No. 775,340. PATENTED NOV. 22, 1904.

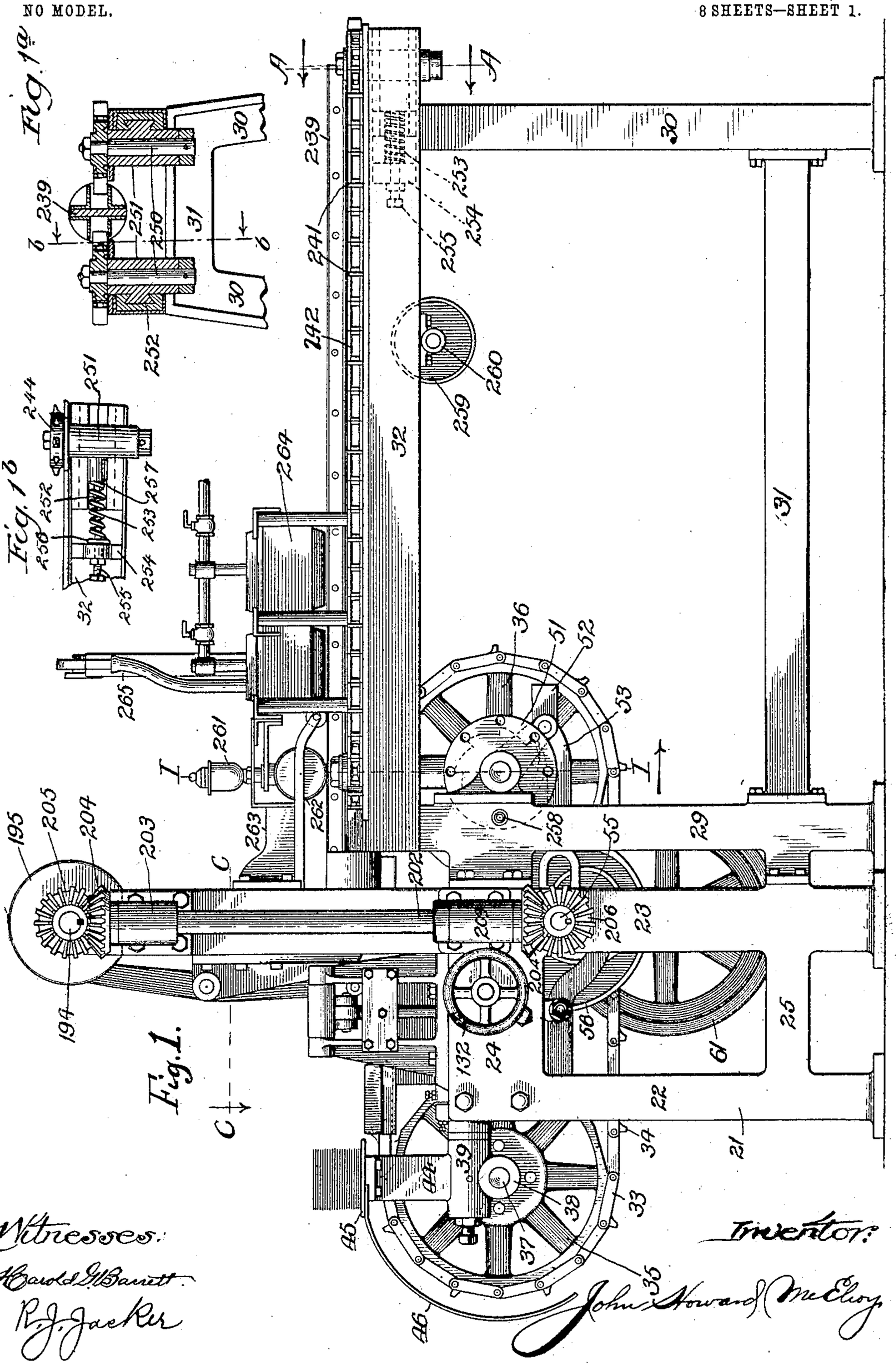
J. H. McELROY.

LOCKED SEAM CAN BODY MACHINE.

APPLICATION FILED JULY 9, 1902.

NO MODEL. 8 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

Harold G. Barrett.

R. J. Jacker

Inventor:

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NO MODEL. 8 SHEETS—SHEET 2.

