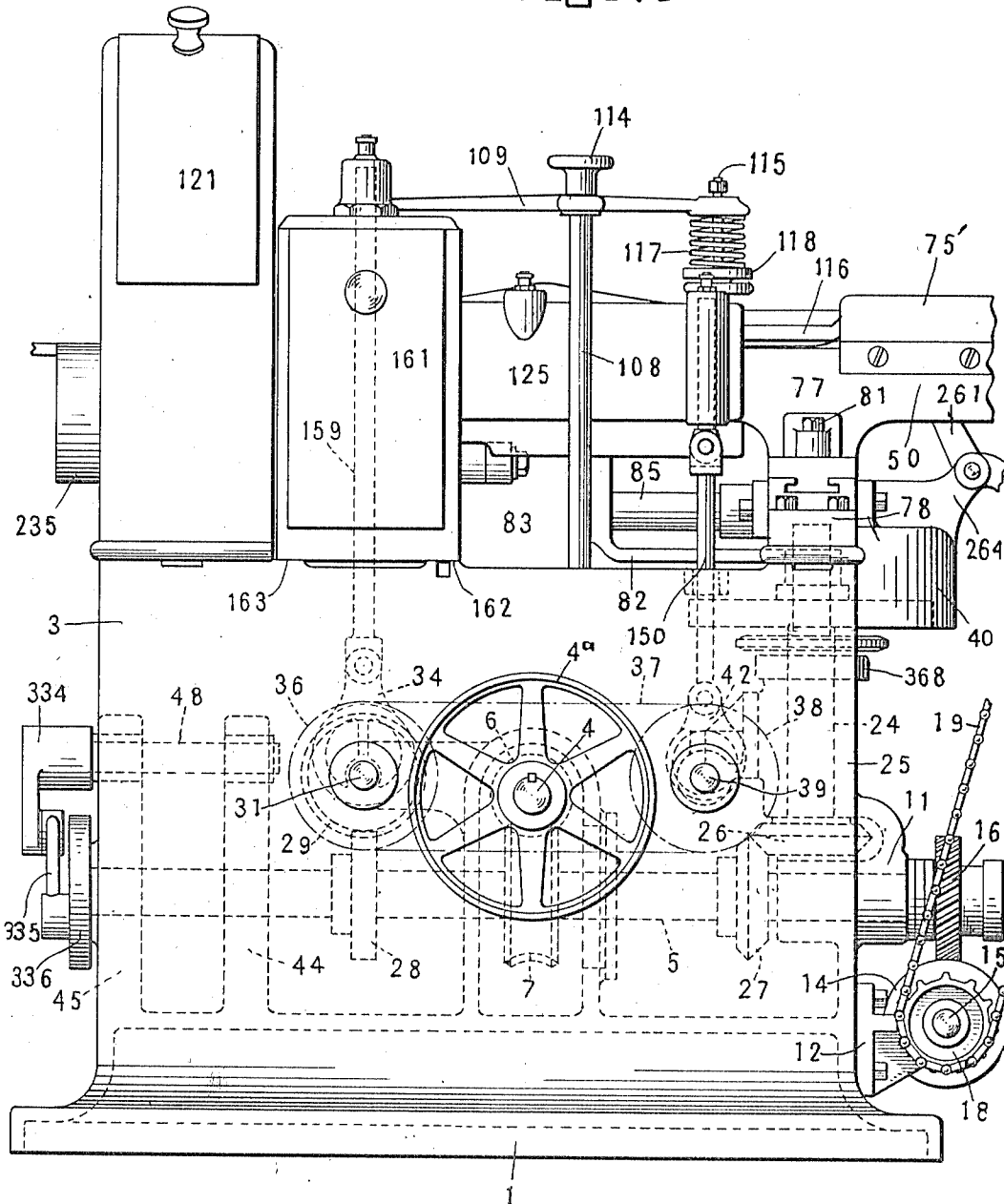
C. W. GRAHAM.
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1,063,918.

Patented June 3, 1913.

18 SHEETS—SHEET 7.

Fig-7.



WITNESSES
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APPLICATION FILED JAN. 28, 1910.

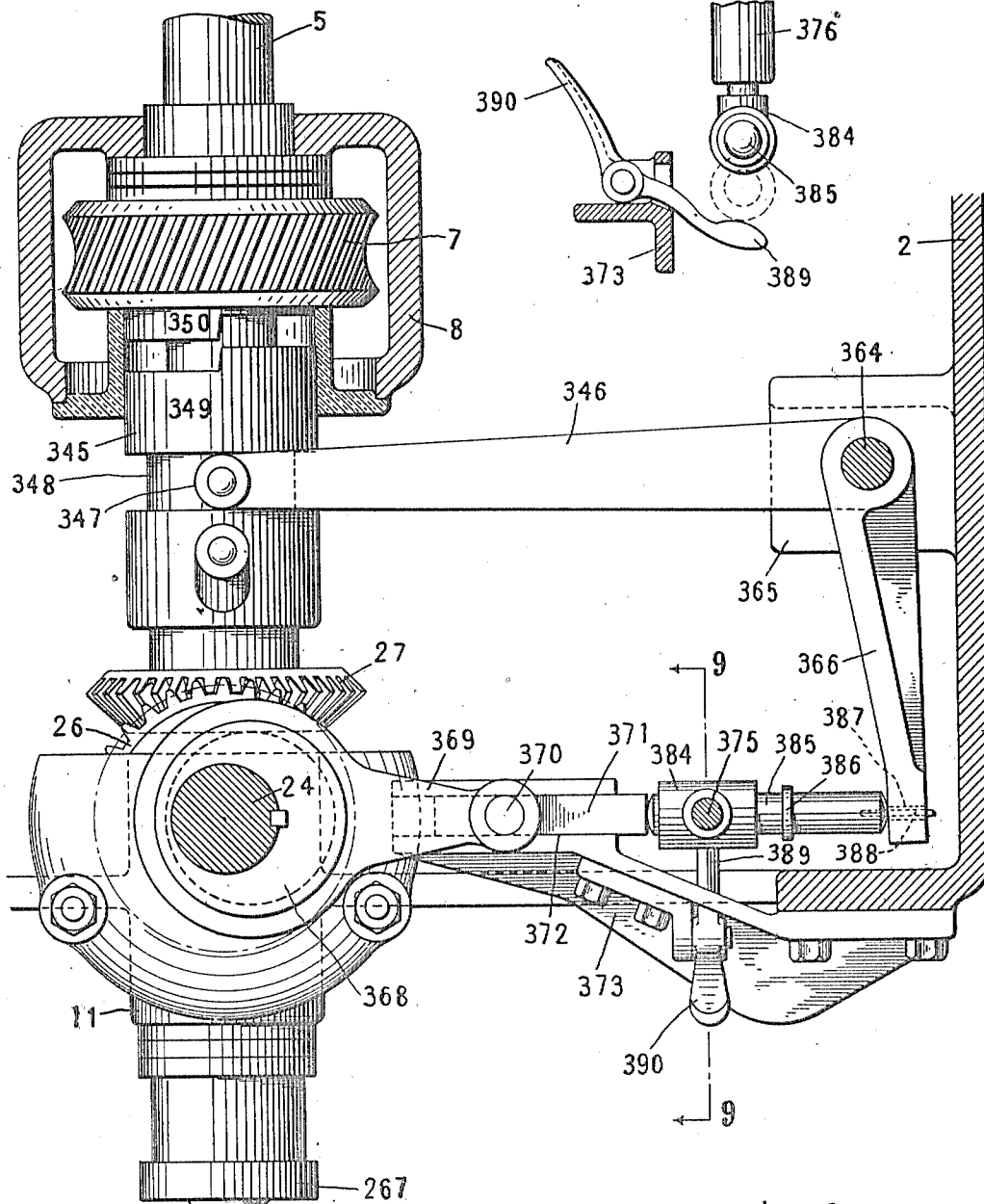
1,063,918.

Patented June 3, 1913.

18 SHEETS—SHEET 8.

Fig. 8.

Fig. 9.



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APPLICATION FILED JAN. 28, 1910.

1,063,918.

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18 SHEETS—SHEET 9.

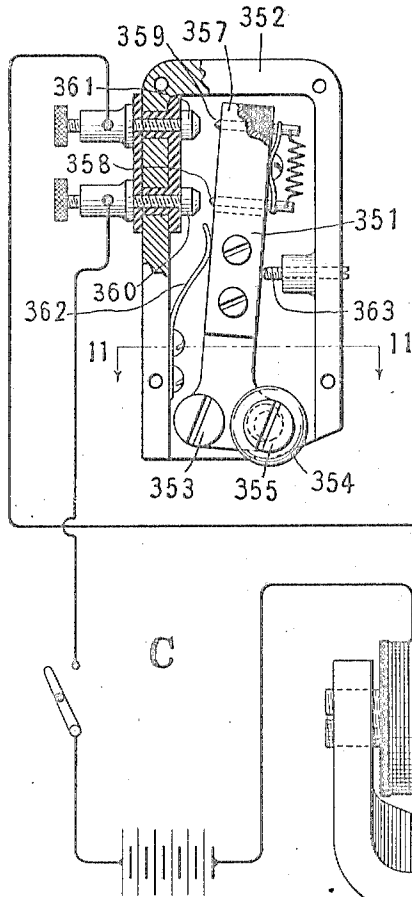
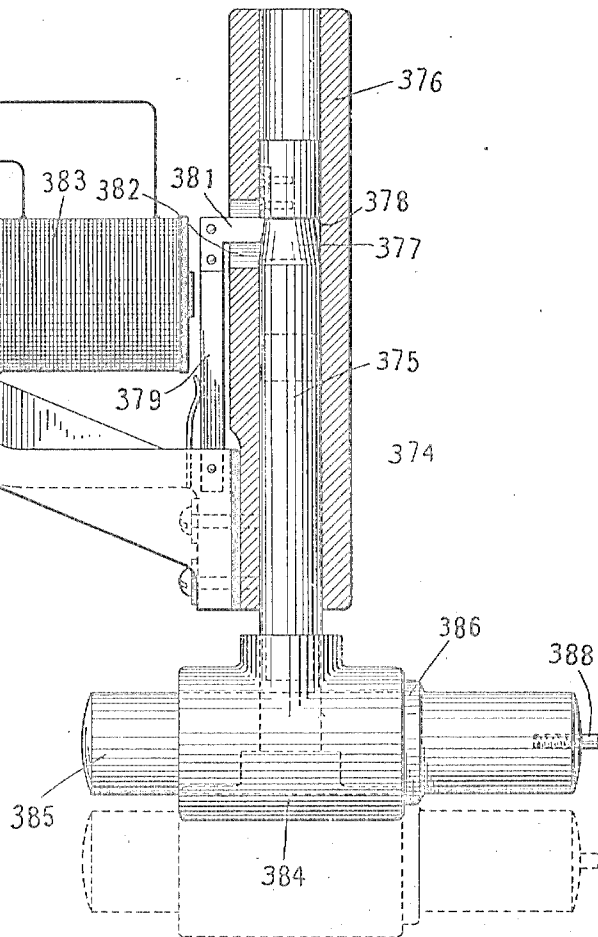
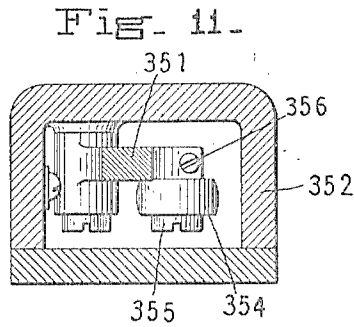


FIG- 10-



WITNESSES:
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18 SHEETS—SHEET 10.

1,063,918.

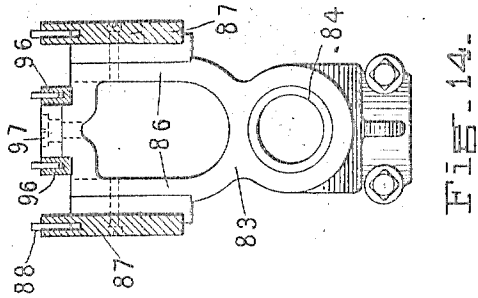


FIG-14.

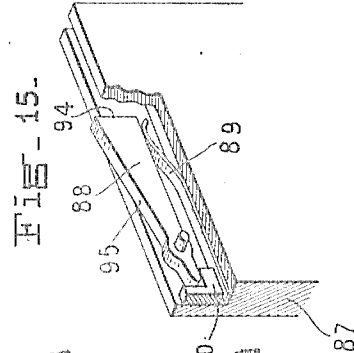


FIG-15.

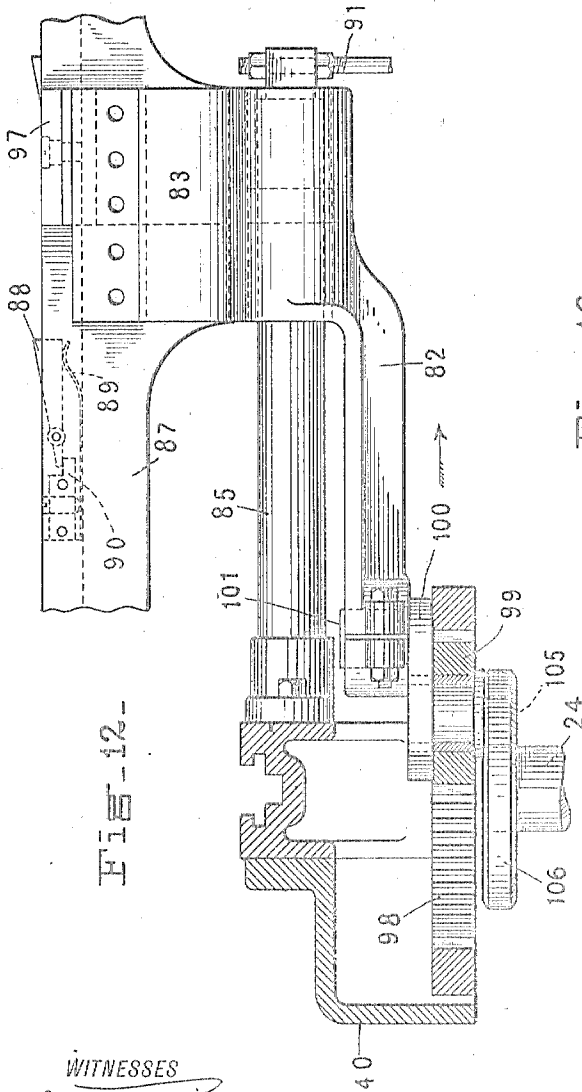


FIG-12.

