(No Model.) 9 Sheets—Sheet 1.

F. M. LEAVITT.

APPARATUS FOR FORMING SHEET METAL CAN BODIES.

No. 382,537. Patented May 8, 1888.

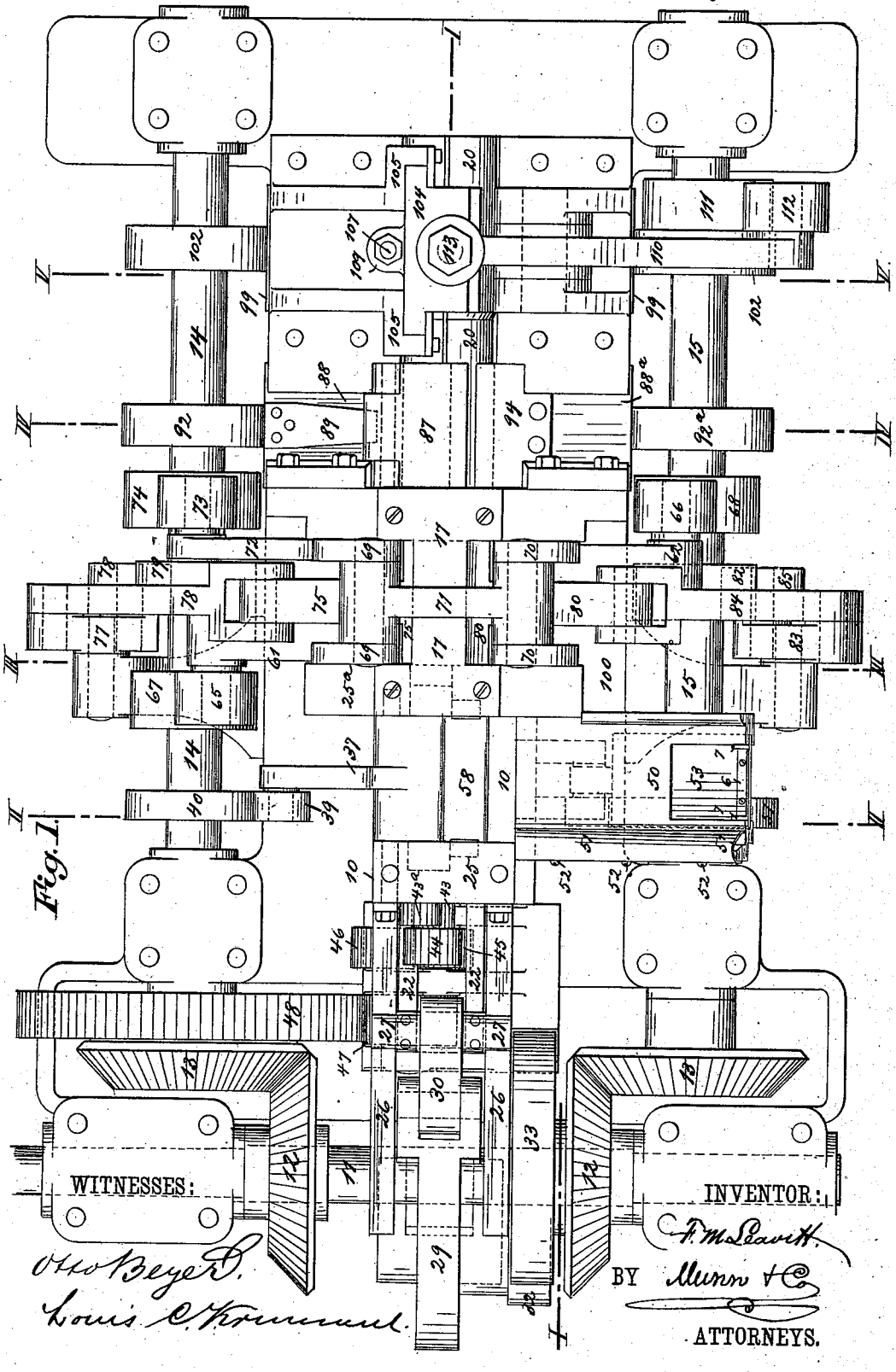

Fig. 1.

WITNESSES:

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Louis C. Krumm.

INVENTOR:

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(No Model.) 9 Sheets—Sheet 2.

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APPARATUS FOR FORMING SHEET METAL CAN BODIES.

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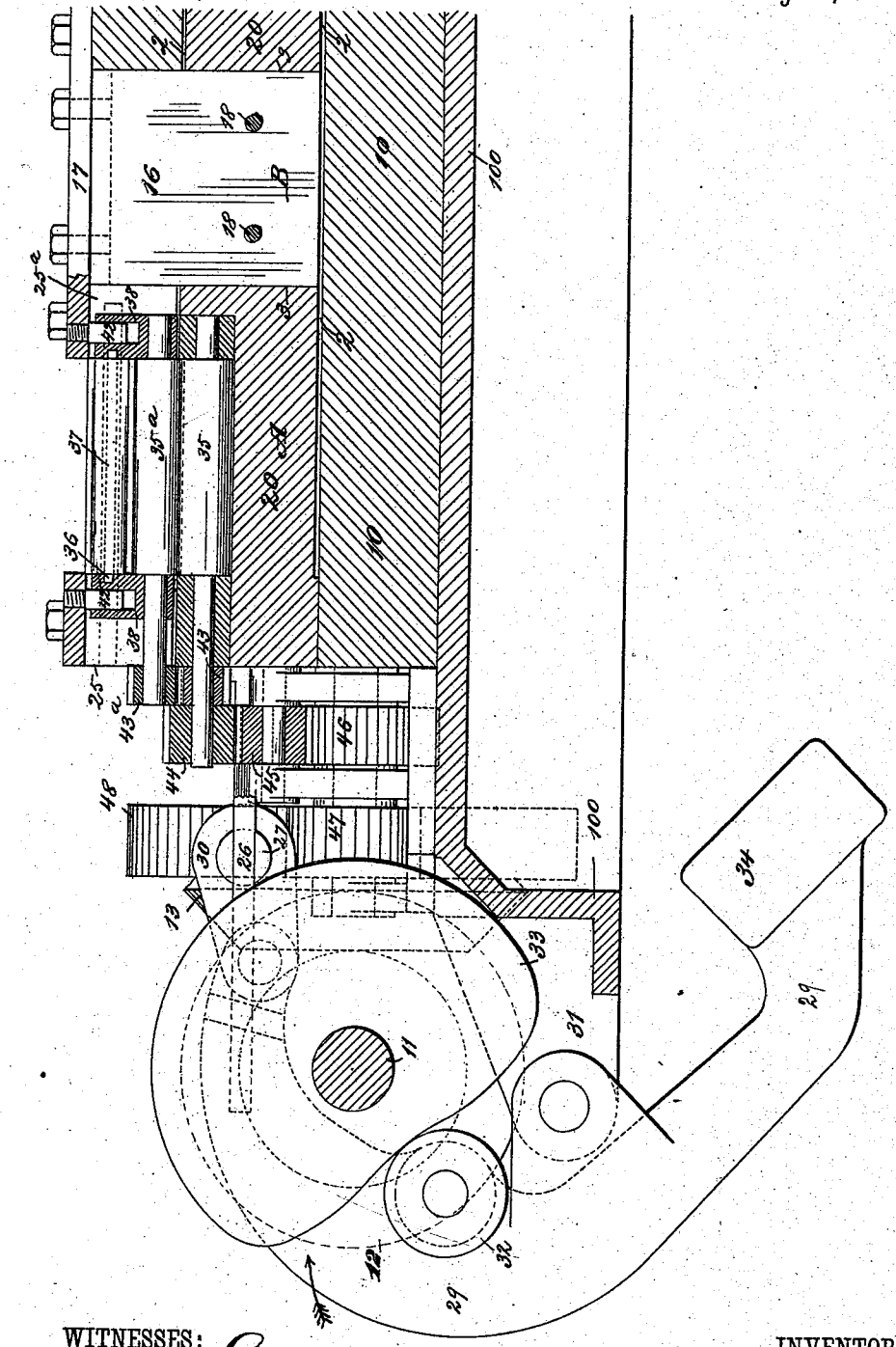

Fig. 2.