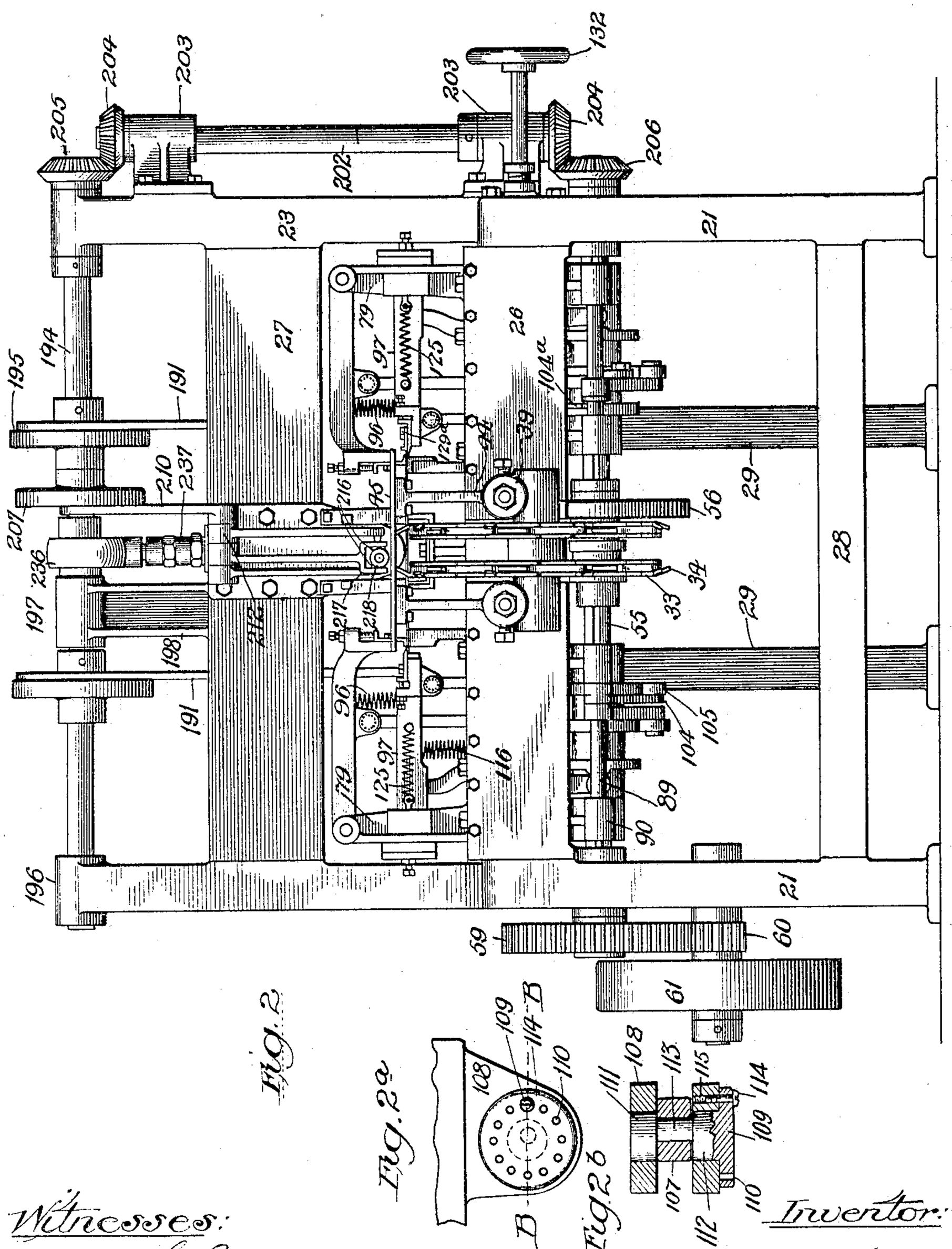

FIG. 2.

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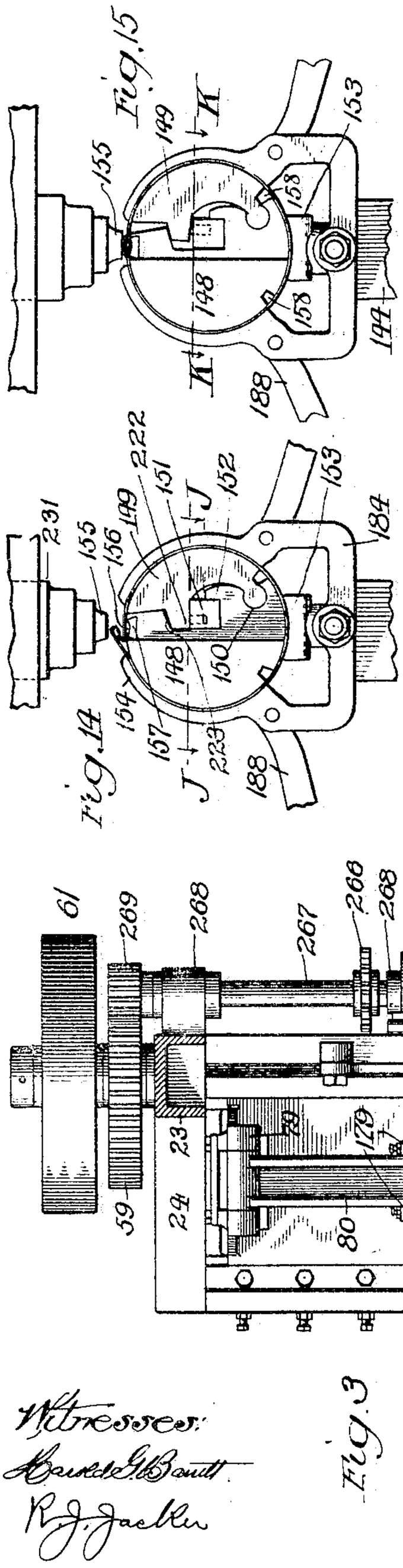
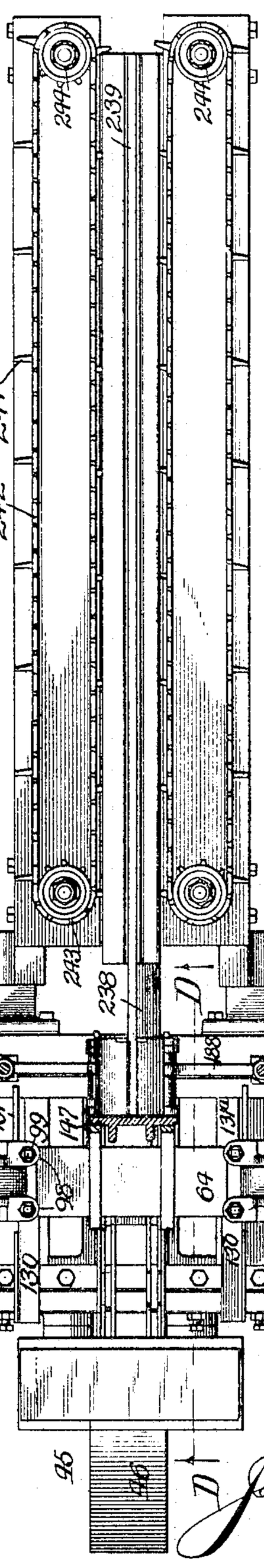
NO MODEL. 8 SHEETS—SHEET 3.