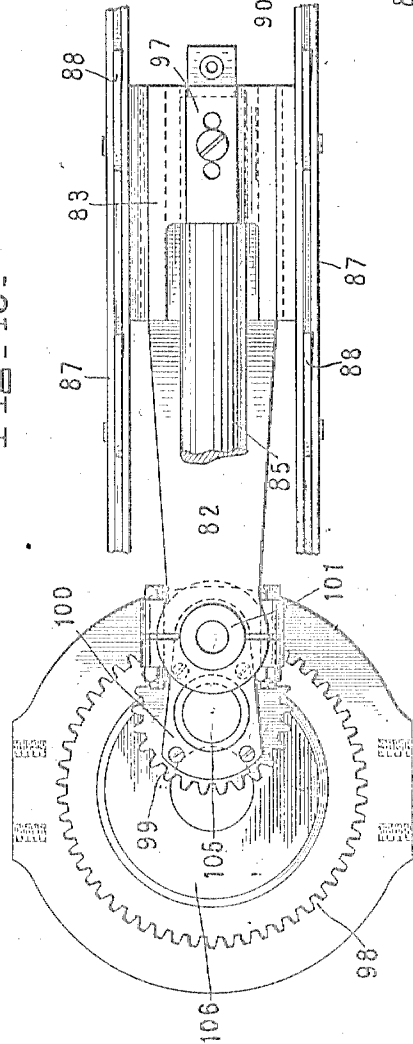


FIG-13.

WITNESSES
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18 SHEETS—SHEET 11.

FIG-18-

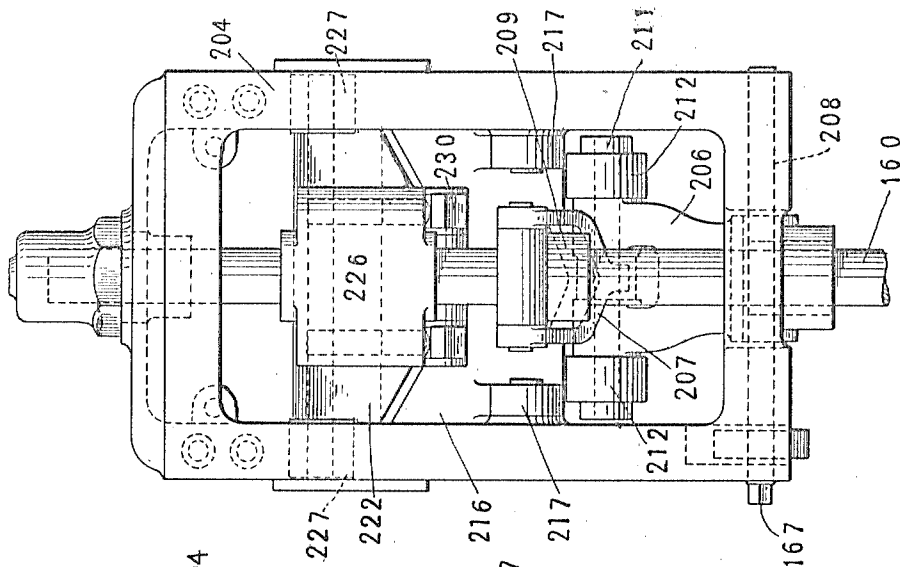


FIG-17-

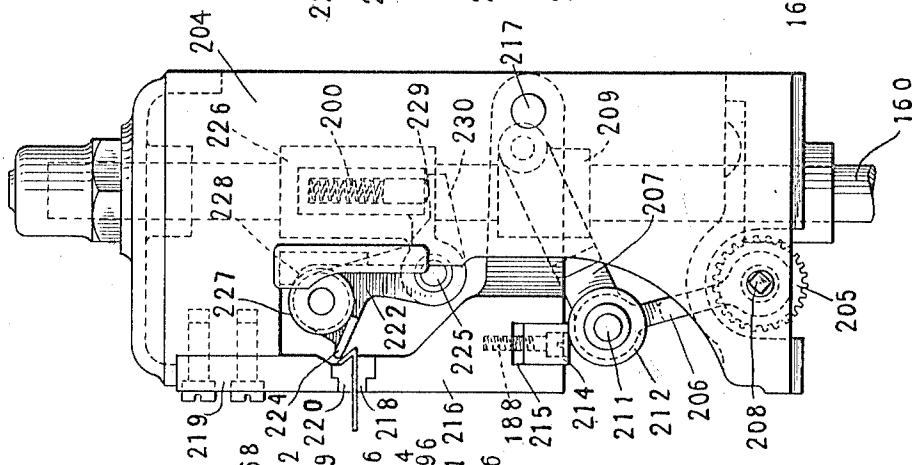
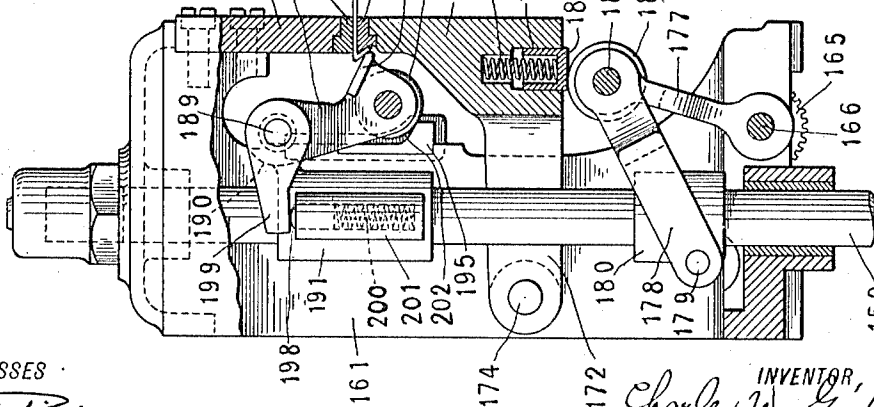


FIG-16-



WITNESSES

J. H. Kipley
A. Hornsberg

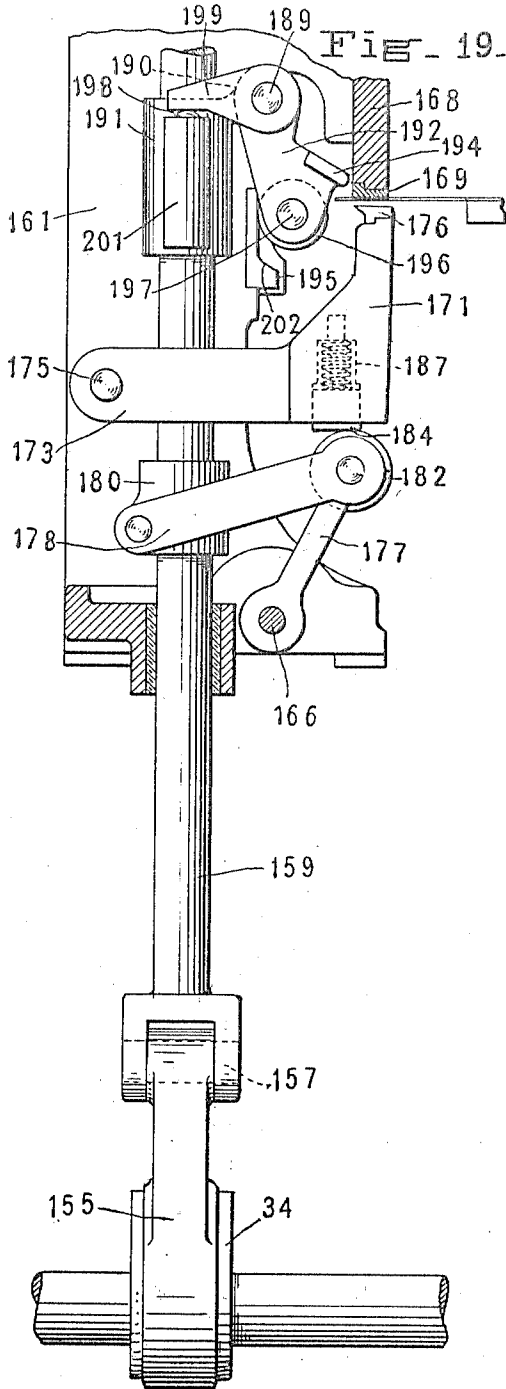
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APPLICATION FILED JAN. 28, 1910.

1,063,918.

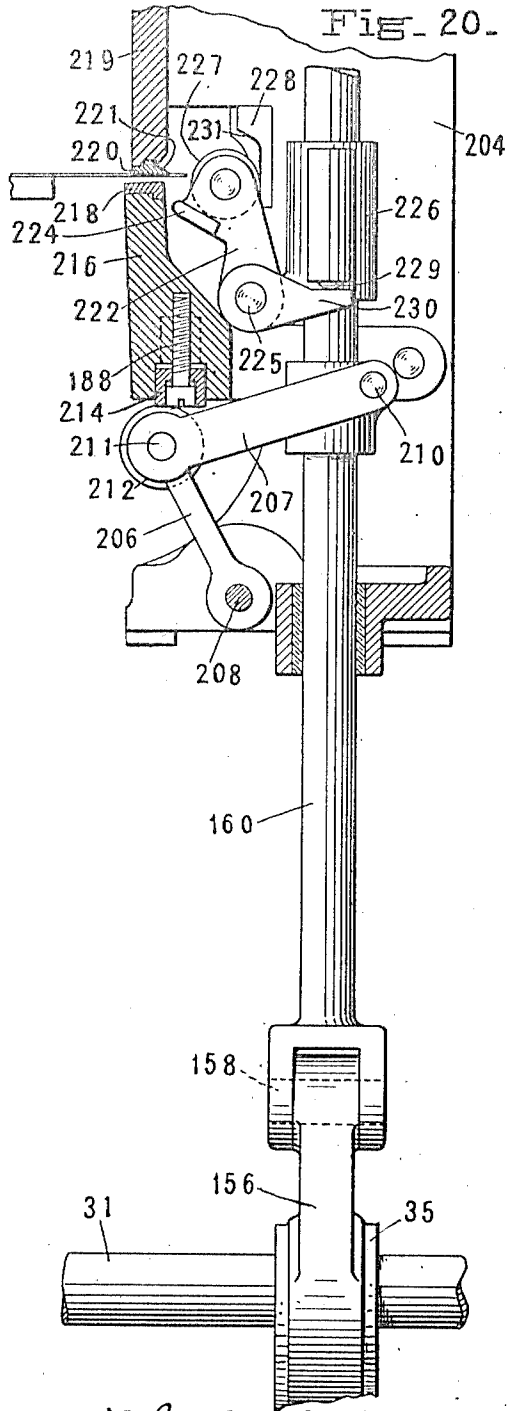
Patented June 3, 1913.

18 SHEETS—SHEET 12.



WITNESSES

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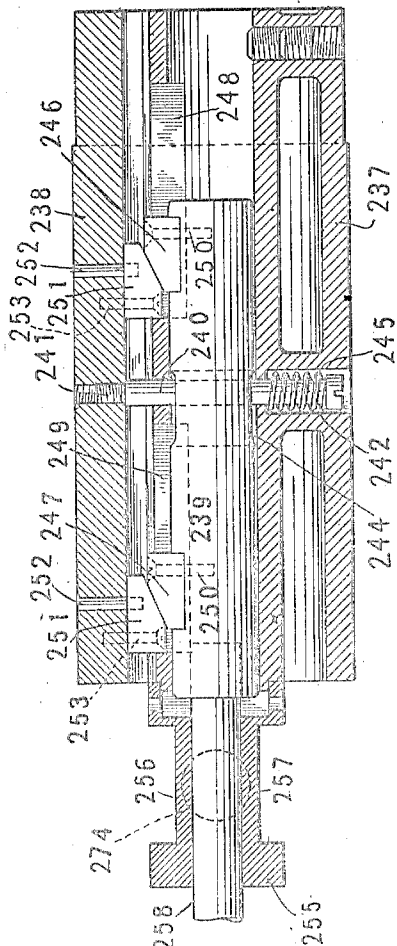
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C. W. GRAHAM.
CAN BODY FORMING MACHINE.
APPLICATION FILED JAN. 28, 1910.

Patented June 3, 1913.

18 SHEETS—SHEET 13.

FIG- 22-



WITNESSES

J. L. D. Tipler
A. H. H. H. H. H.

FIG- 23-

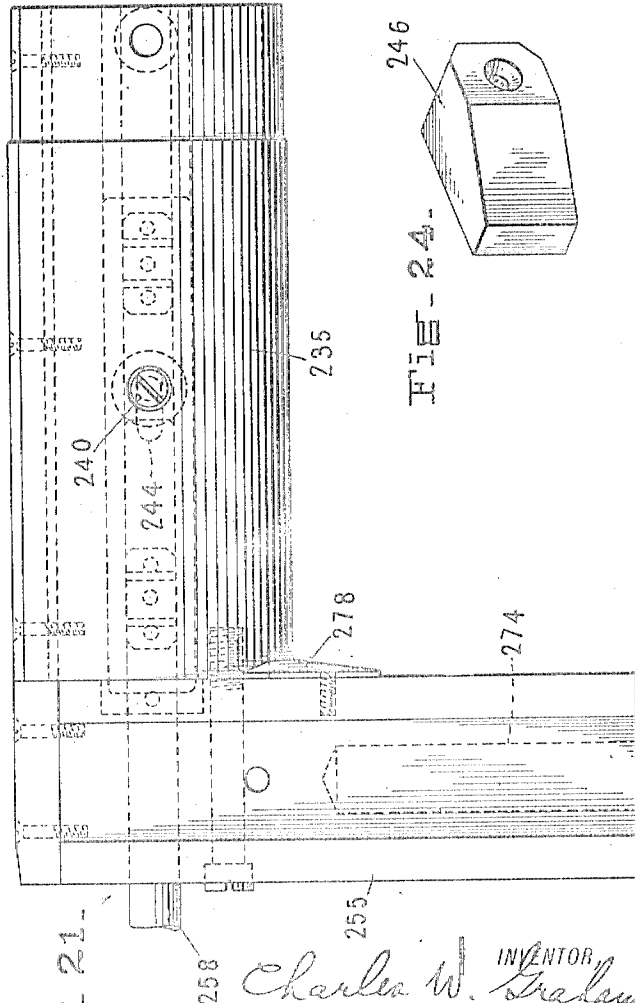
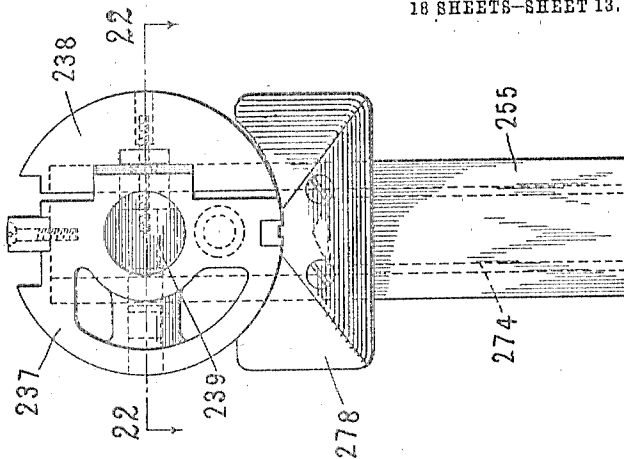


FIG- 24-

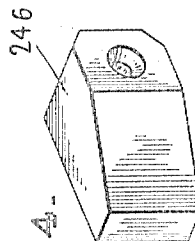


FIG- 21-

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18 SHEETS—SHEET 14.

1,063,918.