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(No Model.) 9 Sheets—Sheet 3.

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APPARATUS FOR FORMING SHEET METAL CAN BODIES.

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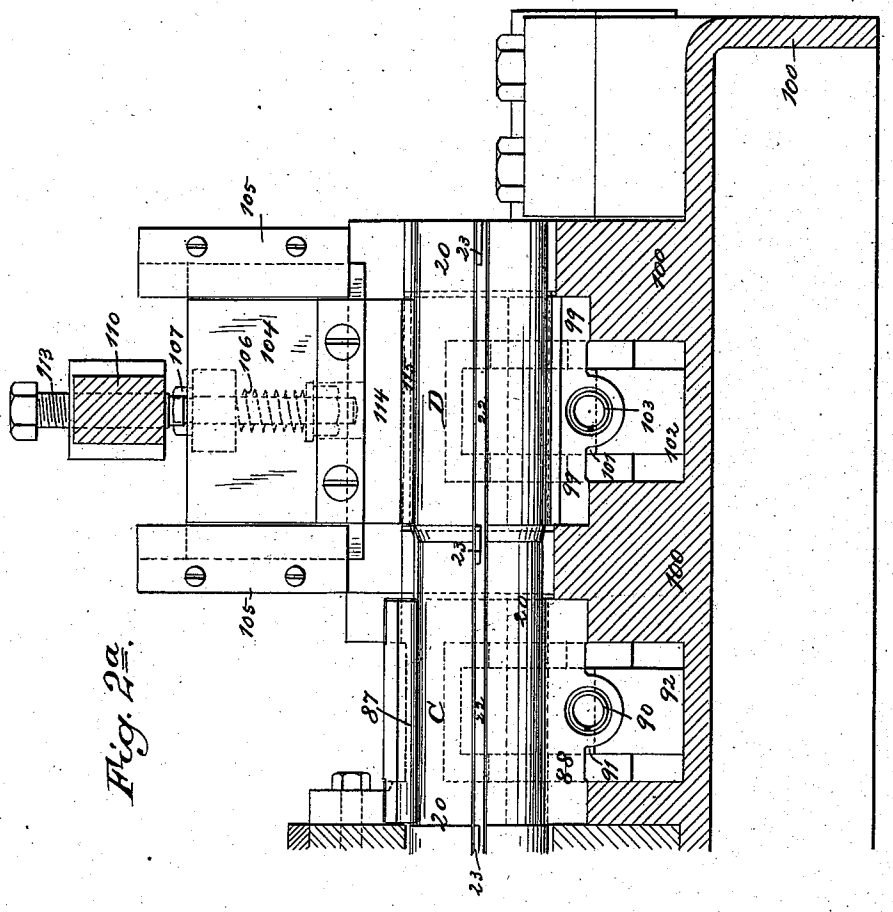

Fig. 2a.

WITNESSES:
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(No Model.) 9 Sheets—Sheet 4.

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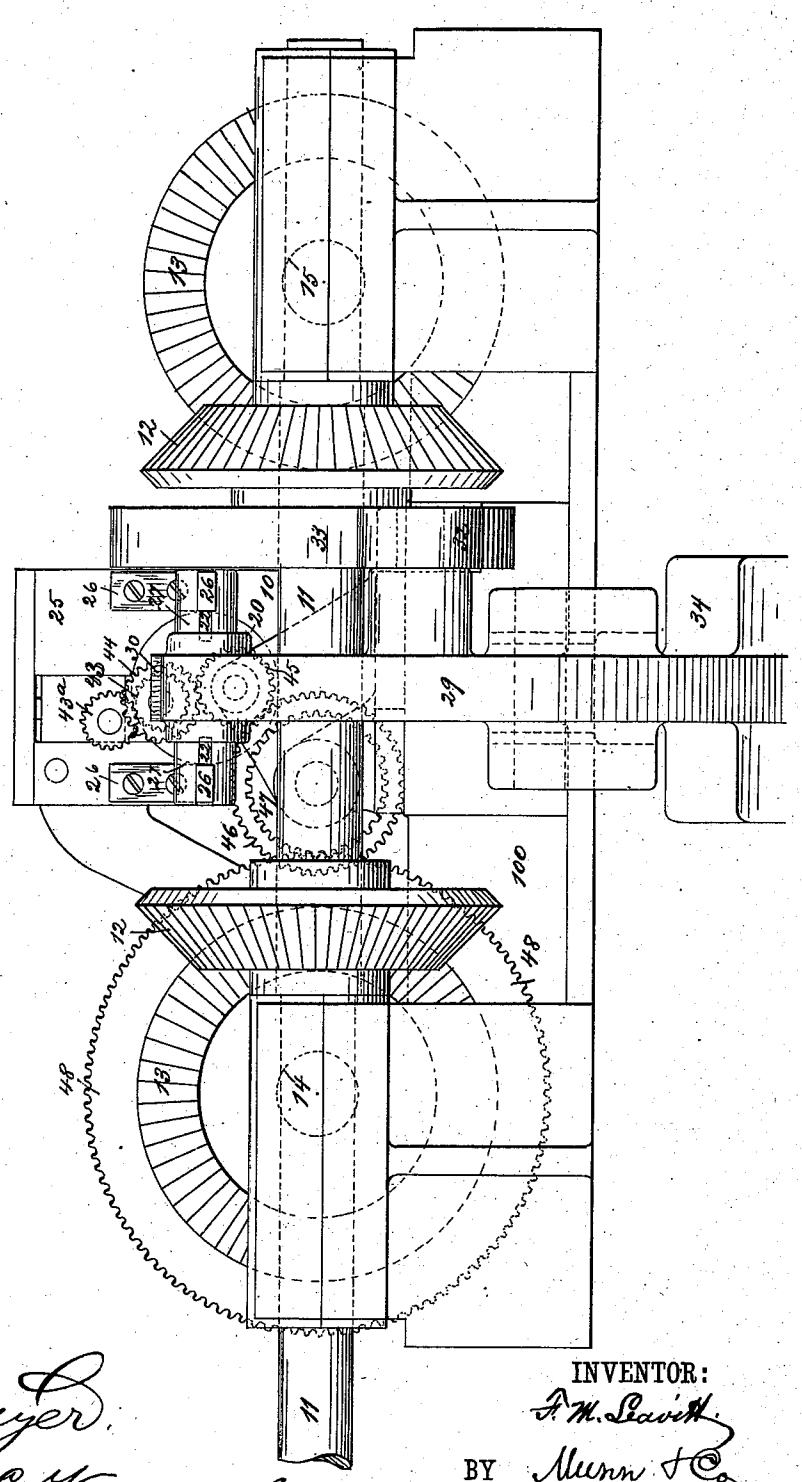
APPARATUS FOR FORMING SHEET METAL CAN BODIES.