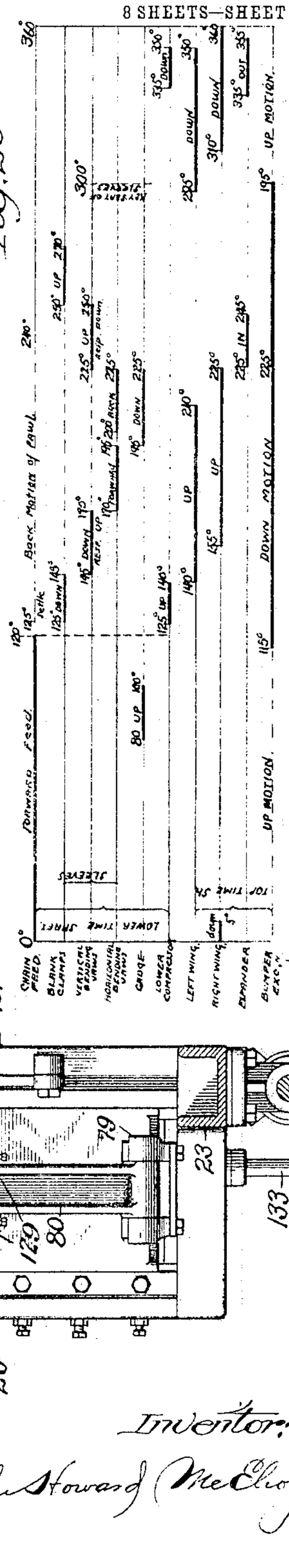


Fig. 3

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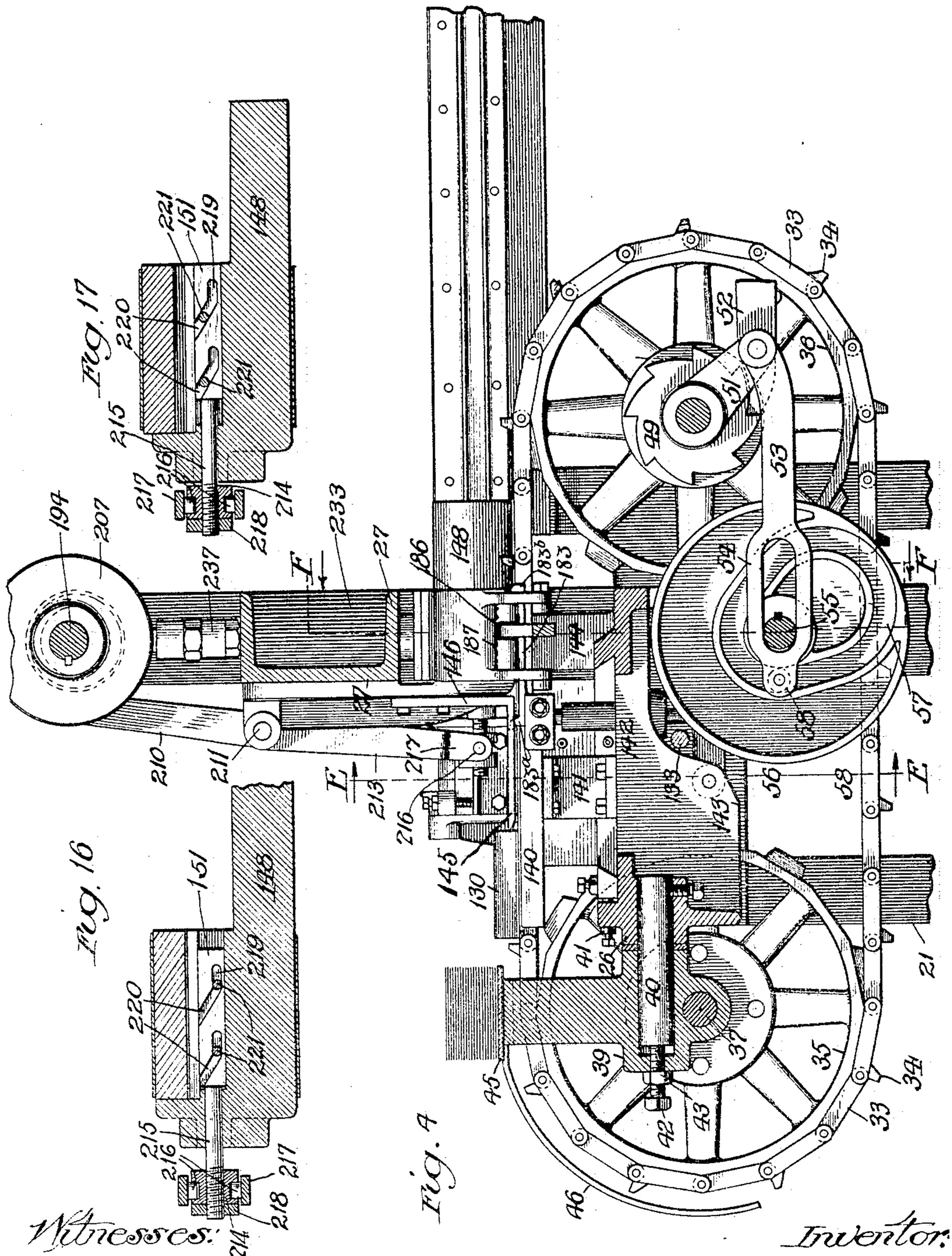
NO MODEL. 3 SHEETS—SHEET 4.



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NO MODEL. 8 SHEETS—SHEET 5.