FIG- 25-

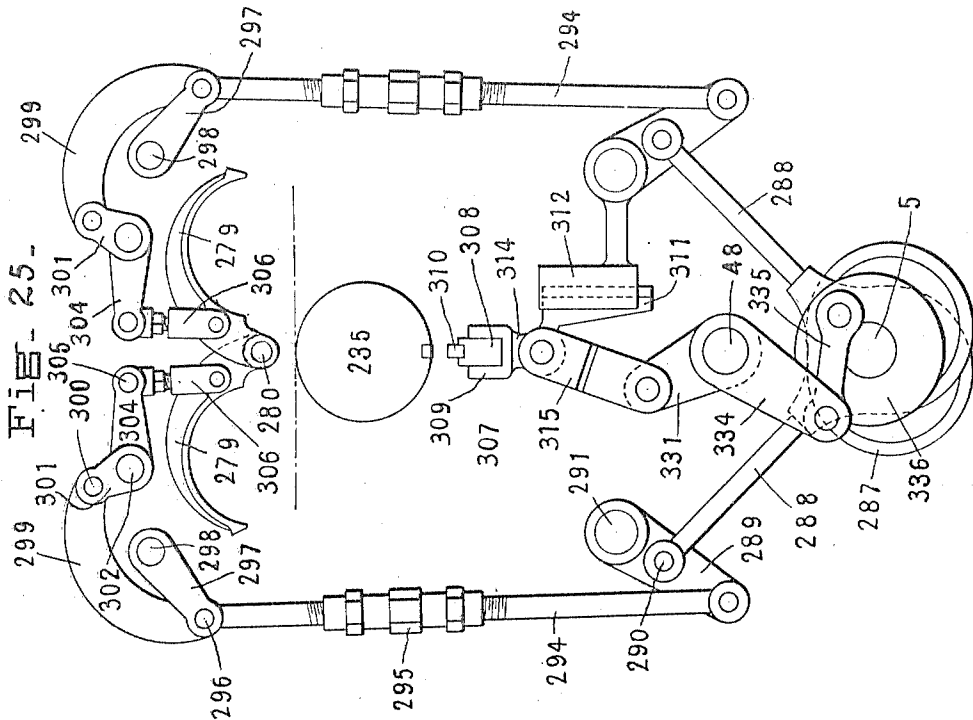
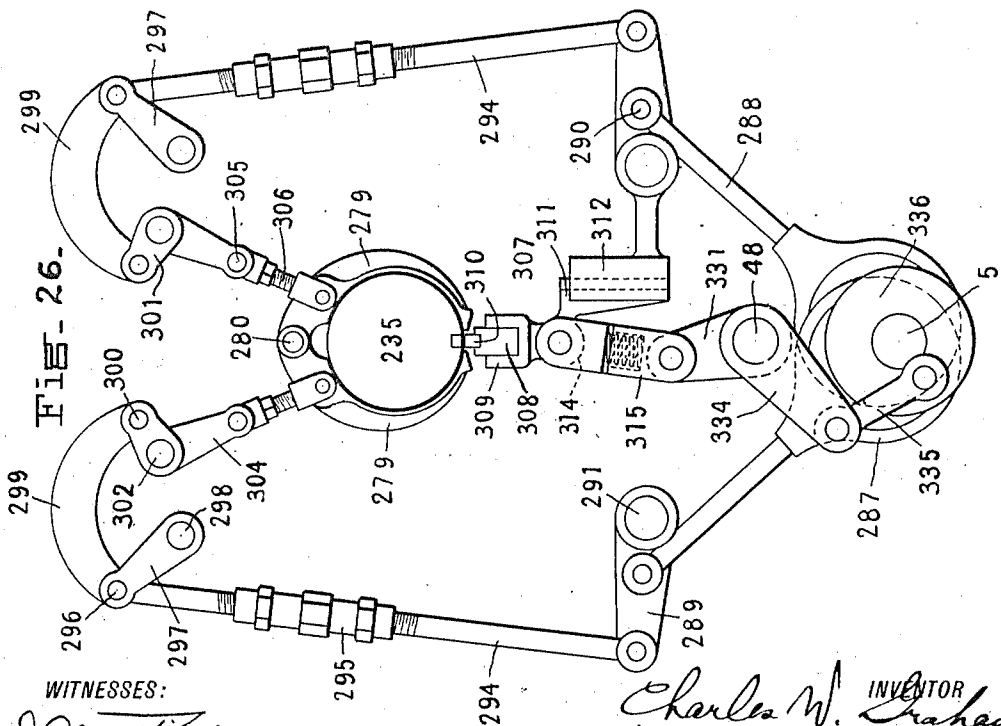


FIG- 26-



WITNESSES:

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1,063,918.

Patented June 3, 1913.

18 SHEETS—SHEET 15.

Fig. 27.

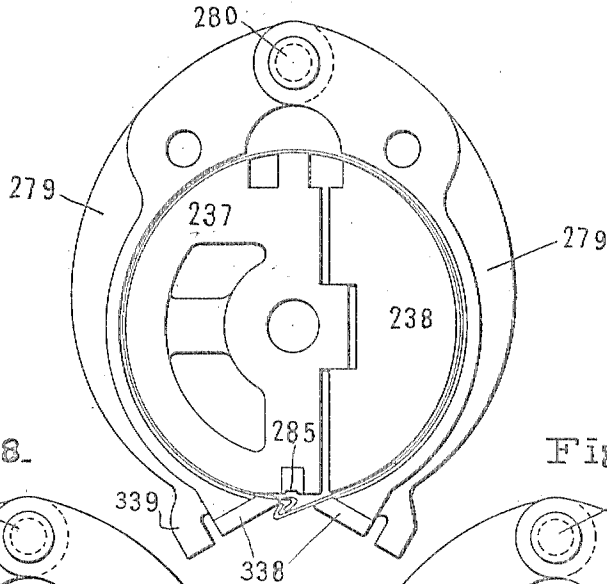


Fig. 28.

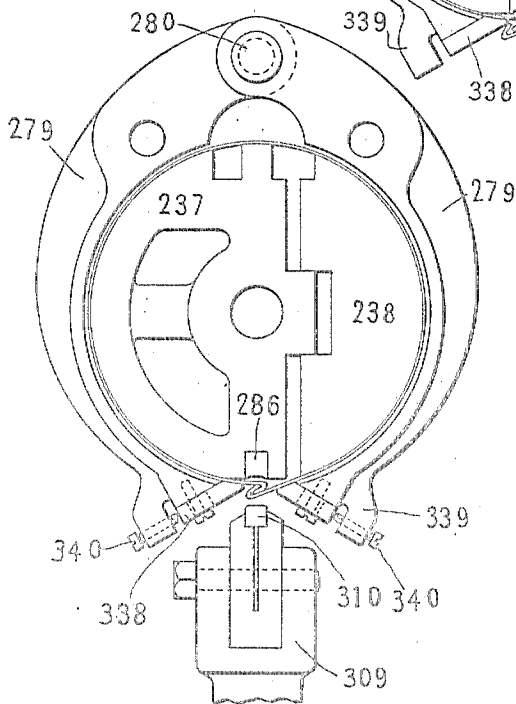
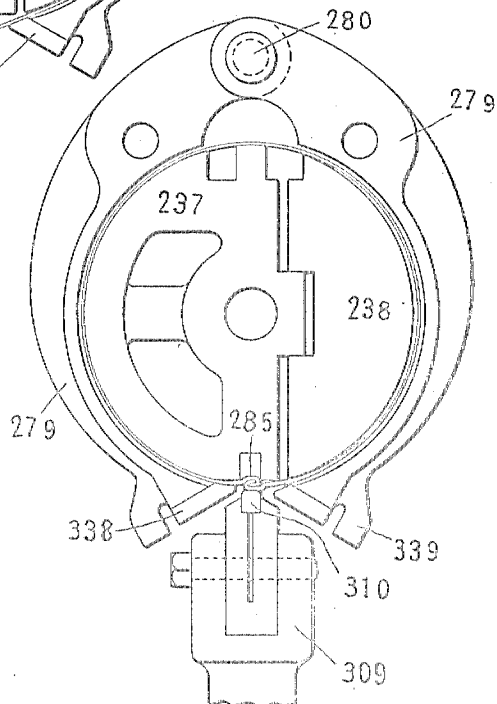


Fig. 29.



WITNESSES:

J. Dyckhoff
A. Noorberg

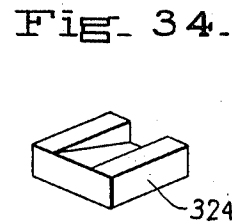
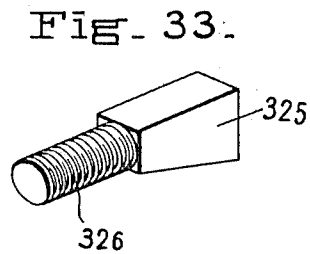
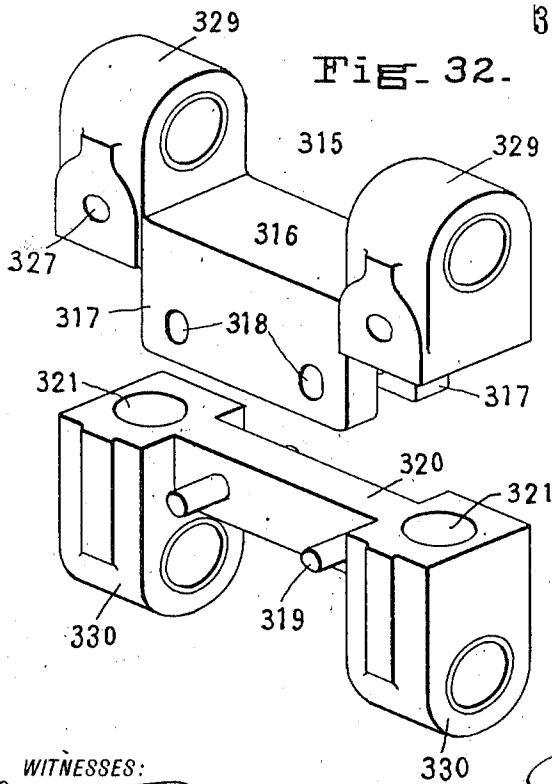
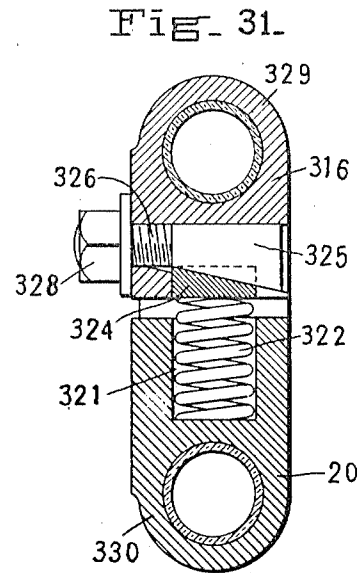
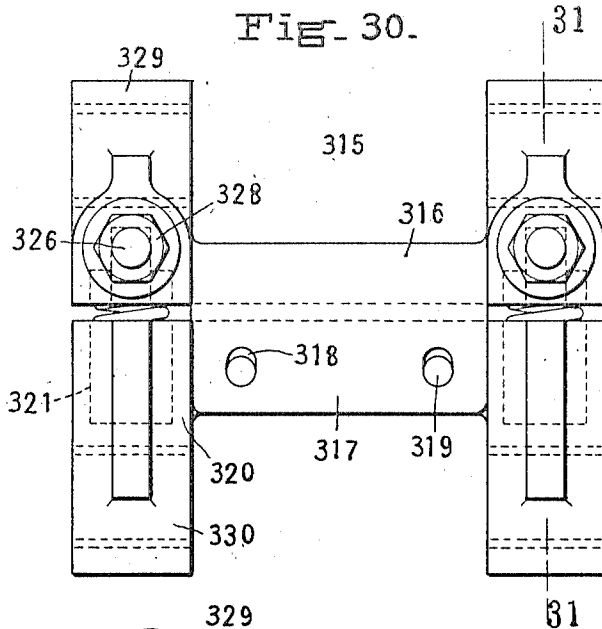
Charles W. Graham INVENTOR,
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APPLICATION FILED JAN. 28, 1910.

1,068,918.

Patented June 3, 1913.

18 SHEETS—SHEET 16.



WITNESSES:
J. A. Knapley
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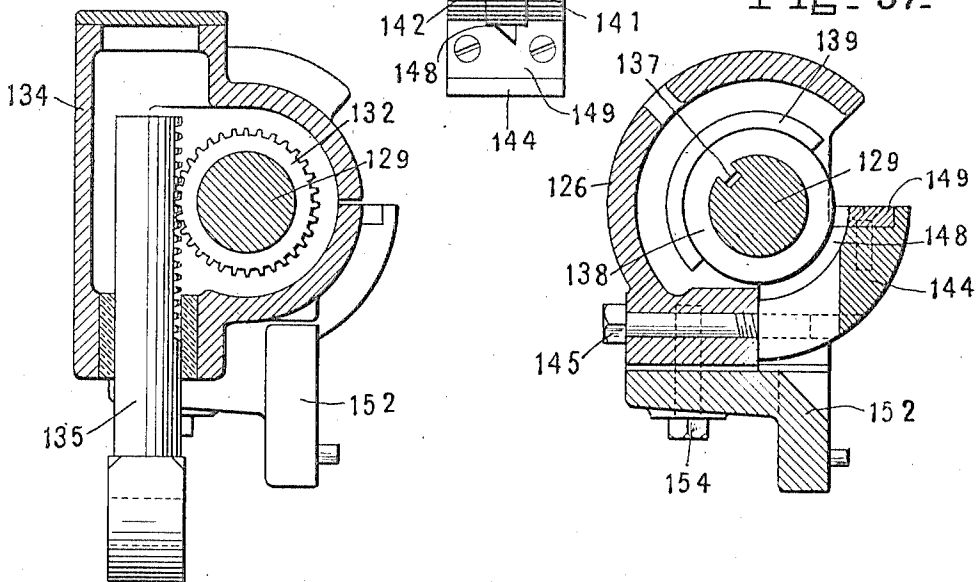
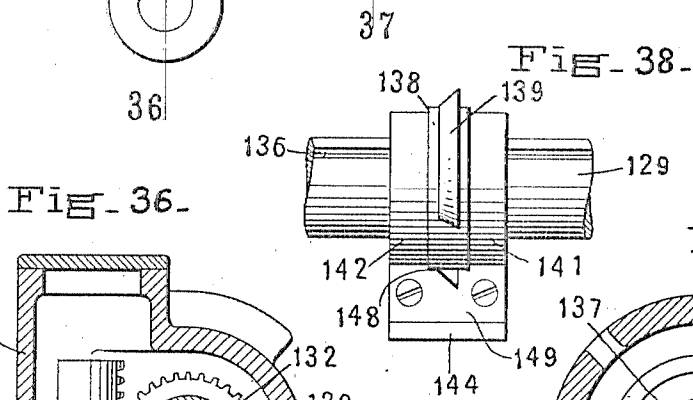
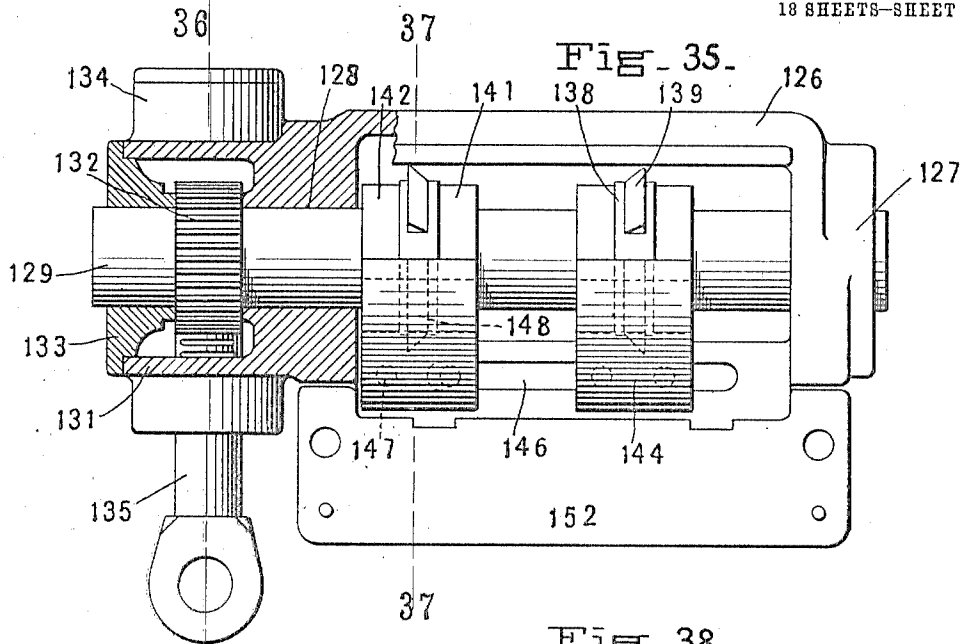
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1,063,918.