No. 382,537. Patented May 8, 1888.

Fig. 3.



WITNESSES:

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(No Model.) 9 Sheets—Sheet 5.

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APPARATUS FOR FORMING SHEET METAL CAN BODIES.

No. 382,537. Patented May 8, 1888.

Fig. 16.

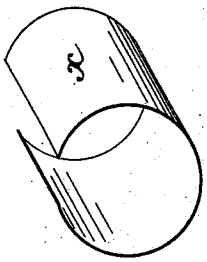


Fig. 4.

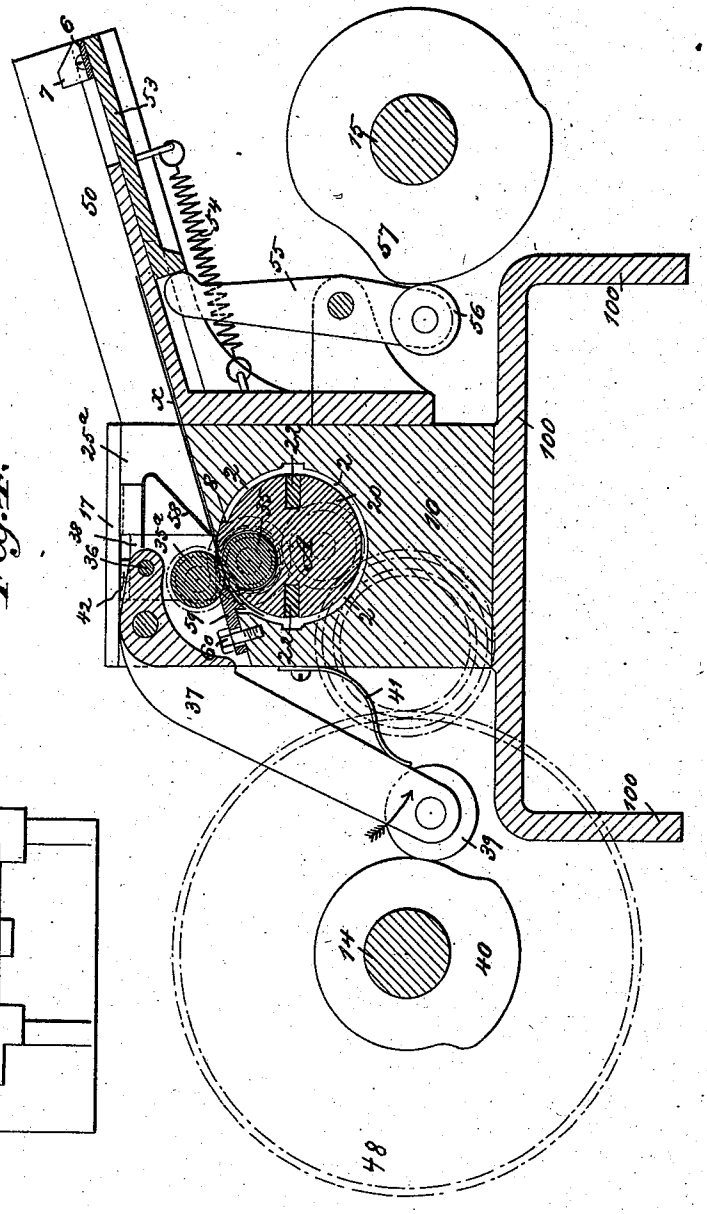
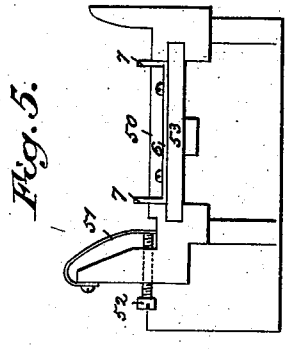


Fig. 5.



WITNESSES:

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APPARATUS FOR FORMING SHEET METAL CAN BODIES.

No. 382,537. Patented May 8, 1888.

Fig. 17.

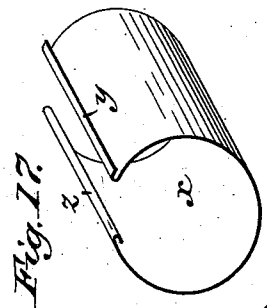
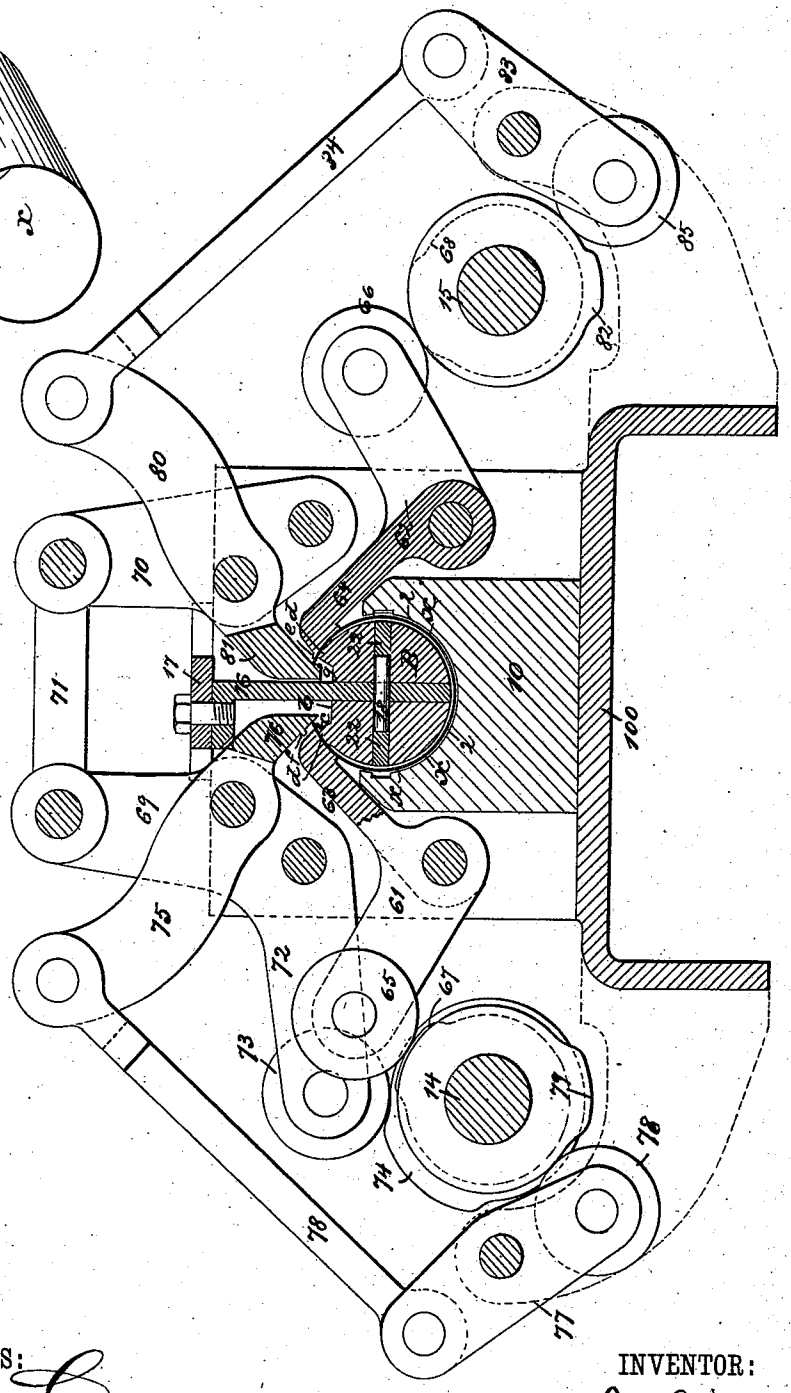


Fig. 6.