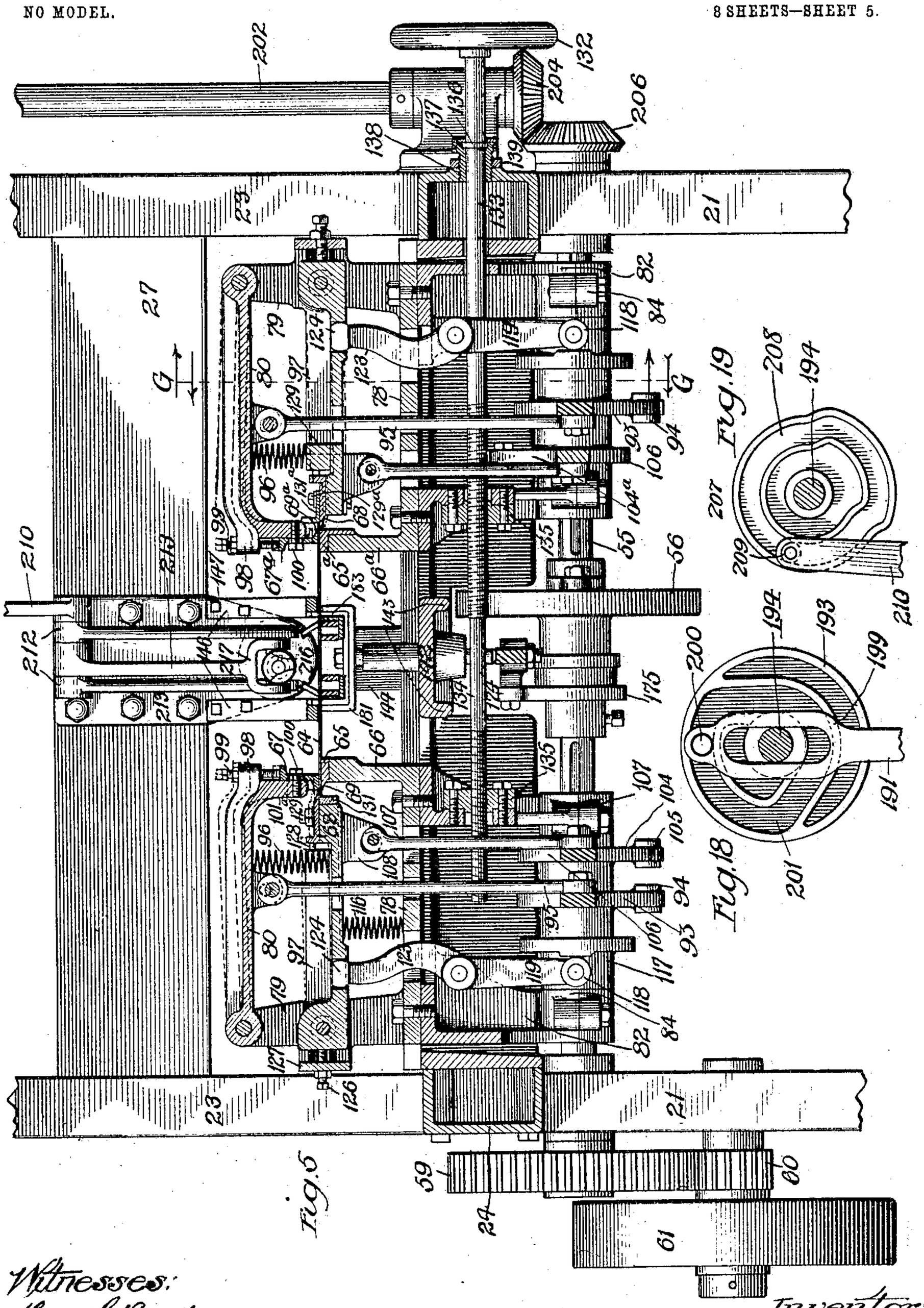

Fig. 5

Fig. 19

Fig. 18

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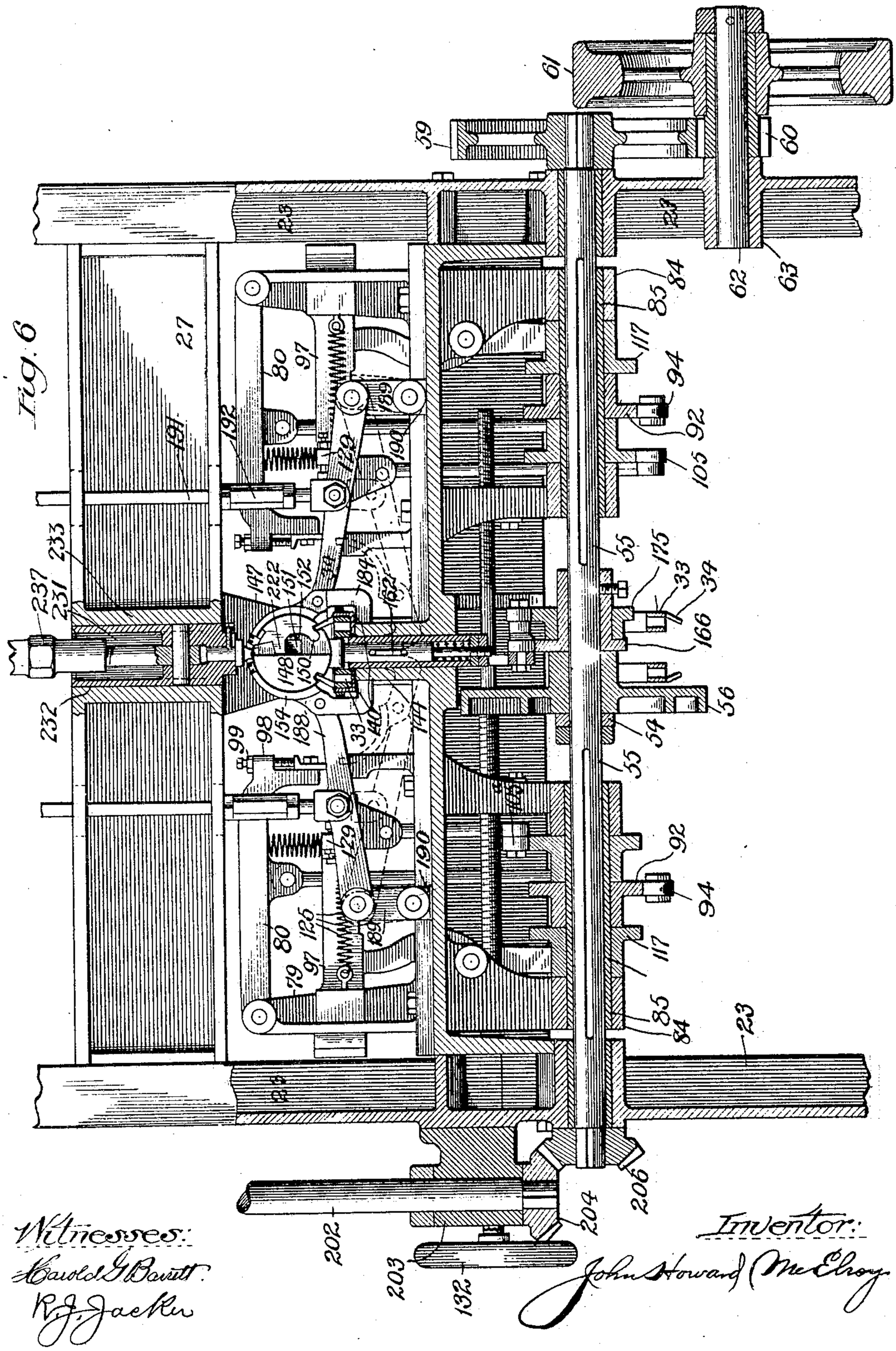
NO MODEL. 8 SHEETS—SHEET 6.