Patented June 3, 1913.

18 SHEETS—SHEET 17.



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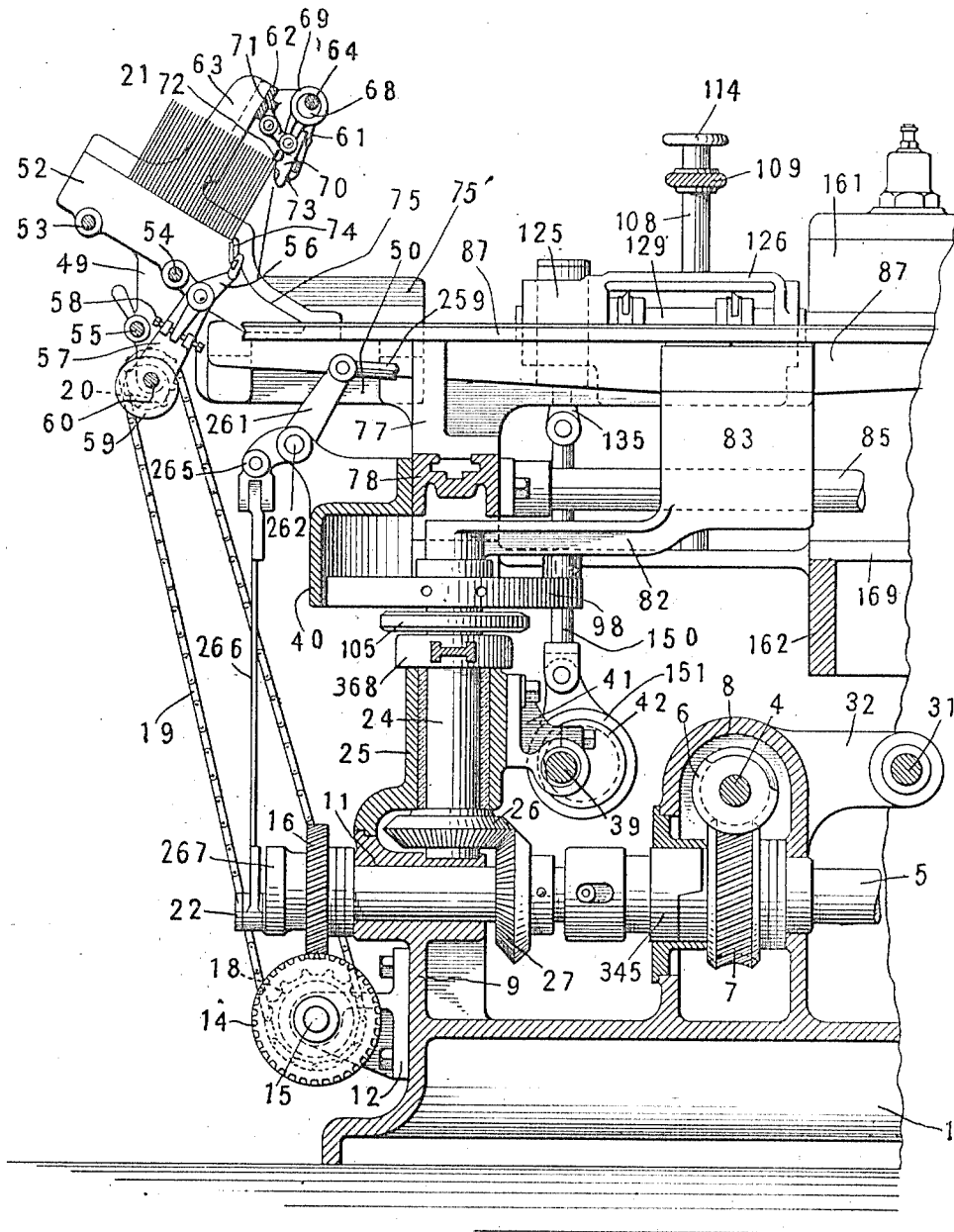
1,063,918.

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APPLICATION FILED JAN. 28, 1910.

Patented June 3, 1913.

18 SHEETS—SHEET 18.

Fig. 39.



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UNITED STATES PATENT OFFICE.

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CAN-BODY-FORMING MACHINE.

1,063,918.

Specification of Letters Patent.

Patented June 3, 1913.

Application filed January 28, 1910. Serial No. 540,569.

To all whom it may concern:

Be it known that I, CHARLES W. GRAHAM, residing at Rome, in the county of Oneida, State of New York, have invented certain new and useful Improvements in Can-Body-Forming Machines, of which the following is a specification.

This invention relates in general to machinery for handling and working sheet metal, and in particular to means for forming can bodies and the like.

One of the objects of the invention is to provide a unitary mechanism which will automatically and efficiently form articles of the above type from sheets of metal, the said machine including improved mechanisms adapted to carry out each of the several steps contributing to such formation.

Another object is to provide particularly simple, durable and reliable means for carrying on each stage of the above named formation in proper succession, and preparing the article for the next succeeding step.

Other objects, more or less broad than these above stated, together with the advantages inherent, will be in part obvious and in part specifically adverted to in the course of the following detailed description of the elements, combinations, arrangements of parts, and applications of principles constituting my invention, and the scope of the application thereof will be indicated in the appended claims.

In the accompanying drawings, which are to be taken as a part of this specification, and in which I have shown a merely preferred form of embodiment of the invention and of the various features ancillary thereto—

Figure 1 is a rear elevation of a machine embodying my improvements, the positions of some of the parts being indicated in dotted lines. Fig. 2 is a front elevation of the structure shown in Fig. 1, and disclosing some parts not shown in Fig. 1. Fig. 3 is a top plan view of the same, with the blank feeding mechanism removed; Fig. 4 is a vertical sectional view, partly in elevation, taken on the line 4—4 of Fig. 3; Fig. 5 is a sectional plan upon the line 5—5 of Fig. 4; Fig. 6 is a similar view taken on the line 6—6 of Fig. 4; Fig. 7 is a left side elevation of the machine showing parts in dotted lines; Fig. 8 is a detail plan view of part of the automatic stop mechanism; Fig.

9 is a section, partly in elevation and partly broken away, on the line 9—9 of Fig. 8, looking in the direction of the arrow, but omitting the driving mechanism shown in Fig. 8; Fig. 10 is a detail view, partly in section, partly in elevation, and partly diagrammatic, of parts of the automatic stop mechanism; Fig. 11 is a section on the line 11—11 of Fig. 10, looking in the direction of the arrow; Fig. 12 is a detail, partly in section, partly in elevation, and partly broken away, illustrating the means for progressing a blank through the machine, and certain of the immediate actuating mechanism; Fig. 13 is a top plan view of the subject-matter of Fig. 12; Fig. 14 is an end view of the cross-head shown in Fig. 12, illustrating the attached blank-progressing parts in section and elevation; Fig. 15 is a detail, partly broken away, of part of the blank progressing means; Fig. 16 is a detail of one of the edger mechanisms, partly broken away, and showing the parts at the end of one of their phases of movement; Fig. 17 is a side elevation of the edger mechanism complementary to that shown in Fig. 16, the parts being in the same relative position as the corresponding parts in said latter figure; Fig. 18 is a side elevation of the subject-matter of Fig. 16; Fig. 19 is an end elevation, partly broken away and partly in section, showing part of the subject-matter of Fig. 16, with the parts at the end of another phase of their movement; Fig. 20 is a substantially similar view of the complementary edging mechanism; Fig. 21 is a detail side elevation of the horn and supporting member; Fig. 22 is a section on the line 22—22 of Fig. 23; Fig. 23 is an end view of the subject-matter of Fig. 21; Fig. 24 is a detail of one of the removable wedge pieces used in the expanding horn; Fig. 25 is an elevation, detached, showing the driving mechanism and intermediate linkage for the forming jaws and bumper, the parts occupying a position as when they are at the end of one of their phases of movement; Fig. 26 is a view similar to Fig. 25, showing the parts at the end of another phase of their movement; Fig. 27 is a detail of the expansible horn and complementary forming jaws, showing the horn contracted and the hooks of the blank interengaged; Fig. 28 is a view similar to Fig. 27, showing the horn expanded and the hooks interlocked, and showing also

the relative position of the bumper; Fig. 29 is a view similar to Fig. 28, showing the horn and the bumper pressing the can body seam; Fig. 30 is a detail of the two-part link included in the bumper drive; Fig. 31 is a section, partly in elevation, on the line 31—31 of Fig. 30; Fig. 32 is a perspective of the parts of the link shown in Fig. 30, disassembled; Fig. 33 is a detail of a member for regulating the compression spring between the parts of the link; Fig. 34 is a detail perspective of a bearing block coöperative with the member shown in Fig. 33 in the performance of the function of the latter; Fig. 35 is an elevation, partly in section, of one of the notcher devices and its immediate actuating connections; Fig. 36 is a section on the line 36—36 of Fig. 35; Fig. 37 is a section on the line 37—37 of Fig. 35; Fig. 38 is a detail of one of the notchers proper; and Fig. 39 is a partial, central, vertical section, part of which is taken along the lines 39—39 of Fig. 2.

The reference letters and numerals herein used indicate, respectively, the same parts in the several figures of the drawings. The arrows indicate, without further description, the directions of movement of parts; and where single figures of the drawings are referred to in this specification, such reference is only intended to point out a figure in which the specific parts referred to are well shown, and other figures may show the same parts.

In order to obtain a clear understanding of the nature of my invention, it may be premised that on account of the low selling price of the individual product of can forming machines, it is essential that the amount of manual labor necessarily expended be small, and the rate of production high. To accomplish this object I have provided a machine, hereinafter described, which is entirely automatic in action, and each distinct part of which performs its functions efficiently and prepares the article for the next succeeding step. In this machine it is of importance that the blanks be positively fed thereto singly, and that means be provided for progressing the same through the machine at proper times during the various stages of its formation, and at all times by edge engagement in the same general direction. It has also been found highly desirable to provide mechanism for automatically stopping the machine upon the happening of a given circumstance, as when two blanks simultaneously, or an excessively thick blank, are presented to the machine.

Another desirable feature is the provision of means for maintaining the blanks flat upon the bed along which they are progressed, and means for maintaining the edges of the blank in proper alinement with each other and or with the various blank

treating means to which they are presented, the latter being always accomplished by rear edge engagement.

I have also provided other novel and advantageous features, to which attention will be called in connection with the description of various parts of the machine.

Referring to the drawings, there is shown a frame comprising a base 1, from which rise side walls 2 and 3. A main shaft 4 has bearings in said side walls, and may be driven by a pulley 4^a exteriorly of the machine frame.

5 indicates a secondary shaft, disposed transversely of shaft 4, and driven therefrom as by means of worm gearing 6 and 7 on the shafts 4 and 5, respectively, the engaging portions of said shafts being included in a boxing 8, which rises from and is preferably integral with the base 1, said boxing being provided with transversely disposed bearings for the two shafts respectively, as clearly shown in Figs. 4 and 5, for instance. The shaft 5, through suitable connections, drives all of the moving parts of the machine, and the connections may be briefly indicated as follows: 9 is a standard at the front of the machine, preferably integral with the base 1, and formed with a bearing 11 for the rear end of the shaft 5. A bracket 12 secured to base 1 carries spiral gear 14, on a shaft 15, and gear 14 is driven by engagement with a corresponding gear 16 on the shaft 5. Shaft 15 has bearing in a sleeve 17 (see Fig. 5) and at its other end from the gear 14 carries a sprocket-wheel 18, which drives, as by means of chain 19, the sprocket-wheel drive 20 of a blank supporting and feeding device 21. The rear end of shaft 5 also carries a crank pin 22, which, through intermediate linkage hereafter described, operates a horn expander. 24 is a vertical shaft having an end thrust bearing in the horizontal bearing 11 of the shaft 5, and said shaft 24 revolves within a sleeve 25 connected to the bearing 11. Said vertical shaft is driven through bevel gears 26 and 27 thereon, and on the shaft 5, respectively, to actuate means for progressing blanks through the machine, as hereinafter described. Forwardly of its length the shaft 5 is provided with a spiral gear 28, which engages a corresponding gear 29, carried on a shaft 31 between brackets 32 and 33 extending forwardly from boxing 8; the shaft 31 being arranged transversely of the machine frame, and having bearings in the side walls (see Fig. 5). The said shaft 31 drives, by means of eccentrics 34 and 35, and intermediate connections, edging devices, hereinafter described. Shaft 31 also carries, adjacent its bearing in the wall 2, a sprocket-wheel 36, which drives, through chain 37, a sprocket-wheel 38 on shaft 39 having end bearings in the side walls and an interme-

diate bearing in bracket 41 secured to member 25 (see Fig. 4); shafts 31 and 39 being in substantial parallelism.

The shaft 39 drives, through eccentrics 42 and 43 thereon at opposite sides of the machine, notching devices hereinafter described. Rearwardly of the machine the shaft 5 has bearings in spaced standards 44 and 45, which are preferably integral with the base 1. Carried on the shaft between said standards are eccentrics 46 and 47, which, through connections that extend to opposite sides of the machine, operate bending mechanism hereinafter described. A rock shaft 48 also has bearings in the standards 44 and 45, and is adapted to be oscillated by a crank connection between the forward ends of shafts 48 and 5. The shaft 48, between its bearings in the standards 44 and 45, carries an arm through which motion is transmitted to a bumping mechanism hereinafter explained.