WITNESSES:

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(No Model.) 9 Sheets—Sheet 7.

F. M. LEAVITT.

APPARATUS FOR FORMING SHEET METAL CAN BODIES.

No. 382,537. Patented May 8, 1888.

Fig. 18.

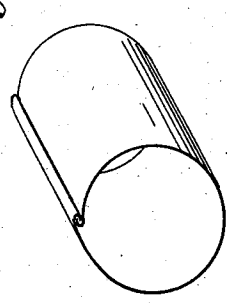
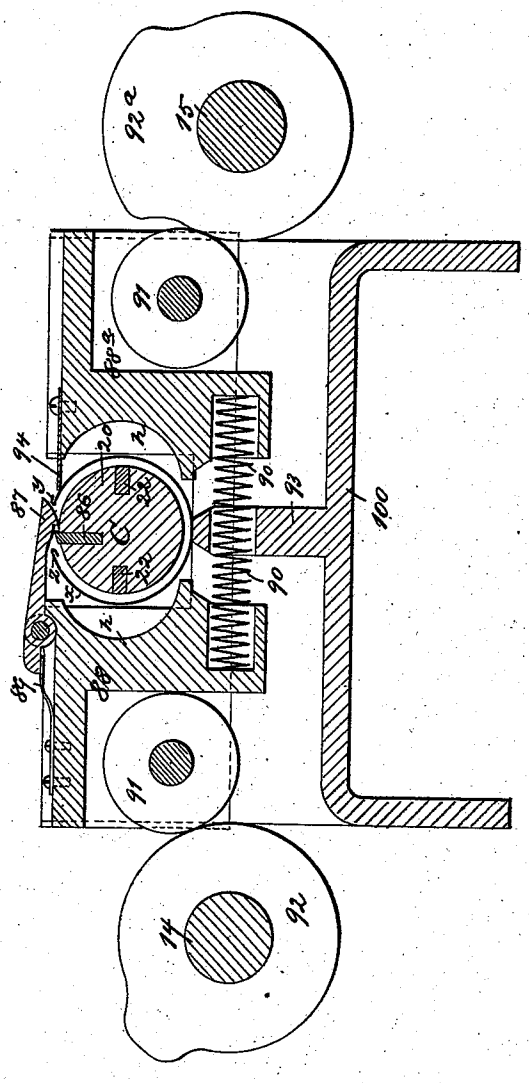


Fig. 7.



WITNESSES:
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(No Model.) 9 Sheets—Sheet 8.

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APPARATUS FOR FORMING SHEET METAL CAN BODIES.

No. 382,537. Patented May 8, 1888.

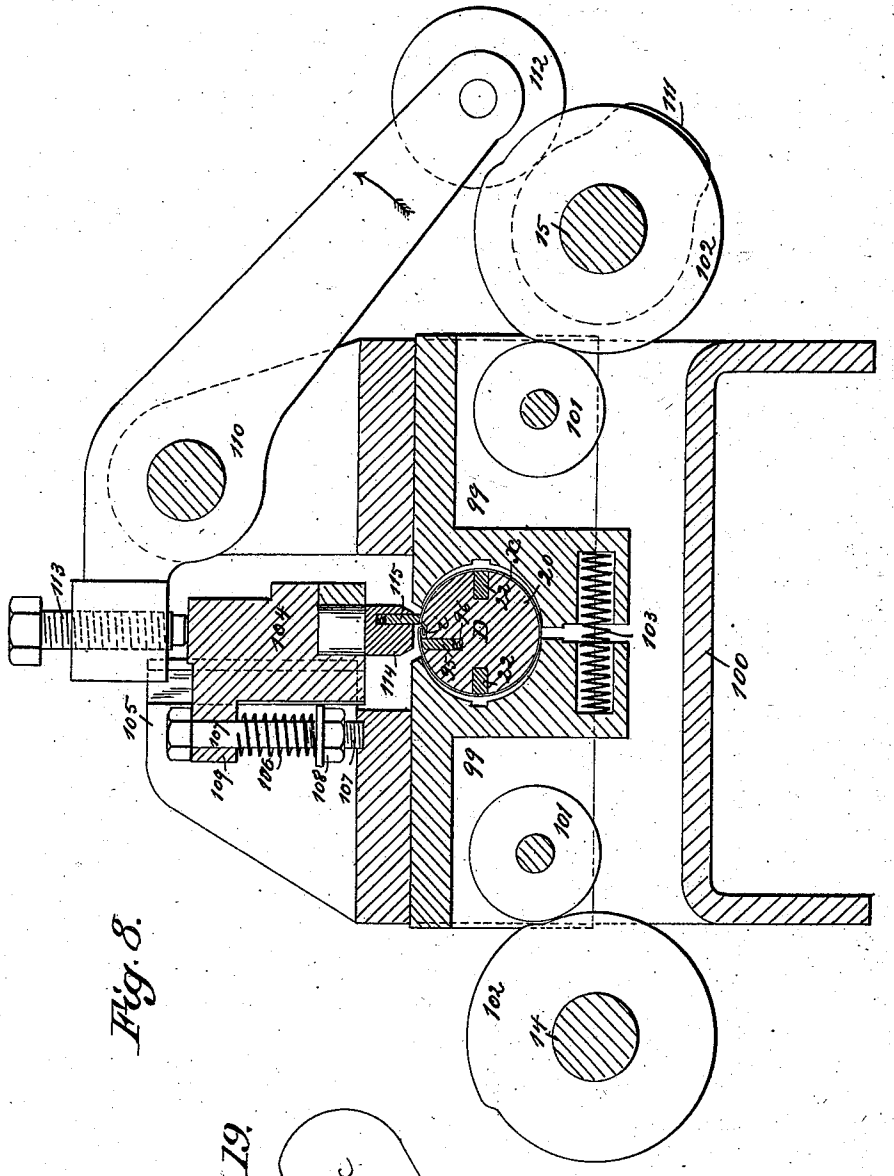

Fig. 8.

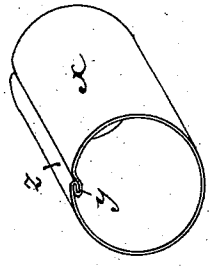

Fig. 19.

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(No Model.) 9 Sheets—Sheet 9.