Fig. 6



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NO MODEL. 8 SHEETS—SHEET 7.

Fig. 8

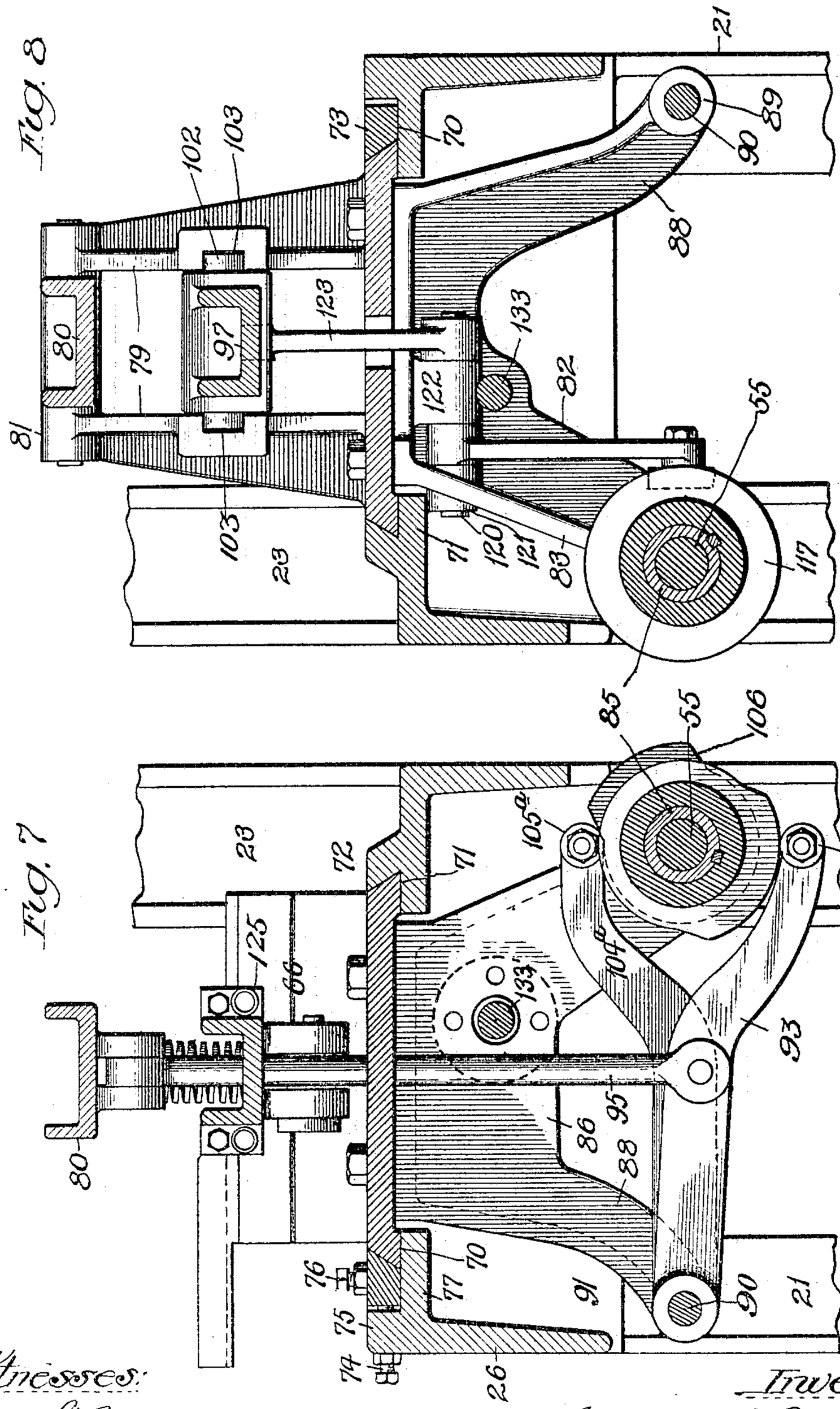

Fig. 7

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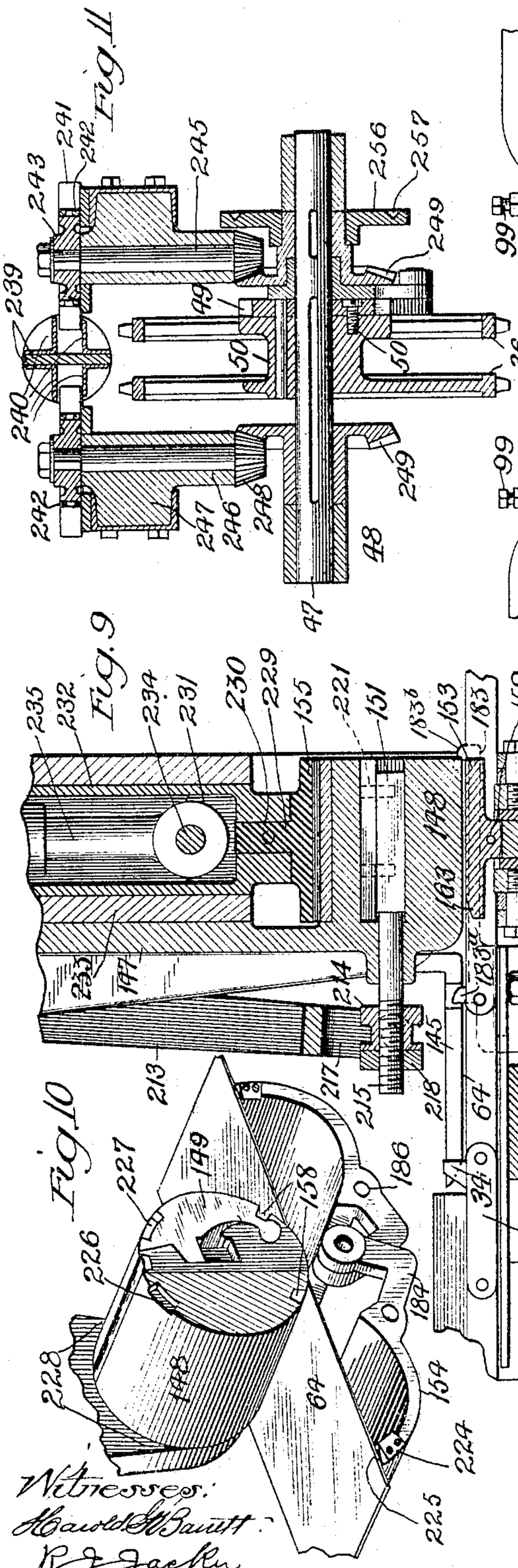
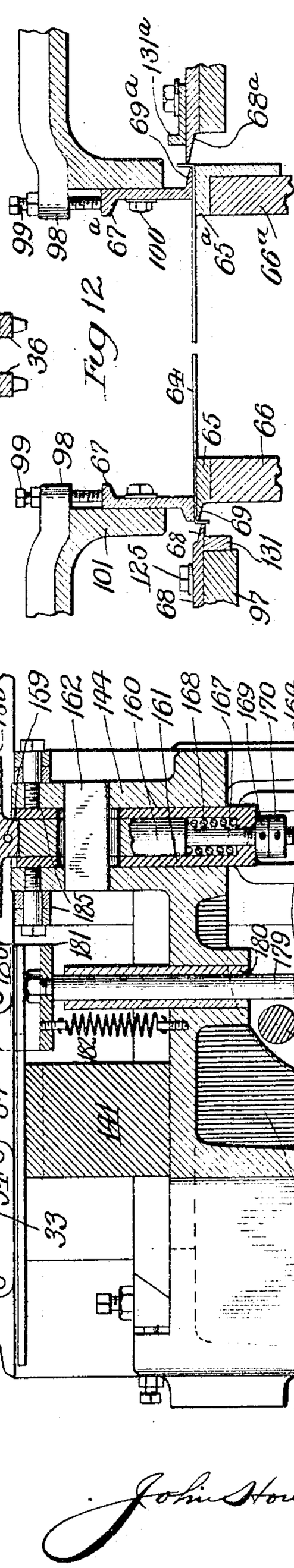
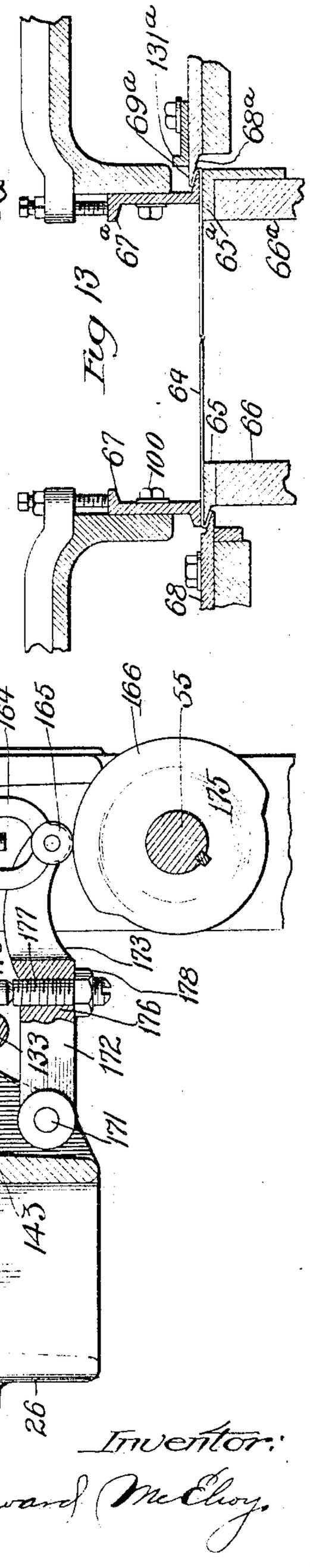
NO MODEL. 8 SHEETS—SHEET 8.







Witnesses:
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R. J. Jackson

Inventor:
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No. 775,340. Patented November 22, 1904.

UNITED STATES PATENT OFFICE.

JOHN HOWARD McELROY, OF CHICAGO, ILLINOIS.

LOCKED-SEAM-CAN-BODY MACHINE.

SPECIFICATION forming part of Letters Patent No. 775,340, dated November 22, 1904.

Application filed July 9, 1902. Serial No. 114,896. (No model.)

To all whom it may concern:

Be it known that I, JOHN HOWARD McELROY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Locked-Seam-Can-Body Machines, of which the following is a specification.

My invention is concerned with certain new and useful improvements of the class described, and is mainly concerned with certain new and useful mechanical constructions and combinations of elements the details of which will be fully described in the following specification and the novel features thereof particularly pointed out in the claims.

To illustrate my invention, I annex hereto eight sheets of drawings, in which the same reference characters are used to designate identical parts in all the figures, of which—

Figure 1 is a side elevation of a machine embodying my improvements. Fig. 1^a is a detail of the can-carrying mechanism in section on the line A A of Fig. 1. Fig. 1^b is a detail on the line *b b* of Fig. 1^a. Fig. 2 is a front elevation of the machine. Fig. 2^a is an enlarged detail showing the vertical adjustment of the bending-jaws. Fig. 2^b is a horizontal section on the line B B of Fig. 2^a. Fig. 3 is a top plan view of the machine with the soldering mechanism omitted and in section on the