Considering so much of the machine as has been described, it will be apparent that I have provided a frame which, because of the integral standards and bearing members, is adapted to maintain the driving shafts and operating parts always in alinement and proper relation.

The various contributing structures and mechanisms of the machine, and their relations one to another and to the mechanism as a whole, are now to be described.

The blank supply feeding device 21 (see Figs. 2, 4, and 39) includes a support comprising inclined side members 49 secured, respectively, to the alined bed members 50 and 51 (see Figs. 4 and 6), and movable therewith. Between these side members are spaced, alined supporting members 52 for a pack of blanks, adjustably supported by cross-rods 53, 54 and 55 which connect the side pieces 49. The construction and arrangement are such that the members 52 bear an inclined relation to the plane of the bed members 50 and 51. One end of the way formed by the members 52 is open and unobstructed, and extends forwardly of the machine, in convenient position for ready insertion of a pack of blanks, which, by gravity, move down the inclined way toward selecting and ejecting devices, which are located rearwardly in the machine, above and below the lower ends of members 52. The means for transferring blanks one at a time from the supporting device to the bed of the machine include a selector finger and an ejector finger, working oppositely in alternation upon the foremost blank of the pack. The selector means, which work between the members 52 and engage the lower edge of a blank, comprise selector fingers 56 pivotally mounted on the end of a connecting rod 57, being held in their normal adjustment by set screws 58. (See Fig. 39.)

The connecting rod 57 is attached to an eccentric strap upon an eccentric 59 that is mounted upon the shaft 60 which carries the sprocket-wheel 20, driven by chain 19. A restraining link is hung on the laterally extending tie-bar 54, the outer end of said link pivotally engaging the connecting rod 57 and controlling the movement thereof. In the operation of the separating device the finger 56 moves upwardly, engaging the lower edge of the foremost blank, and moves the same up and into a separator 61.

Referring to Fig. 2, 62 indicates a cross-rail at the upper end of the machine, supported in adjustable relation to the side frames 49 by means of the upward slotted extensions 63 thereof, in which the rail is held by suitable bolt fastenings. The rail 62 carries all the upper mechanism of the machine, consisting of a shaft 64 parallel to the shaft 60, and driven therefrom by means of vertical connecting shaft 65, through gears 66 and 67; eccentrics 68 mounted on shaft 64; eccentric straps 69, ejector fingers 70 operated by the straps, restraining links 71, and a blank separating or segregating head 72.

In the operation of the machine a pack of rectangular accurately cut blanks is placed in the machine at the front end and stands on edge upon the inclined way 52, the upper part of the forward sheet bearing against the supporting member 73, the same being an integral part of the cross-rail 62. The inclination of the members is sufficient to cause the pack to feed forward automatically toward the mechanism as blanks are removed thereby. The operation of the fingers 56 upon the foremost blank of the pack is believed to be clear; and it may be noted that the lower edge of the sheet will be moved up and away from the stops 74 against which the lower edge of the blank rests, so that when the fingers 56 recede this edge of the blank will be entirely free, and the blank remains suspended by the pressure between the remaining pack and the supporting member 73 of the cross-rail 62. The fingers 56 having moved the blank up so that its upper edge rests in the separator 72, said fingers begin their return movement, while at the same time the ejector fingers 70 are advancing downward to engage the upper edge of the blank on either side of the separator. As the fingers 70 continue on their downward path they engage the blank resting in the separator 72, and force it down beyond the frictional resistance, when it will drop on the curved way 75 at the front of the feeding device and slide to the bed of the adjacent operating machine. For further details of this feeding mechanism reference is made to the patent issued to me, February 7, 1911, No. 983,822.

Inasmuch as the side pieces of the feeding

and supporting device are secured to the relatively adjustable bed portions 50 and 51, which will be hereinafter described, it follows that an adjustment of the bed for a particular size blank may be made simultaneously with the corresponding adjustment of the blank supporting device; and for the purpose of insuring that the blanks will be brought from the support to the bed in a properly alined condition, I provide inclined walls 75' extending upwardly away from the bed and in alinement therewith.

As heretofore stated, the bed is adjustable as to its width, and accordingly comprises separate members 50 and 51, which are disposed in spaced parallelism centrally of the machine. The bed members are supported upon base portions 77, conformably shaped to engage in a channeled girder 78 which extends transversely of the machine, and is provided with a rack 79 for engagement with a pinion 80 carried by the base portions 77, respectively, of the bed members 50 and 51. It will be evident that by this construction the bed members may be moved toward and from one another, while maintaining their parallelism, because movement in any plane other than that in which they are slidable is precluded. The base portions 77 preferably extend laterally an appreciable distance, so as to provide a firm base for the bed, and may be fixed in adjusted position by means of a binding screw 81 extending through the base and engaging the channel member.

The blank progressing means (see Figs. 12, 13, 14 and 15) takes the form of a reciprocating arm 82, provided with a cross-head 83 having a portion 84 adapted to engage a guide 85, and side portions 86, to which are bolted longitudinally extending members or pusher bars 87, which are channeled on their upper edges. Within said channels are carried dogs 88, preferably of elongated triangular formation, each pivoted near an apex thereof and having its other end pressed upwardly by a spring 89, a stop 90 being provided to limit the upward movement of the dog. The guide 85 is preferably secured at one end to the channel member 78, and at its other may be adjustable within slight limits by means of a threaded pin connection 91 with a fixed part of the machine. The dogs 88 are arranged upon the pusher bars 87 with their squared ends 94 in their direction of feed, and present an inclined surface 95 in the opposite direction, so that when thrown in the direction indicated by the arrow in Fig. 12 they will engage with the rear edges of the blank and propel the same in the direction of the arrow. Upon the cross-head being retracted, however, the inclined face 95 of each of the dogs engages the forward edge of the blank, passing to the rear thereof, and is depressed

and passes beneath the same without moving it. The pairs of dogs are so positioned, and the throw of the cross-head such, that in the operation of the machine a blank is simultaneously presented to the notching mechanism, the edging mechanism, and the forming mechanism. It may be observed also that beyond the point where a blank is presented to the forming mechanism the next forward pair of dogs should be spaced more closely together, because when the blank is next moved forward it is in the form of a can body. Accordingly the forward pairs of dogs are carried in members 96 which are upon the top of the cross-head as indicated at Fig. 14, adjacent a central raised portion 97 thereof.

The arm 82 of cross-head 83 is preferably driven by means of an epicyclic gear, comprising a fixed annular gear 98 bolted within a casing 40 secured to the channeled member 78 at the front of the machine; an inner spur gear 99, and a crank-plate 100 on the spur gear having a pin 101 engaging arm 82 (Figs. 12 and 13). The spur gear 99 is secured upon a pin 105 on a crank-disk 106 at the upper end of vertical shaft 24, and it will be seen that as this shaft is driven from shaft 5 through gears 26 and 27, the cross-head will be moved in a path parallel to and coincident with the longitudinal central plane of the machine. The cross-head is thus reciprocated at the desired rate of speed, and has a suitable length of travel, owing to the long throw of the epicyclic gear as above described.

As the blanks are progressed along the bed and engaged by the various devices in turn, it is desirable that inertia or other movements thereof, aside from the positive movements of travel and formation, should be prevented. To this end I provide means as follows: 108 indicates vertical rods at the sides of the machine, secured in the top sides of the machine frame. 109 indicates a spider, having longitudinally extending arms 110 and transversely extending arms 111. The arms 111 are hooked near their ends, as indicated at 112, to engage the rods 108, being held against upward movement thereon as by means of the collars 114. Loosely engaging the ends of the longitudinal arms 110 are rods 115, which at their lower ends are threaded into a pressure shoe 116, that extends centrally and longitudinally of the bed. Between the arms 110, respectively, and the shoe, and surrounding the rods 115, are compression springs 117 which bear between the shoe and the spider, and whose upward thrust is taken by the collars 114. The springs 117 are regulated as by the adjusting means indicated at 118. The pressure shoe proper comprises a longitudinal member having its end adjacent the blank supply 21 curved upwardly, in

order that a blank may readily be fed thereunder, and having its other end, as indicated at 119, abutting the yoke 121. A rib 122 is arranged along the length of the shoe, and at each side of this rib are apertures in the shoe through which extend pressure blocks 123 which are spring-pressed downwardly by springs 124 secured to said rib 122. These pressure blocks are longitudinally disposed, and have beveled faces in the direction of the blank supply 21, to facilitate the passage thereunder of the blanks. Thus the pressure shoe is self-compensating for any tendency to unevenness caused by the presence of a blank at one point on the bed when there are no blanks at other points, besides that the general resiliency of the device is enhanced. As a blank is transferred from the blank supply 21 to the bed in the manner already described, it is engaged by the rearmost dogs 88, properly alined and progressed forwardly along the bed between the pressure shoe 116 and the bed, to the various blank treating mechanisms which will now be described. In each forward step the blank is positively alined, and the movements thereof are caused always by rear edge engagement therewith. The first mechanism to which the blank is presented is the notcher, whose construction and operation will now be explained.

Referring particularly to the notching mechanisms, which are the first blank treating devices to which the blanks are presented in their passage through the machine, it should be understood that the purpose of the notchers is to remove portions of a blank edge in the form of a notch or incision, as is necessary in the manufacture of certain types of cans. To this end a blank is fed along the bed edgewise intermittently, as already described, so that one of its phases of movement presents it in operative relation to the notching mechanisms indicated generally by the reference numeral 125, which are positioned in alinement at opposite sides of the bed. (See Fig. 6.) Here each mechanism, by properly timed actuations, operates to cut a notch or notches in the presented edge portions of the blank. Inasmuch as the mechanisms shown are substantially identical in construction, except for such differences as are due to their opposed relation in the machine, I shall describe but one of them. Each of the notcher mechanisms comprises a box-like casing 126, which is provided at opposite ends with bearings 127 and 128 for a shaft 129. At one end the said casing is provided with a tubular extension 131 beyond the bearing 128, and the said shaft projects into said tubular extension. Within said extension the shaft is provided with a pinion 132, and beyond said pinion there is a closure 133 for

the tubular extension. Preferably formed integral with the casing thus far described is a sleeve 134, disposed transversely of the shaft bearings, and opening into the tubular extension. Within said sleeve is adapted to reciprocate a rack-bar 135, which engages the pinion 132, and in its reciprocation rocks the shaft 129.

The shaft 129 is provided with a longitudinal key-way 136, and within said key-way is adapted to engage a correspondingly formed key 137 on a notcher member, which comprises an annular support or collar 138 adapted to be slid on to the shaft, and having an integral, preferably segmental, cutting member 139, which may be of any preferred cross-section, or as shown in the drawings. Closely embracing the member 138 are spaced collars 141 and 142, within which the shaft 129 is free to rotate, and preferably integral with said collars 141 and 142 is the die-portion 144 of the mechanism. This die-portion is preferably segmental in form, as indicated in Fig. 37, and abuts at its rear against the lower part of the casing, to which it is secured as by means of a bolt 145.

From the description thus far given it is evident that the die-portion 144 is fixed in the casing, while the notcher proper travels in a circular path toward and from it, being guided in its movements by the collars 141 and 142. The bolt fastening 145 for the die preferably passes through the slot 146 in the casing, and obviously upon loosening the bolt, the die may be slid along the shaft, carrying the notcher with it, so that adjustment of the die and notcher longitudinally of the shaft may be made simultaneously. I have shown each shaft provided with two of the dies and cooperating notchers, and only one of them, at the right in Fig. 35, is adjustable in the slot 146, the fastening of the other being partly in the slot 146 and partly through an ordinary bolt-hole 147.

The die member 144 is provided with an aperture 148 extending therethrough from the horizontal face thereof down, and a removable die-plate 149 is carried on the face, being provided with a notch shaped conformably with the cross-section of the notcher part 139. It will be seen that as the shaft 129 is rocked, the notcher 139, moving with the shaft, will approach the die 144 and cut out a correspondingly shaped piece from the edge of the blank which overlies the die. The cut-out piece is forced through the notch in the removable die-plate, and thence falls through the aperture in the die.

The rack-bar 135, which drives the shaft 129 as already described, is reciprocated by means of a link 150 connected to an eccentric strap 151, which is driven from an eccentric 42 on the shaft 39 that extends transversely

of the machine, and which is driven in the manner already described. The notcher mechanisms are carried on the sides of the bed as shown in Fig. 6. The attachment is preferably through the intermediary of bracket 152, upon which the casing is held in an adjustable relation as by means of bolt and slot connections indicated at 154 in Fig. 37. If the bed members, with the attached notching devices be moved, it will, of course, be necessary to change the position of the eccentrics 42 and 43 on the shaft. It will be evident that with the construction described the adjustment of the bed for blanks of a particular width adjusts also the feeding device 21 and the notching mechanisms. On account of the removability and adjustability of parts, as described, it is obvious that the particular kind or location of cut or notch is merely a matter of selection and arrangement.

The device having both of its operating parts mounted upon the drive shaft, makes possible an efficient and economical drive with a minimum of operating parts, and subserves compactness. Furthermore, because of the interengaging portions of the die and notcher, the operating parts reciprocally guide one another, while their adjustability is a very important feature. As the next step in the series of operations, the blank, which has now been notched, is progressed to edging or hook forming mechanism, which operates thereupon simultaneously with the notching of the blank next following. The edging mechanism now to be described is adapted to edge a blank so that the hooks will be of uniform size and shape, and friction and vibration of moving parts be reduced, thus lessening wear and noise. The device comprises few operative parts, thus minimizing the space occupied thereby in a can body forming machine. In this device there is provided a bending means whose initial movement is substantially normal to the surface of the blank, and which, after engagement with said blank, bends the edge thereof about the edge forming member, the construction being such that there is no scraping action between the surface of the tin and the edge forming means. Proceeding to a description of the edgers, there are located upon shaft 31, adjacent the ends thereof, oppositely disposed eccentrics 34 and 35, and connected with sleeves 155 and 156 mounted upon said eccentrics by means of pivots 157 and 158, are vertically disposed rods 159 and 160, which operate the edging mechanism as hereinafter described.