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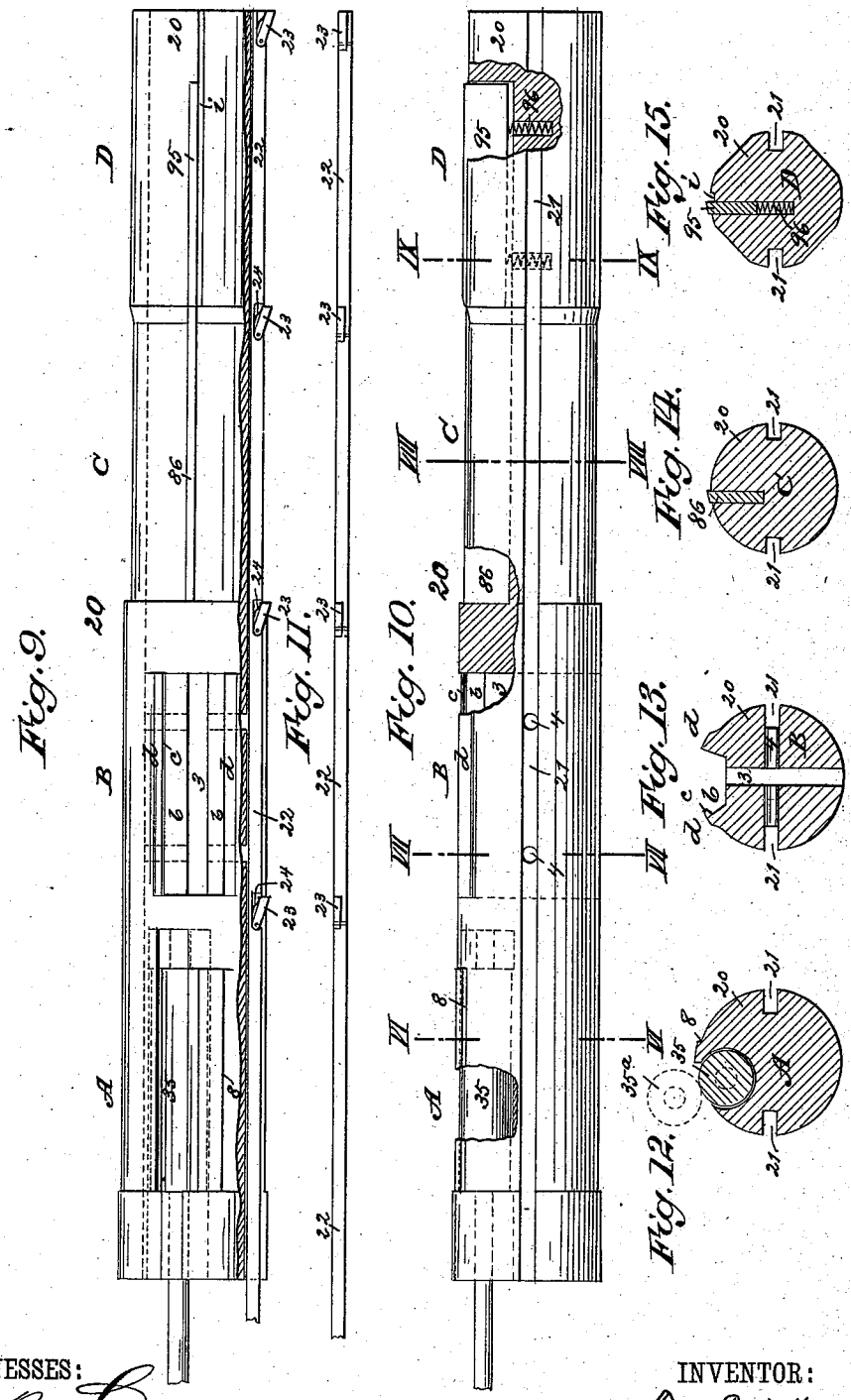
APPARATUS FOR FORMING SHEET METAL CAN BODIES.

No. 382,537. Patented May 8, 1888.



WITNESSES:

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INVENTOR:

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ATTORNEYS.

UNITED STATES PATENT OFFICE.

FRANK M. LEAVITT, OF BROOKLYN, NEW YORK, ASSIGNOR TO EDWIN NORTON AND OLIVER W. NORTON, OF CHICAGO, ILLINOIS.

APPARATUS FOR FORMING SHEET-METAL CAN-BODIES.

SPECIFICATION forming part of Letters Patent No. 382,537, dated May 8, 1888.

Application filed July 6, 1887. Serial No. 243,496. (No model.)

To all whom it may concern:

Be it known that I, FRANK M. LEAVITT, of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Apparatus for Forming Sheet-Metal Can-Bodies, of which the following is a full, clear, and exact description.

This invention relates to sheet-metal-can-forming machinery, the object of the invention being to simplify the construction of the machinery employed to form the can-bodies, and consequently to reduce the cost of producing said bodies; and to these ends the invention consists of mechanism whereby the blanks from which the can-bodies are to be formed are first bent to approximately cylindrical form, whereby the approaching edges of the blank are then each bent over to hook-like form, the bending, however, being upward and then over the blank body at one edge and downward and under the blank body at the other edge, whereby the hook-like edges are brought together and the hooks or folds interlocked, and, finally, whereby the interlocked hooks or folds are pressed together and securely locked, all as will be hereinafter more fully explained, and specifically pointed out in the claims, many novel constructions and combinations of elements being employed in carrying my invention into practice.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters and figures of reference indicate corresponding parts in all the views.

Figure 1 is a plan view of a machine adapted to carry out my method of forming can-bodies. Figs. 2 and 2* together constitute an enlarged longitudinal sectional elevation of the machine, the view being taken on line I I of Fig. 1. Fig. 3 is an end view of the machine. Fig. 4 is a cross-sectional view taken on line II II of Fig. 1, the mechanism shown in this figure being employed to impart the preliminary bend to the blank. Fig. 5 is a detail view representing the end of the feeding-chute and its connections. Fig. 6 is a cross-sectional view taken on line III III of Fig. 1, the parts represented in this figure being employed to impart the hook-like folds to the lateral or approaching edges of the blank. Fig. 7 is a cross-sectional view taken on line IV IV of Fig. 1, the parts illustrated being employed to bring the hook-like folds together to a position so that they will interlock. Fig. 8 is a cross-sectional view taken on line V V of Fig. 1, the parts represented in this figure being employed to finally compress the interlocked folds upon the lateral edges of the blank. Fig. 9 is a plan view of the horn, said horn being broken away at one side above the reciprocating feeding-slide. Fig. 10 is a side view of the horn, parts being broken away. Fig. 11 is an edge view of one of the reciprocating feeding-racks. Fig. 12 is a cross-sectional view of the horn, the view being taken on line VI VI of Fig. 10. Fig. 13 is a cross-sectional view taken on line VII VII of Fig. 10. Fig. 14 is a cross-sectional view taken on line VIII VIII of Fig. 10. Fig. 15 a cross-sectional view taken on line IX IX of Fig. 10. Fig. 16 is a view of the blank after the first operation to which it is subjected. Fig. 17 is a view of the blank as it appears after the second operation. Fig. 18 is a similar view representing the blank as it appears after the third operation, and Fig. 19 is a view of the completed can-body.