line C C of Fig. 1. Fig. 4 is an enlarged sectional view through the main portion of the machine on the line D D of Fig. 3. Fig. 5 is a vertical section through the edge-bending mechanism on the line E E of Fig. 4, the supporting-block 141 being omitted. Fig. 6 is a similar view through the blank-folding and seam-bumping mechanism, with some of the parts in elevation, but substantially in section on the line F F of Fig. 4. Figs. 7 and 8 are views, on a still larger scale, through the edge-bending mechanism in section on the line G G of Fig. 5 looking to the left and right, respectively. Fig. 9 is a central longitudinal vertical section through the horn and its associated parts. Fig. 10 is a perspective view of the horn and the folding-wings, showing how the gages on the wings coöperate with the blank to compel its edges to meet with absolute accuracy. Fig. 11 is a vertical section on the line I I of Fig. 1. Fig. 12 is a detail of a portion of the mechanism shown in Fig. 5, but with the bending-jaws moved vertically as they appear at the conclusion of the first operation in forming the hooks. Fig. 13 is a similar view, but showing the bending-jaws moved horizontally and as they appear at the close of the second operation in forming the hooks. Fig. 14, Sheet 3, is an end elevation of the horn, jaws, and bumper, showing the position of the parts after the blank is folded about the horn, but before the hooks are joined. Fig. 15 is a similar view, but with the horn expanded, as occurs in engaging the hooks, and with the bumper down to press the seam. Fig. 16, Sheet 4, is a detail in horizontal section on the line J J of Fig. 14, showing the operation of the mechanism for expanding the horn. Fig. 17 is a similar view in section on the line K K of Fig. 15. Fig. 18, Sheet 5, is a side elevation of one of the wing-folding cams and its operating-link. Fig. 19 is a similar view of the expander-cam; and Fig. 20, Sheet 3, is a diagram illustrating the relative movement of the various mechanisms.