Referring now to Figs. 16 to 20 inclusive, 161 denotes a box or housing which rests upon ways 162 and 163 that extend transversely of the machine and are suitably supported in the side walls thereof. Way 162

is provided with a rack 164, with which meshes a pinion 165 carried upon the shaft 166 journaled in the lower portion of the housing and extending transversely thereof, said shaft being provided with a squared end 167 adapted to receive a wrench, or other turning instrument. The purpose of this rack and pinion construction is to enable the housing to be conveniently adjusted laterally of the machine, as when it is desired to operate upon blanks of different dimensions. Fixedly carried upon the housing 161 is a plate or clamping member 168, the lower end of which is provided with a blank engaging member or jaw 169, and cooperating with the clamping member 168 and arranged in opposed relation thereto is a movable clamping member 171, the same being carried upon arms 172 and 173. These arms are pivotally supported at 174 and 175 upon the housing 161, and straddle the vertically disposed rod 159. Clamping member 171 is provided with a jaw 176 to clamp and hold a blank adjacent an edge thereof, as shown in Fig. 16 of the drawings. The swinging clamping member 171 is actuated by mechanism which will now be described. 177 denotes a link which is journaled upon shaft 166, said link at its upper end being bifurcated to receive the end of a second link 178, which is pivoted thereto. Link 178 at its opposite end is bifurcated to straddle the vertically disposed rod 159, and is journaled upon laterally extending studs 179 provided upon the bracket or collar 180 fixed upon rod 159. Link 177 is provided at its upper end with laterally extending ears or studs 181, upon which are journaled rollers 182. Resting on rollers 182 is a block 184, which is located in a slot 185 extending transversely of the clamping member 171. Springs 186 located in pockets 187 formed in the clamping member 171, and interposed between the same and block 184, form a resilient support for the clamping member upon the rollers 182. Screws 188 extending loosely through block 184 and threaded into the clamping member 171 retain said block 184 within its slot. Link 177 is inclined inwardly as shown, so that when rod 159 is moved downwardly the link will be moved toward a vertical position, which movement will operate to swing the clamping member 171 upward and cause it to cooperate with the fixed clamping member 168 to clamp and hold the interposed blank. Mounted upon the pivot 189 supported in ears 190 formed upon a casting 191, fixedly secured upon the vertical rod 159 is a carrier 192 for the edging blade 194, said blade extending transversely of the carrier and located adjacent the clamping jaw 168 within the housing. The cam members 195 fixed upon the sides of the housing are traversed by rollers 196 carried upon the pivot pin 197, which ex-

tends transversely of the carrier 192. The rollers are maintained in engagement with the surfaces of cams 195 by means of plungers 198, which engage tail-pieces 199 of carrier 192. Plungers 198 are urged to operative movement by means of extensile springs 200, suitably housed in boxes 201, formed in casting 191.

The various parts are so positioned that when the rod 159 is moved downwardly the jaws of the clamping members 168 and 171 engage and hold the blank just prior to the engagement of the bending-blade 194 therewith. This blade, when the rod 159 is moved downwardly, first moves in a straight line normal to the surface of the exposed edge of the blank. When, however, the bending plate 194 engages the blank, and the rollers 196 reach the abruptly curved portions 202 of the cams 195, the further movement of rod 159 and the traversing of rollers 196 upon said cams causes the bending blade to partake of a compound movement, so that it follows substantially the contour of the edge-forming portions of the jaw 176, bending the edge portion of the blank thereabout.

It will be observed that the cams 195 are so formed that when the edging blade 194 moves to the position shown in Fig. 16, the upper surface thereof forms an acute angle with the flanged portion of the blank, and that upon the commencement of the return movement of the blade it will tend to swing into parallelism with said flange.

The above description is directed to the mechanism for flanging one edge of the blank. The mechanism for flanging the opposite edge thereof, which is of a similar character, will now be described. The housing 204, similar to housing 161, and located upon the opposite side of the machine upon the ways 162 and 163, is similarly adjusted transversely of the machine, as by means of the pinion 205 which engages the rack 164 of way 162. Links 206 and 207, pivotally connected respectively to the shaft 208 and the bracket 209 upon the vertically disposed rod 160 at 210, and pivotally connected together as at 211, carry the rollers 212, upon which rests the block 214. This block is positioned in the longitudinally extending slot 215 of the swinging clamping member 216; springs being interposed between the block and the clamping member as in the above described construction. Clamping member 216 is pivotally supported as at 217 upon inwardly extending studs upon the housing 204, and is provided at its upper end with a jaw 218. 219 indicates a fixed clamping member carried by the housing 204, and said clamping member carries the jaw 220, which is provided with the tapered edge portion 221, that slopes inwardly and upwardly. This part constitutes the form-

ing member for the flanged portion of the blank, and corresponds to the portion 176 of the other edger means. The carrier 222 for the edging blade 224 is pivotally mounted at 225, upon ears of a casting 226 fixedly secured to the rod 160, and has rollers 227 which traverse the paths of the cams, one of which is shown at 228 in Fig. 20, said cam being mounted upon the housing 204. The rollers 227 of the carrier 222 are maintained in engagement with the cam paths by means of the plungers 229, which engage with tail-pieces 230 of the carrier, said plungers being forced outwardly by means of extensile springs suitably housed in the casting 226. When rod 160 moves upwardly the edging blade is first moved in a corresponding direction along a right line normal to the edge of the blank, until it engages the same, at which point the rollers 227 engage with the abruptly curved portion 231 of the cam path, whereby the edging plate moves in a compound curve to bend the edge portion of the blank about the edge forming portion of the jaw, as shown in Fig. 17 of the drawings, in a manner similar to that already described in connection with the first described edging mechanism.

The operation of the edging devices is as follows: Assuming that the blank to be edged has been fed between the clamping jaws of the edging mechanism as shown in Figs. 19 and 20, wherein the opposed edging mechanisms are shown in their proper relation, insofar as their vertical positions are concerned, the simultaneous upward and downward movements of rods 159 and 160 respectively, will, through the links 177, 178, 206 and 207 respectively, swing the clamping members 171 and 216 upward, whereby the blank will be firmly clamped and held adjacent the edge portions thereof. It will be noted that during the upward swinging movements of the clamping members 171 and 216 they are moved outwardly, and that such swinging movement tends to take out any slack there may be in the clamped blank, and stretch it taut between the opposed edging devices. The opposed clamping jaws are so positioned as to permit lateral edges of the blank to project slightly beyond the same, and into the path of travel of blades 194 and 224. Substantially simultaneously with the closing of the clamping jaws upon the blank, the blades 194 and 224, moving in opposite directions, strike the projecting portions of the blank and bend them into the positions shown in Figs. 16 and 17 of the drawings, as has been previously explained. Movement of the rods 159 and 160 in opposite directions, respectively, will return the edging members to the positions shown in Figs. 19 and 20, which permits the edged blank to be fed forward so that the succeeding blank may be brought into operative po-

sition. The above cycle of operations is then repeated, the blades 194 and 224 operating to edge the succeeding blanks in the manner above described. The driving parts for the edging mechanism are so proportioned as to feed and discharge one blank during each revolution of the shaft 31. It will thus be seen that I have provided efficient edging mechanism which, while simple, is of the most substantial construction, the operative parts of the mechanism for each side of the machine being compactly arranged in a single housing. The driving means for the edging device is also of simple construction, comprising merely vertically reciprocating rods, which are driven from eccentrics mounted upon a common shaft. Another advantage inherent in the present invention lies in the fact that the entire edging mechanism is readily adjustable to accommodate blanks of varying widths.

The given blank having now received such necessary treatment as can be given to it while it remains in a flat condition, it is, at the next step, progressed into superposed relation above an expanding horn or mandrel 235. The horn is positioned centrally of the machine beneath the yoke 121, and is supported in a manner hereinafter described so that it is pressed upwardly into engagement with the yoke. Yoke and horn are located centrally of the machine, so that the strains incident to body forming and bumping may be resisted uniformly. The horn comprises two complementary members 237 and 238 which interengage, and between which a reciprocating element 239 by its movement causes movement of said complementary members toward and from each other. One of said complementary members, for instance the one numbered 237, is longitudinally apertured (see Figs. 22 and 23), and the reciprocating element 239 is movable in said aperture. A pin 240 is threaded into member 238 as indicated at 241, and headed in a transverse recess 242 of the member 237, there being an elongated slot 244 in the reciprocating member 239 for the passage of the pin 240. A spring 245 surrounds the end of the pin and bears between the head of the pin and the inner wall of said recess, to urge the members 237 and 238 to movement toward each other, that is, to bring about the contracted condition of the horn. Upon the reciprocating element, at each side of this slot, are provided wedge members 246 and 247, which extend through and have movement in slots 248 and 249 in the wall of member 237. Said wedge pieces 246 and 247 are preferably socketed into member 239 in order to prevent relative sliding movement, and there held in place as by means of screws 250. Coöperative with said wedge pieces are similar pieces 251 upon the opposed face of member 238, ar-

ranged so that as the several wedge pieces are moved toward each other they tend to separate the members 237 and 238. The pieces 251 are preferably provided with a fixed pin 252 adapted to be slipped into apertures in the member 238, and are secured by means of screws 253. The wedge pieces 251 extend down into the slots 248 and 249, so that their movement toward the left in Fig. 22 is limited by engagement with the end walls of said slots, as shown in said figure. It will be evident that when the reciprocating member 239 is moved to the right in Fig. 22 the spring 245 draws the members 237 and 238 together, while in the case of movement of member 239 in the other direction, the members 237 and 238 will be forced apart against the resistance of spring 245, thus bringing about the expanded condition of the horn. The renewable wedge pieces I consider of importance, particularly in view of the ease with which they may be removed, and the security of their attachment.

Secured to the rear end of the horn 235 is a vertical member or extension 255, which is preferably channeled on opposite sides, as indicated at 256 and 257, for a purpose hereinafter referred to. A rod 258 for operating the member 239 is slidable through member 255, and reciprocation of said rod is accomplished as follows: A link 259, which may be adjustable as by a right-and-left connection 260, is connected at one end to the rod 258 and at the other to an arm 261 of a bell-crank lever that is pivoted at 262 in a bracket 264 formed on the casing 40 at the front of the machine. The other arm 265 of the lever is swiveled to the end of a connecting rod 266, whose other end is pivoted to crank-pin 22, carried on disk 267 at the front end of shaft 5. It will be evident that with each revolution of the shaft 5 the bell-crank lever will be oscillated back and forth on its pivot 262, thereby accomplishing reciprocation of the member 239, with consequent expansion and contraction of the horn. The parts are so disposed that a dead center condition is established between the shaft 5 and connecting rod 266 at the end of each half-revolution, that is at the ends of the contracting and expanding phases of movement of member 239. At the same time bell crank 261 is rocked about center 262, whereby a dead center condition is obtained between the pivot point 262, the pivot at the end of 261 and the pivot at the end of rod 259, where it connects to the bar 258. The longitudinal travel of bar 258 is of greater extent than is necessary to simply cause the expansion of the horn, this excess travel being for the purpose of incorporating a time element in the movements of sufficient length to provide a complete rest of the movable portion of the

horn in its contracted position for a sufficient time to convey a completed can body from the horn and deposit the following body blank in position on the horn and to fold the same around the horn before the expansion again takes place. Otherwise the timing of this mechanism is as hereinafter described.

It should be noted that in order to maintain constant the ultimate diameter of the can body formed on the horn, it is necessary only to regulate the amount of expanding movement of the reciprocating member 239, which is accomplished by adjustment of the right-and-left connection 260, in an obvious manner.

For most efficient operation it is desirable that the horn should be constantly spring-pressed against the fixed abutment or yoke, that it should be laterally adjustable with respect to the yoke, and that it should have capacity for movement in the vertical plane of its axis. The channeled member 255 extends between spaced alined standards 268, rising from a horizontally disposed base 269 that is supported centrally of the machine upon the members 162 and 163. The connection with the member 162 is by means of the threaded pivot pin 270, that extends vertically through member 162, and the pin 270 has slight lateral adjustment within its transversely extending slot in the member 162, by means of the alined horizontal set screws 271 that bear against it. An aperture is formed in the member 163 substantially in alinement with set screw 276, and a plunger 272 extends through said aperture and through an aperture in the member 269 up into an aperture 274 in the member 255, a spring 275 being compressed within the member 255 by said plunger, the spring being regulated by manipulation of the screw 276. The spring constantly tends, therefore, to throw the member 255 and the rigidly attached horn vertically against the yoke 121. Each of the standards 268 carries a pair of rollers 277, one near the top and one near the bottom, the rollers of each pair, respectively, engaging opposite side walls of the channels 256 and 257 in the member 255, said rollers being very slightly smaller in diameter than the width of said channels.

278 indicates a device for insuring that as edged blanks are bent about the horn, the flanged edges or hooks thereof will remain in, or be brought into, longitudinal alinement. This device preferably takes the form of a plate, which may be secured to the member 255, and shaped so as to extend partly about the horn (see Fig. 23), the face of the plate adjacent the horn being formed so that it rises rearwardly toward the horn in a plurality of directions, three different planes being shown in Fig. 23. It should be observed, further, that the blank is held in

frictional engagement with the yoke and the horn by means of the spring which urges the horn against the yoke, while the rear edge thereof is contacting the gage plate 278.

Referring now to the means for bending the previously flat blank into round shape on the horn, with the hooked edges thereof interengaged, 279 indicates a pair of bending members or jaws, shaped conformably to and adapted to embrace the horn 235. The jaws 279 have a common pivot 280, which is longitudinally disposed between the spaced centrally depending walls 281 and 282 of the yoke, and are adapted to move simultaneously toward and from the horn. When in their open position, as indicated in Fig. 25, the ends of the jaws are up and out of the way of the blank as it is fed to the horn, and of the formed body as it is withdrawn therefrom. With a blank at rest in the position indicated in Fig. 25, and the jaws open, movement of the jaws toward each other to the position of Fig. 26 will bend the blank about the horn, which, by the properly timed movement of the horn expander, is at this time in its contracted condition (Fig. 27). Jaws 279 by means of their swinging movement tightly stretch the blank about the contracted horn, and the oppositely flanged edges slip over one another. The horn is now expanded through the properly timed movement of its expander (Fig. 28), thus causing the flanged edges to interlock, one with another. At this stage the bumper, which is being slowly moved upward, contacts the interlocked edges and clenches the same, by pressing them into a groove 285, formed in a seaming steel 286 carried by the horn, with considerable force. The bumper is then quickly retracted, and the horn being allowed to contract by means of the movement of its expander, and the jaws swung upwardly, the feed pawls take against the rear edge of what now may be termed the can body and move it off from the horn.

The mechanism as above referred to, in its embodiment herein disclosed, possesses certain features of utility and advantage, due to construction and arrangement of parts now to be described, referring particularly to the forming jaws and their operative connections. Movement of jaws 279 about pivot 280 is occasioned through connections with eccentrics 46 and 47 on shaft 5, respectively; and inasmuch as the jaws, with their connected parts, are similar, the explanation will be confined to one of them. Extending from the eccentric strap 287 of the eccentrics 46 and 47 is an eccentric rod 288, whose outer end is pivoted to a lever 289, intermediate the ends thereof, as at 290, said lever being pivoted as at 291 to the cross-piece 163 of the machine frame. Pivoted to the free end of lever 289 is a link 294, adjustable as to length as by means of

a turn-buckle or right and left connection 295. At its upper end the link is pivotally connected to the free end 296 of a controlling arm 297, which is pivoted between the plates 5 of the yoke as at 298. Pivoted to the free end of the arm 297, preferably also at 296, is the end of a link 299, whose other end is pivoted as at 300 to one end 301 of a bell-crank lever pivoted in the yoke as at 302, and whose other end 304 is pivoted as at 10 305 to one end of a link 306 that is adjustable as to length and pivoted at its other end to the jaw 279, adjacent the jaw pivot 280.