In constructing such a machine as the one illustrated in the drawings above referred to there is provided a heavy bed plate or frame, 100, upon which there is mounted a longitudinal block, 10, or the bed-plate and the block could be made integral. Just beyond the outer end of the block 10, I mount the main shaft 11, which shaft carries two beveled gears, 12, that engage similar gears, 13, that are carried by shafts 14 and 15, said shafts being mounted at either side of the block 10. The upper part of the block 10 is chambered longitudinally, and in the chamber so formed I place the upper end of a horn, 20, the extreme upper end of said horn fitting snugly within the chamber formed in the block 10, while the main body of the horn is of less diameter than the chamber, thus providing for a space, 2, between the peripheral face of the horn and the defining-walls of the chamber within the block 10.

In order that the sheet-metal blank while under treatment may pass about and be slid along the peripheral face of the horn, it is necessary that said peripheral face should be almost entirely free from obstructions; but it is

also necessary that the horn should be rigidly supported, and to meet these two requirements I form the horn with a longitudinal slot, 3, in which there is fitted a plate, 16, said plate being secured to a bridge, 17, and being held in rigid connection with the horn by pins 18, which pass through the plate and enter apertures 4, that are formed in the horn.

Upon opposite sides of the horn 20, I form longitudinal grooves 21, in which there are mounted slides 22, said slides being each provided with four tongues, 23, that are pivotally mounted within recesses formed in the slides, the tongues being normally held in the position in which they are shown in Fig. 9 by springs 24.

The block 10 is formed or provided with an upwardly-extending projection, 25, to which projection there are connected two rearwardly-extending arms, 26, which serve as guides for a head-block or follower, 27, the slides 22 being connected to this head-block or follower just within the arms 26. The head-block 27 is connected to a lever, 29, by a link, 30, and this lever 29 is pivotally connected to a bracket, 31, which extends outward from the end of the bed-plate 100. To one side of the lever 29 there is studded a roller, 32, which is held against the face of a cam, 33, which is mounted on the shaft 11, by the action of a weight, 34, formed upon or connected to the lower underhanging arm of the lever 29, the arrangement being such that as the shaft 11 is revolved a reciprocating motion will be imparted to the slides 22.

The horn 20 is divided longitudinally into four sections, A, B, C, and D, of which the sections A and B are of the same diameter and are larger than the sections C and D, the section C being materially reduced in size, while the diameter of the section D is between that of the sections A and B and the section C.

The first quarter-section of the horn 20 is recessed to receive a small roller, 35, the bearings of this roller being fitted within the recess formed in the horn, and just above the roller 35, and outside of the horn 20, there is mounted a second roller, 35^a, that is of the same diameter as the roller 35, the bearings 38 of the roller 35^a being connected by a cross-bar, 36, to which cross-bar there is connected a lever, 37, that is pivotally mounted between the projection 25 and a second projection, 25^a, the lower end of the lever being provided with a roller, 39, which is held against a cam, 40, that is carried by the shaft 14, by the action of a spring, 41, so that at every revolution of the shaft 14 the roller 35^a and its bearings will be carried away from the roller 35, the bearings 38 being guided in any manner desired, but preferably by studs 42, which enter recesses formed in the upper portion of the boxes constituting the bearings.

The shafts of the rollers 35 and 35^a carry intermeshing pinions 43 and 43^a, while the shaft of the roller 35 carries a second pinion or gear, 44, that is engaged by an idler, 45, said idler being in turn engaged by a gear, 46, that is carried by a short shaft which is mounted at the head of the horn 20, said shaft in turn carrying a smaller gear, 47, that is engaged by a large gear, 48, carried by the shaft 14, or any other arrangement of accelerating gearing might be employed to drive the rollers 35 and 35^a.

The feeding-chute 50 is connected to that side of the block 10 which is adjacent to the shaft 15, and the bottom of this chute is inclined to correspond with the incline of the upper face of that section of the block 10 which incloses the first quarter-section, A, of the horn 20. Upon one of the side walls of the chute 50, I mount a spring-plate, 51, the lower edge of which may be adjusted toward or from the center of the slide by set screws 52, that are arranged as best shown in Figs. 1 and 5, this spring-plate being used as a guide to secure a proper register for the blanks that are placed within the chute 50.

Beneath the upper portion of the chute I mount a sliding plate, 53, which carries a bar, 6, that is formed with upturned ears 7. The plate 53 is normally drawn downward by a spring, 54; but in order that the plate may be moved against the tension of said spring I mount a lever, 55, beneath the plate, one end of said lever bearing against a projection formed at the lower end of the plate, while the other end of the lever carries a roller, 56, which bears against a cam, 57, carried by the shaft 15, from which arrangement it follows that at every revolution of the shaft 15 the spring 54 will be free to act to draw the plate 53 downward, and thereby to feed a blank to the bite of the rollers 35 and 35^a, the forward edge of the blank being guided to said rollers by a spring-plate, 58, which is so connected to the frame that its lower edge will bear against the upper inclined face of the block 10 just above the opening through which the horn projects. Below the opening in the block 10, I mount a former, 59, which is adjustably held to the block by set-screws 60, as best shown in Fig. 4, and this former also acts as a stripping-plate for the roller 35^a.

The mechanism above described is employed in the first operation of forming the can-body, the blank, which is shown at *x*, being forced down beneath the plate 58 and into the bite of the rollers 35 and 35^a by the ears 7 of the plate 53, and, being in the bite of said rollers, will be drawn inward and forced against the former 59, to be thereby bent downward and guided into the space 2 about the horn 20, the blank being carried forward until its leading edge strikes against a longitudinal shoulder, 8, that is formed on the horn, the cam 40 being so timed that just as the blank passes from between the rollers 35 and 35^a it will act to throw the lever 37 in the direction of the arrow shown in connection therewith in Fig. 4, thereby raising the roller 35^a and clearing the blank. Immediately after this movement has taken place the cam 33 will reach a position

such that the weight 34 will be free to move to throw the lever 29 in the direction of its arrow, (shown in Fig. 2,) thereby carrying the slides 22 forward, the rear set of tongues 23 being at this time in engagement with the rear circular edge of the partially-formed can-body, the forward movement being sufficient to carry the blank to a position so that it will partially inclose the second quarter-section of the horn, at which point the hook-like lips or folds are to be formed.

In describing the mechanism employed to bring about the formation of the hook-like lips or folds just mentioned particular reference will be had to Figs. 1 and 6. The second quarter-section of the horn is formed with an upper longitudinal groove, *b*, one edge of which is simply inclined, while the other edge is formed with a lip, *c*, and ridges *d*, which project beyond the general peripheral face of the horn, being formed adjacent to the recess, as is clearly shown in the figures last named and in Fig. 13.

Upon each side of the section of the horn now under consideration I mount levers 61 and 62, said levers being provided with clamping-arms 63 and 64, respectively, these arms being formed with curved bearing-faces that are arranged to bear upon the outer face of the blank *x*, and clamp said blank to the outer curved faces of the ridges *d*. The end of the arm 63 does not extend quite to the end of the lip *c*, while upon the end of the arm 64 there is formed a lip, *e*, which extends somewhat beyond the adjacent inclined defining-edge of the recess *b*. The levers 61 and 62 carry rollers 65 and 66, which rollers run in engagement with cams 67 and 68, that are carried, respectively, by the shafts 14 and 15, the weight of the lever-arms and of the rollers carried thereby holding said rollers in contact with their operating-cams.