To form the necessary framework to support the various parts of the machine, I preferably employ at each side the castings 21, which will be seen to consist of the shorter front standard 22 and the longer main or rear standard 23, which are connected by the wide cross-piece 24 at the top of the standard 22 and the smaller cross-piece 25 near the bottom. These castings 21 are connected by the transverse casting 26, extending between them and occupying the vertical horizontal space represented by the cross-piece 24, the general shape of this casting being of an inverted-U shape, with the exceptions that will appear in connection with the description of the associated parts. The standards 23 are connected by the transverse casting 27, which is preferably U-shaped in general cross-section, as seen in Fig. 4. The standards 22 are also connected in the plane of the cross-pieces 25 by the transverse casting 28. To the rear of the casting 26 and to another transverse casting (not shown) between the standards 23

in the plane of the casting 28 I secure the two standards 29, and to support the soldering mechanism I employ the two standards 30 at the rear of the machine, connected at their upper ends by the cross-piece 31 and constituting a single casting, and connected at their lower ends to the standards 29 by the castings 31 and at their top by the channel-beams 32. The castings heretofore described suitably bolted together constitute the framework and skeleton of the machine.

To carry the blanks to the operating mechanism, I employ an intermittently-operating chain-feed, consisting of two chains 33, provided preferably on their alternate links with the carrying-spurs 34, which engage the blanks and carry them forward as the chain is advanced. The chains are of a sprocket construction and are carried by the wheels 35 at the front of the machine and wheels 36 at the rear of the machine. The wheels 35 are keyed or otherwise rigidly secured to the shaft 37, mounted to rotate in the bearings 38, formed on the sleeves 39, adjustably mounted on the pins 40, secured in correspondingly-shaped recesses 41, formed in the front of the casting 26, as best seen in Fig. 4. By means of set-screws 42, screwed through the ends of the sleeves 39 and taking against the ends of the pins 40, and the lock-nuts 43 coöperating therewith I am enabled to adjust the position of the wheels 35 and take up any slack in the chains 33. The sleeves 39 are preferably provided with the standards 44, connected at their upper ends by the plate 45, upon which the blanks are piled, and a curved shield 46, covering the wheels and chains, may be secured to the under side of the plate 45, as clearly shown in Fig. 1. The rear wheels 36 are, as best seen in Fig. 11, splined to a shaft 47, which rotates in suitable bearings 48, bolted to the rear sides of the standards 29. To advance the wheels intermittently, a ratchet-wheel 49 is rigidly secured to the wheels 36, as by the pin or screw 50, and mounted to swing on the shaft 47 is an arm 51, which has pivoted thereon the pawl 52, engaging the ratchet 49. This pawl 52 may be held in engagement with the ratchet by spring-pressure; but I preferably overweight the pawl, so that it will be held in engagement therewith by gravity. The arm 51 has pivotally secured thereto the link 53, which preferably has its other end slotted, as shown at 54, and embracing the shaft 55, which is journaled in suitable bearings formed in the standards 23, and may be described as the main shaft of the machine. Secured upon the shaft 55 in the proper plane is the face-cam 56, with whose groove 57 the engaging member, such as the antifriction-roller 58, mounted on the end of the link 53, coöperates. The shaft 55 has the gear-wheel 59 secured on one end thereof, and meshing with the gear-pinion 60, rigidly secured to the preferably heavy pulley-wheel 61, which is mounted to rotate on a stub-shaft 62, secured in the elongated bearings 63, formed in the standard 23 on that side of the machine, as best shown in Fig. 6. As power is applied to the driving-pulley 61 it will be apparent that the shaft 55 will be continuously rotated at the proper rate of speed and by means of the mechanism heretofore described will, during preferably about one-third of each rotation, advance the chains 33 through a distance amounting to the length of two links, so that the blanks will be presented at regular intervals to the operating mechanism to be described.

As is well known, to form the ordinary locked seam with this class of machine it is necessary to form a downwardly and inwardly pointing hook on one end of the blank and an upwardly and inwardly pointing hook on the other end of the blank, and before describing the details of the mechanism for forming these hooks I will briefly describe, by reference to Figs. 5, 12, and 13, the fundamental steps of the operation, so as to thereby anticipate the necessary movements of the mechanism employed in carrying out this operation.

As the edge-bending mechanism is composed of two substantially symmetrical right and left parts, I will apply the same reference-numeral to the same part in the right and left hand side, unless they should be different other than as rights and lefts, in which case I shall distinguish the right-hand ones by adding the reference-letter *a* to the numeral designating the corresponding left-hand ones.