The parts above set forth are of such 15 lengths and so related that they constitute a connection between the shaft 5 and jaw 279 whereby the movement of the jaw is arrested, without shock or impact, when it reaches its closed position (Fig. 26), and 20 when it reaches its open position (Fig. 25), at the ends of half-revolutions of the shaft, respectively. This result is due to the fact that the arm 304 of the bell crank and the link 306 constitute a toggle which is 25 straightened, as in Fig. 26, at the end of one half-revolution of the shaft 5 when jaw 279 is in its closed position; while at the end of the second half-revolution, as in Fig. 25, when the jaw is in its open position, a dead 30 center condition is established between the arm 297 and the bearings 296 and 300 of the curved link 299. Furthermore, when the jaw is in the position of Fig. 26, at the end of the first half-revolution of shaft 5, a dead 35 center condition is established between shaft 5, eccentric 46, and pivot 290, while a similar condition arises when shaft 5 has reached the end of its second half-revolution, as in Fig. 25, with the jaw in its open position. 40 Thus, the connection between shaft 5 and the jaw provides a self-contained check, effective at the ends of the opening and closing movements thereof, without impact with or the intervention of extraneous elements. 45 In addition to attaining this important result, the jaw operating mechanism is so constructed and arranged, as shown, that the driving movement of shaft 5 is transmitted to the jaw so that the jaw moves at varying 50 speeds, in view of the movements of the other parts of the assembled machine. For example, in the present device the parts are such and so related that the to-and-fro movement of the jaw above the line of the blank 55 is accomplished in an interval of time substantially equal to that in which the to-and-fro movement of the jaw below the tin line takes place. For the most practical engagement of the blank by the jaws the pivoted ends of the latter are positioned relatively near the line of the blank, and the movement of the end of a jaw from its open position to the tin or blank line is considerably less than its movement from the tin 60 line to the closed position. Therefore, in

view of the fact that, as stated, the to-and-fro movement of the jaw above the tin line is accomplished in the same length of time as the to-and-fro movement below the tin line, it follows that the movement of the jaw 70 above the tin line is relatively slower than that below the line. Thus ample time is allowed for feeding the blank onto the horn before the actual bending movement of the jaw takes place. Furthermore, after the 75 blank is engaged, the movement of the blank is accelerated.

The description heretofore given of the operative connection between shaft 5 and jaw 279 applies, element for element, to 80 those between the shaft and the complementary jaw or bending member, it being understood that the arrangement of parts is the same, except that they are disposed appropriately in view of the opposed relation 85 of the jaw, as shown. It will thus be apparent that I have devised a bending mechanism which is effective and powerful to the performance of its function, because of the simplicity of its operative connections and 90 its powerful toggle action in which noise, shock, strain, vibration, and wear are relatively small and whose operation is harmonious with that of other parts of the assembled machine, and yet without the use of 95 cams or other undesirable instrumentalities. It will also be observed that the driving shaft 5 is in alinement with the pivot 280, and that the transmission elements are equally disposed on each side of the pivot, 100 and surround it at top, bottom, and sides. Strains are therefore evenly distributed and absorbed, and the mechanism is effectively balanced in structure and operation.

Coöperative with the bending means in 105 a manner previously referred to is the bumper 307. This device includes the bumper proper, which may be of any preferred construction, adapted to contact with the interlocked edges of a can body, 110 but which may well comprise, as shown a U-shaped member 309, between the arms of which is carried a block 308 in which is removably mounted a bumper steel 310. From the lower end of member 309 extends an 115 arm 311, slidable in a guide 312 secured in the machine frame, and a depending part 314 of member 309 is pivoted to one end of link 315. Said link 315, in order to cushion the bumper and render its action uniform, 120 is preferably made in two pieces, relatively movable, with an interposed spring cushion, and may well be constructed as shown in Figs. 30 to 34. As there illustrated, the upper link member 316 carries a bifurcated 125 depending part 317, provided with elongated slots 318, in which slots extend and have slight play, pins 319 on the corresponding interfitting part of lower link member 320. At each end the member 320 is provided 130

with a well 321 for the accommodation of coiled springs 322. Said springs bear respectively against beveled plates 324 carried within the ends of the upper member 316, and correspondingly beveled blocks 325, having threaded portions 326 extending through apertures 327 in the ends of upper member 316, are also located within the ends of the upper member, engaging the channeled beveled faces of plates 324, and in an obvious manner causing the latter to regulate the pressure of springs 322 upon the turning of nuts 328 upon the ends of threaded extensions 326.

Rising from the ends of upper member 316 are journal members 329, suitably spaced to embrace the depending part 314 of the bumper, a pin passing through and pivotally connecting said part 314 and members 329. Similarly, lower link member 320 is provided at its ends with depending journal members 330, adapted to receive between them the end of arm 331, being pivotally connected as by a pin passing through suitable apertures therein. Said arm 331 is fast on the rock shaft 48 having bearings in standards 44 and 45 above shaft 5. Also fast on shaft 48 is an arm 334, arm 331, shaft 48, and arm 334 thus constituting in effect a bell-crank lever. The outer end of arm 334 is pivoted to link 335, that is in turn pivoted to a crank disk 336 upon the end of and coaxial with the shaft 5, exteriorly of standard 45.

It will be noted that the arm 331 and the cushioned link are related after the manner of a toggle, and that in the bumping operation the toggle is tending to straighten.

An important feature in connection with the driving of the bending jaws and the bumper is the fact that shaft 5 has bearings in both standards 44 and 45, and the eccentrics 46 and 47 for the jaws are mounted on the shaft between said bearings. Thus bending strains on the shaft due to the jaw motion are minimized. Furthermore, the rock-shaft 48 has bearings in both standards 44 and 45, and the arm 331 is fast thereon between said bearings, so that in the operation of the bumper no bending strains are transferred to shaft 5. Rock-shaft 48 is driven from shaft 5, and is yet separate therefrom, so far as the transmission of strains is concerned. And in this connection it may be observed, generally, that the various operating parts throughout the machine are so arranged that they act reciprocally to preserve unstrained conditions and evenness of drive.

Referring to Figs. 27 to 29, it may be remarked that the bending jaws are arranged so that only their ends contact the blank. When the jaws are in their closed position, the end of one of them is in a different horizontal plane from that occupied by the other,

to insure that the hooked edges of the blank, as they are forced toward each other by the jaws, will pass over one another and inter-engage. Preferably also the end of each jaw is provided with a wearing plate 338 adjustably held thereon by means of a bolt-and-slot connection, so that its distance from the axis of the horn may be regulated; and said end has a lug 339 thereon in which is threaded a screw 340 that bears against the plate 338 in the plane of the adjustability of the latter. The blank having, by the various described operations, been formed into a can body, the bumper and jaws recede from the horn, and upon the next reciprocation of the feed the can body is taken off the horn, and its place thereon taken by the next succeeding blank. For the purposes of the various mechanisms heretofore described, it is expedient that only one blank at a time be presented to any one of them, and that said blank should be of proper thickness. Therefore I provide a means by which, when too many blanks, or an improper blank, are accidentally or otherwise presented, will immediately act to stop the progression of blanks through the machine. Accordingly, I provide a clutch member 345 pinned to the shaft 5 for relative reciprocatory movement. A shipper-fork 346 straddles the member 345, the bifurcated ends of the shipper being provided with anti-friction rollers 347 that engage a circumferential groove 348 of the member 345. Obviously, by moving the shipper, the clutch end 349 of the member 345 may be moved into or out of engagement with a correspondingly shaped clutch face 350 integral with worm gear 7 loose on the shaft 5 with the effect of positively driving the gear 27 or not, as desired, said gear being fast to the shaft, and by its engagement with the bevel-gear 26 driving shaft 24 and the epicyclic blank progressing means previously described.

At the front end of the machine, suitably spaced above one of the bed members 50 and 51 is a means which, through intermediate devices, will stop the action of the blank progressing mechanism by disrupting the operative connection between the blank progressing means and the shaft 5, through movement of the clutch that is operative to connect or disconnect them. The control for said disrupting means in the present invention being electrical, the said member takes the form of a contact piece 351, carried in a housing 352, and pivoted at its lower end, as indicated at 353. The lower end of member 351 carries a part that extends forwardly of the machine, preferably provided with a roller 354, carried on an eccentric screw 355, held by set screw 356, whereby the roller may be secured in the desired vertical relation. A stem 357 extends upwardly into the housing, and is provided with electrically

connected contacts 358 and 359, adapted to engage, respectively, contacts 360 and 361, insulatedly mounted in the back of the housing, and forming the terminals of a circuit C, diagrammatically indicated in Fig. 10. A spring 362 on the housing bears against the member 351 to hold the contacts 358 and 359 normally separated from contacts 360 and 361, and keep the roller 354 projected slightly below the housing, as shown in Fig. 10.

363 indicates a stop-piece for the member 351, which may be adjustable to regulate the amount of possible projection of roller 354. Normally the roller projects to such an extent that a blank of proper thickness may pass between it and the bed, and so that if more than one blank, or too thick a blank, is presented, the roller will be engaged thereby and forced back and up to close the circuit referred to, with effects hereinafter described.

The shipper 346 is fast on a rock shaft 364 that is pivoted on a bracket 365 near the bottom of the machine frame, so that rotative movement of said rock shaft will cause movement of the shipper. Such rotative movement of the rock shaft is brought about automatically by means of an arm 366, which is adapted to be operated from a moving part of the machine when the circuit C is closed. For manual control of the clutch the rock shaft may be provided with a handle 367, exteriorly of the top side wall of the frame through which it extends.

368 indicates an eccentric upon the shaft 24, and 369 an eccentric rod provided at its outer end with a wrist-pin 370 that engages a block 371 slidable in a way 372 on a bracket 373 fast to the machine frame. The arrangement of parts is preferably such that the path of reciprocation of block 371 is alined with the end of arm 366, though these parts are normally physically disjunct. It is obvious that if a connecting member be interposed between block 371 and arm 366 to transmit the movement of the former to the latter, the clutch may be operated to disconnect the entire machine from further movement. Such connecting means preferably takes the form of a gravity member 374, which may include a rod 375 slidable and adapted to be held in a sleeve 376 suitably secured to the end frame of the machine. Adjacent its upper end the rod 375 is provided with an upwardly tapering portion 377, terminating in an abrupt shoulder 378, with which is adapted to engage the end of a finger 379, that is pivoted outside the sleeve and spring pressed so that a portion 381 thereof extends through an aperture 382 in the sleeve, to engage the rod 375. When the rod is slid upwardly a sufficient distance, the end of part 381, which is shaped conformably with the taper 377, will engage

with the shoulder 378, and thus hold the rod in uplifted position.

The finger 379 constitutes the armature of an electro-magnet 383 that is mounted on a bracket insulatedly secured to the sleeve 376, the coils of said magnet being included in the circuit C, so that when the said circuit is closed, the member 379 will be moved against the pressure of its spring to withdraw the portion 381 from engagement with the shoulder 378, thereby permitting the rod 375 to slide downwardly in its sleeve by gravity.

Secured to the lower end of rod 375 is a piece 384, provided with a bore in which is slidable a member 385, which may have a collar 386 to limit its sliding movement in one direction. Pivotal movement of rod 375 within its sleeve is prevented by the engagement with a slot 387 in the arm 366 of a pin extension 388 on member 385, said pin moving vertically in the slot as rod 375 moves. 389 indicates a support for the piece 384, which limits the downward movement of the rod 375, and which may be pivoted on the bracket 373 and provided with a handle 390, by the manipulation of which the rod may be moved up into renewed engagement with finger 381. The parts are so disposed that the member 385, when the rod 375 has reached its limit of downward movement, will be in the line of movement of block 371, and extending laterally between the latter and the clutch lever arm 366; member 385 is of such length that when block 371 is at the inward limit of its stroke, as shown in Fig. 8, it will contact one end of member 385 and slide it within the bore of piece 384 to contact and move the arm 366, supposing the latter to be in the position of Fig. 2, which is its position when the gear 27 is rotated by the shaft 5, and the blank progressing means operating.

In the operation of the device, if the blank progressing device moves a blank along the bed that is too thick to pass between the bed and the roller 354 without moving the latter, or if two blanks are presented, the member 351 will be moved on its pivot to close the circuit C, in the manner described. The closing of said circuit energizes the magnet 383 whereupon the finger 381 is moved out of engagement with the rod 375, permitting the rod to slide downwardly in its sleeve, whereby the member 385 is brought to the position in which the relative approach of the block 371 to arm 366 may constitute it a connecting member between them, so that the rock-shaft 364 will be actuated to move the clutch, whereby to break the operative relation between the gear 7 and shaft 24, thereby stopping further movement of the machine.

The machine comprising the various assembled cooperating mechanisms, by reason

of the construction and the arrangement of the various operative parts, is exceedingly compact, and the construction and relation of the moving parts is such that the entire operation of forming the can body from a blank is effected without any great jar, and substantially noiselessly. Another advantage inherent in the construction as above described lies in the fact that the use of cams is avoided, thus minimizing the necessity of replacement of operative parts through wear. The output of this machine is very large because, the blank being constantly and positively under control throughout its course in the machine, great speed is possible without sacrificing the uniformity of the product. Furthermore, because of the numerous and easily effected adjustments provided for in the various parts of the machine, it is readily susceptible of modification for various styles and sizes of can bodies.

I desire it understood that I do not limit my claims by the details of construction shown, in which I have simply illustrated one way of embodying the creative part or conception of the invention in concrete form in a structure or machine. The described devices are simply embodiments of the invention which other structures might embody, and some of the parts, as also combinations of parts, might well be used without the others in different types of such machines, without departure from the purview of my invention; and I regard myself as entitled to such variations from the shown and described devices as fall within the scope of my invention as indicated in the claims. It is also to be understood that materials, sizes, and relations of parts are unimportant, except as they are specified in the claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a lock and lap seam can body forming machine, in combination, an integrally formed base portion provided with a plurality of vertically extending integral supports, bearings formed in said supports, a shaft in said bearings, means for feeding, notching and edging can blanks and means for forming them into lock and lap seam can bodies and operative connections between said means and said shaft.

2. In a lock and lap seam can body forming machine, in combination, blank feeding means, means for treating a blank and forming the same into a can body, and electromechanical means for disconnecting the entire operative elements of the machine from the driving means whose operation is occasioned by a characteristic of the blanks being fed through the machine.

3. In a device of the class described, in combination, blank advancing means, a horn,

a blank bending means, a bed, a pressure shoe located above the bed, and a pressure block secured to the shoe and spring-pressed to extend beyond the surface thereof.

4. In a machine of the class described, in combination, blank advancing means, a horn, a blank bending means, a bed, a pressure shoe located above the bed, and a plurality of pressure blocks secured to the shoe and spring pressed to extend beyond the surface thereof.

5. In a machine of the class described, in combination, a bed, a plurality of can treating means disposed along the bed, a pressure shoe secured above the bed, and a plurality of pressure blocks secured to the shoe and spring-pressed to extend beyond the surface thereof, said blocks being arranged in accordance with the disposition of the can treating means along the bed, respectively.