Above the levers 61 and 62, I mount other levers, 69 and 70, the upper ends of said levers being connected by a link, 71. The lever 70 is simply studded or otherwise connected to the frame, while the lever 69 is provided with an outwardly-extending arm, 72, which carries a roller, 73, that runs in engagement with a cam, 74, carried by the shaft 14.

To the lever 69 there is connected a lever, 75, which is formed with a toe, 76, on which there is formed a lip, *f*, the extending end of the lever under consideration being connected with an operating-lever, 77, by a link, 78, this lever 77 being supported by a bracket which extends outward from the bed of the machine. The lever 77 carries a roller, 78, that runs in engagement with a cam, 79, carried by the shaft 14. To the lever 70 there is connected a lever, 80, formed with a toe, 81, that is provided with a shoulder, *g*, the lever 80 being operated by a cam, 82, through the medium of an operating-lever, 83, a link, 84, and a roller, 85, running in contact with the cam 82.

The cams 67, 68, 74, 79, and 82 are so timed that just as the blank *x* is fed forward by the tongues 23 of the slides 22 the cams 67 and 68 will act to throw the levers 61 and 62 upward, and consequently to carry the arms 63 and 64 downward to positions such that their bearing-faces will clamp the blank against the projections *d* of the horn 20. After this movement has been brought about, the cam 74 will throw the outwardly-projecting arm of the lever 69 upward, thus carrying the upper arm of said lever toward the center line of the machine, and as the lever 69 so moves the lever 70 will be carried in an opposite direction, the levers 75 and 80 at this time acting to bend the edges of the blank over the lips *c* and *e*, after which the cam 79 will act to throw the foot of the lever 75 downward, the lip *f* bearing against the overturned edge of the blank and carrying it beneath the lip *c*, while at the same time the cam 82 will act through its intermediate connections to throw the toe of the lever 80 over the upper face of the lip *e*, the shoulder *g* holding and bending the edge of the blank over the lip *e*.

By the operation just described hook-like lips or folds *y* and *z* are formed upon the adjacent edges of the blank, and immediately after the operation has taken place the slides 22 are again forced forward and the blank is carried on to the third quarter-section of the horn, at which point the hook-like lips are interlocked, as will now be explained, reference being had to Figs. 1, 2ª, 7, and 14.

The third quarter-section of the horn 20, upon which section the lips upon the blank are interlocked, is of less diameter than the first two quarter-sections, and in the upper portion of this section there is inserted a plate, 86, which projects somewhat above the horn, and just over this section of the horn I mount a broad-faced hook, 87, which is connected to a sliding block, 88, mounted in ways formed at the side of the horn, the hook being normally held against the horn by a spring, 89, which is connected to the block 88 and bears against the heel of the hook. Upon the opposite side of the horn there is a block, 88ª, which is also mounted in ways, and between these two blocks there is arranged a spring, 90, which acts to force them to the position in which they are shown in Fig. 7.

The two blocks 88 and 88ª are provided with rollers 91, that are mounted in recesses formed in the blocks, and these rollers bear against cams 92 and 92ª, that are carried by the shafts 14 and 15, the cam 92ª being so timed that just after the blank *x* has been fed forward to the third quarter-section of the horn it will act upon its roller 91 to force the block 88ª forward to a position so that its curved face *h* will bear closely against the blank, the weight of the blank prior to this time being practically supported by the upper curved face of a longitudinal rib, 93, which extends forward from the block 10, the spring 90 passing through an aperture formed in said rib. As the block 88ª is forced forward, the overturned lip *y* of the blank *x* will be carried close up against the

shoulder of the plate 86 by a thin steel plate, 94, that is secured to the block 88^a and extends beyond the upper inner edge of said block. Just after the block 88^a has been moved, as above described, the cam 92 will act to force the block 88 forward against the blank *x*, and as the block so moves forward the underturned lip *z* will pass over the plate 86 and over the overturned lip *y*, the hook 87 holding said lip *z* hard down against the outer face of the adjacent edge of the blank beyond the lip *y*, so that when the cams move to a position to release the rollers 91 and to permit the spring 90 to force the blocks apart the lip *z* will engage with the lip *y*, the two lips interlocking, as is shown in Fig. 19. Just after the lips *y* and *z* have been brought into engagement the third set of tongues carried by the slides 22 will engage the blank and carry said blank forward to the last quarter-section of the horn, which said quarter-section is of greater diameter than the third quarter-section, so that in passing from the third quarter-section to the fourth quarter-section the blank is necessarily forced over an expanding section of the horn, and the interlocking lips are consequently drawn firmly together. In the fourth quarter-section of the horn I yieldingly mount a plate, 95, which is a practical continuation of the plate 86, the plate 95, however, being supported by springs 96, that are arranged in proper recesses formed in the body of the horn. In the upper face of the horn, just at the side of the plate 95, I form a recess, *i*, in which the interlocking lips *y* and *z* rest when the blank is forced onto this section of the horn.

At each side of the fourth quarter-section of the horn I mount blocks 99, which carry rollers 101, said rollers being borne upon by cams 102, that are carried by the shafts 14 and 15. The approaching faces of the blocks 99 are curved, so that when the blocks are forced together they will bear hard against the outer face of the partially-formed can-body, the two blocks, however, being normally separated by a spring, 103, that is arranged as shown in Fig. 8. Above this fourth quarter-section of the horn I arrange a follower, 104, that is mounted in vertical ways 105 and normally upheld by a spring, 106, which spring is coiled about a bolt, 107, upon which there is mounted an adjusting-nut, 108, the bolt 107 passing through a lug, 109, which extends outward from one side of the follower. The follower is operated by a lever, 110, which is mounted in proper bearings at one side of the horn, said lever in turn being operated by a cam, 111, carried by the shaft 15 and arranged to bear against a roller, 112, said roller being connected to the lever 110. In order that the effect of the throw of the lever may be varied at will, I provide said lever with a set-screw, 113, the point of which bears against the follower 104.

The follower carries a presser-foot, 114, and this presser-foot in turn carries a yieldingly-mounted plate, 115, which plate strikes against the can-body and holds said body to the horn just beyond the groove *i*, preventing all displacement of the can-body when the foot 114 is forced downward to a position to bear against the interlocking lips, thus insuring the forcing of said lips into the groove *i*, as is shown in Fig. 8, the downward throw of the follower and the parts carried thereby being brought about by the action of the cam 111, which will throw the lever 110 in the direction of the arrow shown in Fig. 8, and consequently force the follower down, as above described. After the follower has descended and the foot 114 has been brought to bear upon the seam formed by the interlocking lips, the material entering into the formation of said lips will be forced downward by this foot within the circumferential surface of the can-body, the outer peripheral face of said body being practically cylindrical and unbroken at the seam, as is illustrated in Fig. 20. The finished body is then forced off the horn by the last set of tongues 23 on the slides 22.

Having thus fully described my invention, I claim as new, and desire to secure by Letters Patent—

1. In a can-body-forming machine, a horn formed with a series of longitudinally-arranged recesses in its upper surface and divided longitudinally into four sections, of which the third section is of less diameter than the other sections.

2. In a can-body-forming machine, a horn divided longitudinally into four sections, A, B, C, and D, the sections A and B being of the same diameter and of a greater diameter than the other sections, the section C being of less diameter than any of the sections, and the section D being of a diameter between that of the section C and the sections A and B, the said horn being formed with a series of longitudinally-arranged recesses in its upper surface.

3. The combination, with a horn, of feeding-rollers arranged in connection therewith, a means for revolving the rollers, and a former arranged in connection with the rollers, as and for the purpose stated.

4. The combination, with a horn, of feeding-rollers, a means for revolving the rollers, a former arranged in connection with the rollers, and a lip-bending mechanism operating in connection with the horn, as and for the purpose stated.

5. The combination, with a horn, of feeding-rollers, a former mounted in advance of the rollers, a means for revolving the rollers, a lip-bending mechanism, and a lip-locking mechanism arranged in connection with the horn, as and for the purpose stated.

6. The combination, with a horn, of feeding-rollers, a former mounted in connection therewith, a means for revolving the rollers, a lip-bending mechanism, a lip-locking mechanism, and a lip-compressing mechanism, all arranged in connection with the horn, as and for the purpose stated.

7. The combination, with a stepped horn, of a pair of rollers, one of which is journaled in a recess in the larger part of the horn, a means for revolving the rollers, and a former mounted in connection therewith, as and for the purpose stated.

8. The combination, with a stepped horn, of a pair of rollers, one of which is journaled in a recess in the larger part of the horn, a means for revolving the rollers, a former, and a lip-bending mechanism operating after the rollers and upon the larger part of the horn, as and for the purpose stated.

9. The combination, with a stepped horn, of a pair of rollers, one of which is journaled in a recess in the larger part of the horn, a means for revolving the rollers, a former, a lip-bending mechanism operating after the rollers and in connection with the larger part of the horn, and a lip-locking mechanism mounted in connection with the smallest portion of the horn, substantially as described.

10. The combination, with a stepped horn, of a pair of rollers, one of which is journaled in a recess in the larger part of the horn, a means for revolving the rollers, a former, a lip-bending mechanism operating after the rollers and in connection with the largest portion of the horn, a lip-locking mechanism arranged in connection with the smallest section of the horn, and a lip-compressing mechanism arranged in advance of the locking mechanism and in connection with the intermediate section of the horn, substantially as described.

11. The combination, with a horn, of feeding-rollers arranged in connection therewith, a means for revolving the rollers, a former, a lip-bending mechanism operating after the feeding-rollers and former, and a means, substantially as described, for advancing the partially-formed can-bodies, as and for the purpose stated.

12. The combination, with a horn, of a pair of rollers, one of which is mounted in a recess formed in the horn, intermeshing gears carried by the roller-shafts, a driving-shaft, a train of accelerating gearing arranged between said shaft and one of the roller-shafts, and a former mounted in connection with the rollers, substantially as described.

13. The combination, with a horn, of a pair of rollers, one of which is mounted in a recess formed in the horn, a roller-driving mechanism, a former, and a blank-feeding mechanism, substantially as described.

14. The combination, with a horn, of a pair of rollers, one of which is mounted in a recess formed in the horn, a means for driving the rollers, a former and stripping-plate, a blank-feeding mechanism, an adjustable guide arranged in connection with the feeding mechanism, and a spring-guide arranged in advance of the rollers, substantially as described.

15. The combination, with a horn, of a block partially inclosing one section of the horn, an annular space being left between the horn and the block, a shoulder defining the annular space, a roller mounted in the recess formed in the horn, a second roller mounted in connection with the first roller, and a means for revolving the rollers, as and for the purpose specified.

16. In a can-body-forming machine, the combination, with a horn one end of which is held within a chambered block, of a plate connected to the frame and to the horn, substantially as described.

17. In a can-body-forming machine, the combination, with a horn formed with a longitudinal slot, 3, and supported at one end within a chambered block, of a plate, 16, connected to the frame and secured within the slot 3, substantially as described.

18. In a can-body-forming machine, the combination, with a horn formed with longitudinal side grooves, of slides mounted within said grooves, tongues pivotally mounted within recesses formed in the slides, springs arranged in connection with the tongues, and a slide-reciprocating mechanism, substantially as described.

19. In a can-body-forming machine, the combination, with a horn formed with a lip, *c*, of a presser-arm mounted on a movable pivot, a lever formed with a lip, *f*, and an operating mechanism, substantially as described.

20. In a can-body-forming machine, the combination, with a horn formed with a recess, *b*, and a lip, *c*, of presser-arms 63 and 64, the arm 64 being formed with a lip, *e*, levers 69 and 70, that are pivotally connected to the frame, a link by which said levers are connected, levers 75 and 80, that are pivotally connected to the levers 69 and 70, the lever 75 being formed with a lip, *f*, and the lever 80 being formed with a shoulder, *g*, and operating cams and connections, all parts being arranged substantially as described.

21. The combination, with a horn provided with a longitudinal rib or projection, 86, of curved-faced blocks mounted at either side of the horn, a hook carried by one of the blocks, a spring arranged in connection with the hook, and a means, substantially as described, for advancing the blocks toward the horn, as and for the purpose stated.

22. The combination, with a horn provided with a longitudinal rib or projection, 86, of curved-faced blocks mounted at either side of the horn, a hook carried by one of the blocks, a spring arranged in connection with the hook, a stiff metallic plate carried by the other block and extending toward the horn from the upper inner edge of said block, a spring arranged between the blocks, and a means, substantially as described, for advancing the blocks toward the horn, as and for the purpose stated.

23. The combination, with a horn provided with a longitudinal rib or projection, 86, of curved-faced blocks mounted in ways at either side of the horn, a hook carried by one of the blocks, a spring arranged in connection with the hook, a stiff metallic plate secured to the other block and extending outward from the

upper inner edge of the block toward the projection 86, a spring arranged between the blocks, rollers carried by the blocks, and cams arranged in connection with the rollers, as and for the purpose stated.

24. The combination, with a horn formed with a longitudinal groove, *i*, of a plate mounted in a recess formed in the horn at one side of the recess *i*, springs arranged in connection with the plate, curved-faced clamping-blocks mounted at either side of the horn, and a means for operating said blocks, a presser-foot mounted above the horn, and a means for operating said foot, all substantially as described.

25. The combination, with a horn formed with a recess, *i*, of curved blocks mounted at either side of the horn, a means for operating the said blocks, a plate, 95, mounted within a recess formed at the side of the recess *i*, springs by which said plate is supported, a follower mounted above the horn, a presser-foot carried by the follower, a yieldingly-mounted plate carried by the presser-foot, and a means, substantially as described, for forcing the follower downward, as and for the purpose stated.

26. The combination, with a horn, of a pair of rollers, one of which is mounted in a recess formed in the horn, a former, a means for revolving the rollers, and a means for raising the upper roller, substantially as described.

27. The combination, with a horn, of a roller mounted in a recess formed in the horn, a roller mounted in movable boxes above the horn, a former, a means for revolving the rollers, and a means for raising the upper roller, substantially as described.

28. The combination, with a horn provided with a longitudinal recess having on one edge a projecting lip, of binders or presser-arms engaging the horn at the edges of the recess, one of which binders is provided with a projecting lip, and levers having their points working-the one over the lip on the horn and the other over the lip on the binding-arm, substantially as described.

FRANK M. LEAVITT.

Witnesses:
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