6. In a machine of the class described, in combination, a bed, a plurality of can treating means disposed along the bed, a pressure shoe detachably secured above the bed, and a plurality of pressure blocks secured to the shoe and spring-pressed to extend beyond the surface thereof, said blocks being arranged in accordance with the disposition of the can treating means along the bed, respectively.

7. In a machine of the kind described, in combination, a blank advancing means, a blank bending means and can body forming means including a universally movable horn.

8. In a machine of the kind described, in combination, a blank advancing means, a blank bending means a yoke and a horn universally movable with respect to the yoke.

9. In a machine of the kind described, in combination, a yoke, a horn universally movable with respect to the yoke, and spring means urging the horn to engagement with the yoke.

10. In a machine of the kind described, in combination, a blank advancing means, a blank bending means and a horn mounted for angular movement in a plane of its axis.

11. In a machine of the kind described, in combination, a blank advancing means, a blank bending means and a horn mounted for angular movement in the vertical plane of its axis.

12. In a machine of the kind described, in combination, a blank advancing means, a blank bending means and a horn mounted for angular movement in a plane of its axis, and means for moving the horn normal to its axis.

13. In a machine of the kind described, in combination, a blank advancing means, a blank bending means and a horn mounted for angular movement in the vertical plans of its axis, and means for moving the horn normal to its axis.

14. In a machine of the kind described, in

combination, a blank advancing means, a blank bending means and a horn mounted for angular movement in the plane of its axis, and means for moving the horn bodily.

15 15. In a machine of the kind described, in combination, a blank advancing means, a blank bending means, a horn, a yoke and means for maintaining the horn and yoke in yielding engagement.

16 16. In a machine of the kind described, in combination, a blank advancing means, a blank bending means, a horn, a support for the same, a yoke, and a spring interposed between the support and the horn urging the latter toward the yoke.

17 17. In a machine of the kind described, in combination, a blank advancing means, a blank bending means, a horn, an adjustable support for the same, and a yoke in superposed alinement with the horn.

18 18. In a machine of the kind described, in combination, a blank advancing means, a blank bending means, a bed, a yoke longitudinally alined with the bed, a horn beneath the yoke, means for adjustably maintaining the horn in alinement with the yoke, and means urging the horn to engagement with the yoke.

19 19. In a machine of the class described, in combination, a blank advancing means, a blank bending means, a yoke, a horn beneath the yoke having a channeled extension, a support having a portion engaging said channeled extension to permit relative sliding movement, and a spring bearing between said extension and said support.

20 20. In a machine of the class described, in combination, a blank advancing means, a blank bending means, a yoke, a horn beneath the yoke having a channeled extension, a laterally adjustable support having a portion engaging said channeled extension to permit relative sliding movement, and a spring bearing between said extension and said support.

21 21. In a machine of the kind described, in combination, a blank advancing means, a blank bending means, a yoke, a horn beneath the yoke having a vertically disposed extension channeled on opposite sides, a support having a portion embracing said extension to permit relative vertical sliding movement, and means on the support yieldingly engaging said extension.

22 22. In a machine of the class described, in combination, a blank advancing means, a blank bending means, a yoke, a horn beneath the yoke having an extension channeled on opposite sides, a support embracing said extension to permit relative sliding movement in one plane, and means on the support engaging the channels of the extension.

23 23. In a machine of the kind described, in combination, a blank advancing means, a

blank bending means, a yoke, a horn beneath the yoke having an extension, a support for the horn engaging said extension, a spring bearing between said support and said extension, and means for adjusting the spring.

24 24. In a machine of the class described, in combination, a blank advancing means, a blank bending means, a yoke, a horn beneath the yoke having an extension, a laterally adjustable support for the horn engaging said extension, a spring bearing between said support and said extension, and means for adjusting the spring.

25 25. In a machine of the class described, in combination, a blank advancing means, a blank bending means, a yoke, a horn, and means for adjusting the horn with respect to the yoke.

26 26. In a machine of the class described, in combination, a blank advancing means, a blank bending means, a yoke, a horn therebeneath having an extension, and a right-angled supporting member for the horn having a flat horizontal base portion and a vertical portion slidably engaging the extension.

27 27. In a machine of the class described, in combination, a blank advancing means, a blank bending means, a yoke, a horn therebeneath having an extension, and a right-angled supporting member for the horn having a flat horizontal base portion and a vertical portion slidably engaging the extension, the base portion and the support being laterally adjustable.

28 28. In a machine of the class described, in combination, a blank advancing means, a blank bending means, a yoke, a tiltable and bodily movable horn, and spring means for actuating the horn whereby the same will clamp a blank against the yoke.

29 29. In a machine of the kind described, in combination, a pair of standards, a shaft carried thereby, eccentrics upon said shaft intermediate said standards, can body forming mechanism actuated by said eccentrics, a rock shaft journaled in said standards in vertical alinement with and above said first shaft, and bumping mechanism mounted upon said rock shaft intermediate said standards.

30 30. In a machine of the kind described, in combination, a pair of standards, a shaft carried thereby, eccentrics upon said shaft intermediate said standards, can body forming mechanism actuated by said eccentrics, a rock shaft journaled in said standards, bumping mechanism mounted upon said rock shaft intermediate said standards, and actuating connections between said shafts.

31 31. In a machine of the kind described, in combination, a pair of standards, a shaft carried thereby, eccentrics upon said shaft intermediate said standards, can body form-

ing mechanism actuated by said eccentrics, a rock shaft journaled in said standards in alignment with said first shaft, and bumping mechanism mounted upon said rock shaft intermediate said standards, and actuating connections between said shafts.

32. In a device of the kind described, in combination, a bending member adapted to bend a blank about a horn, comprising a jaw shaped conformably with the horn, pivoted at one end above the same, and provided at its other end with a wearing plate adjustably held thereon by means of a bolt-and-slot connection.

33. In a device of the kind described, in combination, a bending member adapted to bend a blank about a horn, comprising a jaw shaped conformably with the horn, pivoted at one end above the same, and provided at its other end with a wearing plate adjustably held thereon by means of a bolt-and-slot connection, said end being provided with a lug, and a screw threaded in said lug and bearing against said wearing plate.

34. In a device of the kind described, in combination, a horn and a bumper movable toward the horn and adapted to press a can seam thereupon, one of said members being movable to permit compensatory change in the angle at which it engages the other member, in accordance with the conditions of the can seam.

35. In a device of the kind described, in combination, a horn and a bumper movable toward the horn and adapted to press a can seam thereupon, one of said members being movable to permit compensatory change in the angle at which it engages the other member, in accordance with the conditions of the can seam, and one of said members having a cushioned support.

36. In a lock and lap seam can body forming machine, the combination of a pack separating device, blank feeding means, blank notchers, blank edging mechanism, body forming mechanism, and an automatically operated disrupting device, substantially as specified.

37. In a lock and lap seam can body forming machine, the combination of a pack separating device, blank feeding means, blank notchers, blank edging mechanism, body forming mechanism, and electromechanically operated means adapted to disconnect the various blank treating means from the shaft.

38. In a lock and lap seam can body forming machine, the combination of a pack separating device, blank feeding means, blank notchers, blank edging mechanism, body forming mechanism, and means controlled by a characteristic of a blank being fed through the machine for automatically disrupting the connection between the various mechanisms and the power shaft.

39. In a lock and lap seam can body form-

ing machine, the combination of a pack separating device, blank feeding means, blank notchers, blank edging mechanism, body forming mechanism, and an automatically operated disrupting device, each of said pack separating devices, notchers and edging mechanism being adjustable for treating blanks of different widths.

40. In a lock and lap seam can body forming machine, the combination with a pack separating device, a reciprocating blank feeder, blank notchers, said notchers being adjustable in the direction of the feed of the blank, edging mechanism, body forming mechanism and an automatically operating disrupting device, substantially as specified.

41. In a blank treating machine, the combination with a power shaft, of a pack separating device and a blank feeder operated from said shaft and electro mechanical means for disconnecting the separating device and the blank feeder from the shaft simultaneously.

42. In a can body forming machine, the combination of spaced blank operating means, all said means being operated from a common power shaft entirely by means of interposed gears, eccentrics and crank motions, thereby avoiding the use of cams, substantially as and for the purpose described.

43. In a can body forming machine, the combination of a frame having a bed, blank guiding means on said bed, a blank stack supporting device, a stack separating device, a blank feeder, blank notching means and body forming mechanism, said supporting device, notching means and blank guiding means being simultaneously adjustable for different widths of blanks.

44. In a can body forming machine, the combination of a frame having a bed, blank guiding means on said bed, a blank stack supporting device, a stack separating device, a blank feeder, and body forming mechanism, said supporting device and blank guiding means being simultaneously adjustable for different widths of blanks.

45. In a can body forming machine, the combination of a frame having a bed, blank guiding means on said bed, a blank stack supporting device, a stack separating device, a blank feeder, blank notching means and body forming mechanism, said supporting device, notching means and blank guiding means being simultaneously adjustable for different widths of blanks, said notching devices being also independently adjustable lengthwise of the line of feed of the blanks.

46. In a can body forming machine, the combination of a frame having a bed and adjustable blank guiding means thereon, a blank stack supporting device, a stack separator, a reciprocating blank feeder, blank notching devices, blank edging devices and means for simultaneously adjusting the sup-

porting device, guiding means and notching devices to adapt the same for operation on blanks of various widths.

47. In a can body forming machine, the combination of blank treating means and a reciprocating blank feeder for advancing the blanks step by step, said feeder comprising a head slidable on a guide bar, an arm, an epicyclic gear, said arm being reciprocated by means of said gear, said guide bar being adjustably mounted at one end.

48. In a can body forming machine, the combination of blank treating means, and a pressure shoe having pressure blocks independently movable relatively to the shoe.

49. In a can body forming machine, the combination of blank treating means, a pressure shoe, having pressure blocks independently movable relatively to the shoe, and a spider arranged above said shoe and spring controlling means operable between said spider and said shoe.

50. In a can body forming machine, the combination of blank treating means, a pressure shoe, having a plurality of spring pressed pressure blocks independently movable relatively to the shoe.

51. In a can body forming machine, the combination of blank treating means, a pressure shoe, having a plurality of spring pressed pressure blocks independently movable relatively to the shoe, a spider arranged above said shoe and spring controlling means operable between said spider and said shoe, substantially as specified.

52. In a can body forming machine, the combination of a plurality of spaced blank treating means disposed along the bed of the machine, a pressure shoe disposed above said bed, said shoe having mounted therein independently movable spring pressed pressure blocks adjacent each blank treating means, a spider detachably mounted on the machine and disposed above the shoe, spring controlling means operating between said spider and said shoe, and means for adjusting the tension of said spring controlling means, substantially as specified.

53. In a can body forming machine, a frame, body forming means comprising a horn, bending members pivoted to a fixed part of the frame, a bumper, an operating shaft and means for operating the bumper from said shaft independently of the means for operating the bending members and arranged so that the resistant force on the bumper is transmitted directly to the framework of the machine.

54. In a can body forming machine, a frame, a body forming means comprising a horn, bending members pivoted to said frame, a bumper, an operating shaft, a rock shaft interposed between the operating shaft and the bumper, a bell crank mounted on said rock shaft for operating the bumper,

one arm of said bell crank forming one part of a toggle link.

55. In a can body forming machine, the combination of a body forming horn, bending members, a bumper, an operating shaft and means for operating the bumper from the shaft including a toggle, one member of said toggle comprising a telescoping link.

56. In a can body forming machine, the combination of a body forming horn, bending members, a bumper, an operating shaft and means for operating the bumper from the shaft including a toggle, one member of said toggle comprising a telescoping link having a spring interposed between the elements thereof.

57. In a can body forming machine, the combination of a body forming horn, bending members, a bumper, an operating shaft and means for operating the bumper from the shaft including a toggle, one member of said toggle comprising a telescoping link having a spring interposed between the elements thereof, and means for adjusting the pressure of said spring.

58. In a can body forming machine, the combination with can body forming means comprising an adjustably mounted horn, of bending members, a bumper and means for operating the bumper from the operating shaft including an adjustable toggle connection.

59. In a can body forming machine, the combination with a yieldably mounted forming horn, of bending members and a bumper.

60. In a can body forming machine, the combination of a yieldingly mounted horn, bending members and a cushioned bumper.

61. In a can body forming machine, the combination with a universally movable forming horn, of bending members and a bumping device.

62. In a can body forming machine, the combination of a frame having a yoke thereon, a forming horn yieldingly pressed against said yoke, bending arms and bumping means, said last named means including a cushioning member.

63. In a can body forming machine, the combination of a forming horn adjustable in a vertical plane, bending members, a bumper adapted to be reciprocated in a vertical plane and means for operating said bumper including a telescoping link, said link having a spring therein and means for adjusting the tension of said spring.

64. In a can body forming machine, the combination with a body forming horn adjustable in a horizontal plane, of bending members, and a reciprocating bumper co-operating with said horn.

65. In a machine of the class described, the combination with a forming horn yieldably and adjustably mounted, of bending

members and a cushioned bumper movable normal to the axis of said horn.

66. In a machine of the class described, a frame having a yoke thereon, a forming horn normally spring pressed against said yoke, bending members and means for adjusting the pressure of said horn against the yoke.

67. In a machine of the class described, the combination with a frame having a stationary clamping member thereon, of a forming horn normally and yieldingly engaging said clamping member and adapted to clamp a blank fed therebetween during the forming operation, bending members and a cushioned bumping device.

68. In a machine of the class described, the combination with a frame having a stationary clamping member, of a horn universally movable and normally yieldingly engaging said clamping member and adapted to clamp a blank fed therebetween during the forming operation, bending members and a bumping device.

69. In a can body forming machine, the combination of an expansible, detachably mounted forming horn, bending members, a bumper, means for operating said bumper including a toggle, one member of said toggle comprising a cushioning link.

70. In a can body forming machine, the combination of a forming horn, bending members pivoted adjacent thereto, said members being shaped to conform to the

horn and having adjustable wearing plates at their free ends, said bending members being so formed that only the wearing plates engage the blanks during the bending operation.

71. In a can body forming machine, the combination with an expansible forming horn, of bending arms pivoted adjacent said horn, said arms being each provided with adjustably mounted wearing plates at their free ends and a bumping device, said horn being adjustable relatively to said arms.

72. In a can body forming machine, the combination with an expansible adjustably mounted forming horn, of bending members pivoted adjacent thereto, said bending members being provided with adjustable wearing plates at their free ends, said members being also shaped to conform to the horn when closed, and at the same time free from engagement with the formed blank, the wearing plates engaging the blank and projecting beyond the surface of the arms.

73. In a lock and lap seam can body forming machine, the combination with a blank feeder, a blank notcher, blank edging means, body forming mechanism and automatically operated disrupting means.

In witness whereof I affix my signature in the presence of two witnesses.

CHARLES W. GRAHAM.

Witnesses:

B. W. COULDOCK,

FRANK J. KENT.