The blank 64 is fed forward by the chain and properly guided by mechanism to be subsequently described until it rests in the position shown in Fig. 5 upon the upper surfaces of the stationary supporting and clamping jaws 65 and 65ª, carried upon the standards 66 and 66ª. At the time that the blanks are fed into position the movable clamping-jaws 67 and 67ª are elevated to the position shown in dotted lines in Fig. 5 to permit the blank to be fed freely between the jaws 65 and 67. At the time the blanks are fed into position the bending-jaws 68 and 68ª are respectively located at such a distance above and below the ends of the blank that they do not interfere with its passage; but after the movable clamping-jaws 67 and 67ª are brought down by the mechanism employed for that purpose the bending-jaw 68 is lowered vertically and the bending-jaw 68ª is raised vertically to the positions shown in Fig. 12 and in their movement bend the ends of the sheet about the coöperating bending edges 69 and 69ª, formed on the stationary clamping-jaw 65 and on the movable clamping-jaw 67ª, respectively, as clearly seen in the figures referred to. Immediately afterward the bending-jaws 68 and 68ª are moved inward to the right and left, respectively, and their beveled surfaces coöperating with the beveled surfaces of the edges 69 and 69ª serve to bend the hooks into the final shape desired.

(Shown in Fig. 13.) The bending-jaws then retreat and resume their normal position, and the clamping-jaws 67 and 67ª are raised to release the blank 64, which is then fed forward to the folding, hook-engaging, and bumping mechanism, where it is operated on while the succeeding blank is having its edges bent. The mechanism for giving these necessary movements to the clamping-jaws and bending-jaws is best illustrated in Figs. 5 to 8, where it will be seen that I form on the upper surface of each end of the casting 26 the ways 70 and 71, which conveniently have the horizontal bearing-surface and the inclined overhanging surface to hold the coöperating slides in place. The overhanging rib 72 for the bearing-surface 71 is conveniently made integrally therewith; but I preferably make the corresponding rib 73 for the way 70 separate and adjustable thereon by means of the set-screws 74, passed through the rib 75, formed on the top of the front edge of the casting 26 and serving to take up any wear or make any necessary adjustment in the ways, the ribs 73 being secured in any desired position of adjustment by the set-screws 76 passing through short slots therein and into the horizontal web 77 of the casting 26. Mounted to slide in the ways thus formed are the plates 78, which are symmetrical, but are rights and lefts, as is necessitated by the fact that the parts that they carry are oppositely disposed. These plates have the standards 66 and 66ª, previously referred to, on their inner ends preferably cast integrally therewith and have preferably integrally formed on their rear ends a pair of standards 79, which form yokes in the upper ends of which are pivoted the swinging clamping-jaw-supporting levers 80, the bearings 81, formed on the upper ends of these standards, being separated by a considerable distance and the breadth of the levers 80 being correspondingly great in order to give a long bearing-surface to the levers and insure the clamping-jaws pressing firmly on the coöperating stationary jaws 65 and 65ª throughout their length. Bolted to the under sides of the plates 78 beneath the standards 79 are the brackets 82. (Best shown in Fig. 8, where the bracket will be seen to have the rearwardly-extending arm 83, terminating in the short horizontal bearing 84, in which is mounted to rotate the outer end of one of the sleeves 85, each of these sleeves being splined upon the shaft 55, so as to rotate therewith, but so as to be capable of longitudinal movement thereon.) The inner ends of these sleeves are supported by the brackets 86, somewhat similar to the brackets 82, but bolted to the inner ends of the plates 78 beneath the standards 66 and 66ª. The brackets 86 have the bearings 87, similar to the bearings 84. The brackets 82 are provided with the downwardly and forwardly projecting arms 88, which have the apertures 89 formed in their ends in the plane of the bearings 84 to receive the rods 90, the other ends of which are supported in similar apertures in the similar arms 91, projecting forwardly and downwardly from the castings 86. The sleeves 85 each have three cams rigidly secured thereon, the central ones of which, 92, control the movements of the clamping-jaw-carrying levers 80. To effect this result, levers 93 are fulcrumed on the rods 90 and have the antifriction-rollers 94 on their other ends coöperating with the surfaces of the cams 92. Pivoted to these levers beneath the center of the levers 80 are the links 95, which extend up through suitable apertures in the plates 78 and are pivoted at their upper ends in suitable ears formed on the under surface of the levers 80. From a consideration of this arrangement of mechanism and the shape of the cams it will be seen that during a considerable portion of the rotation of the shaft 55 the levers 80 will be held up, so as to keep the jaws 67 and 67ª out of engagement with the coöperating jaws 65 and 65ª. Interposed between the under surface of the levers 80 and the upper surface of the plates 78 are the bending-jaw-carrying levers 97, to be described. During the remaining interval, when the aforesaid bending-jaws are acting, the high portion of the cams will carry the jaws 67 and 67ª down to and hold them in engagement with the stationary jaws to securely clamp the blanks in place while they are being operated on. As a preferred method of adjusting the position of the jaws 67 and 67ª I provide the two pairs of ears 98 on the ends of the levers 80, respectively, and through these I screw the set-screws 99, which coöperate with the upper edges of the jaws to limit their movement, and the jaws are firmly clamped in their desired position of adjustment by the set-screws 100 passing through the elongated vertical slots therein and screwed into the downwardly-directed ends 101 of the levers 80, respectively.

The levers 97 are mounted on a movable pivot, preferably formed by the antifriction-rollers 102, (best shown in Fig. 8,) journaled on the ends thereof and rolling in the horizontal ways 103, formed on the inner edges at about the center of the standards 79. This arrangement, as will be readily seen, permits the levers 97 to swing about the rollers as a fulcrum to carry the jaws 68 down and the jaws 68ª up, while also permitting them to move inwardly for the purpose described. To effect the downward movement of the lever 97 to carry the bending-jaw 68 down, a lever 104, similar to the lever 93, is mounted on the left-hand rod 90 and has its antifriction-roller 105 coöperating with the cam 106 on the left-hand sleeve 85, as clearly shown in Fig. 6. This lever 104 is connected by the link 107 with the ears 108, projecting downward from the under side of the forward end of the lever 97. The lever 104ª for the other

side of the machine is similar, except that it is reversed, and the antifriction-roller 105ª rests on the top of the cam 106, as will be apparent is necessary to raise the right-hand lever 97 instead of lowering it, as is the left-hand lever 97. It will be apparent that the right-hand spring 96 serves to not only hold the lever 80 normally up, but also to hold the lever 97 normally down. The connections between the links 107 and the ears 108 are preferably of a construction best shown in Figs. 2, 2ª, 2ᵇ, and 5, where it will be seen that I employ a disk 109, having the equidistant perforations 110 therein near its periphery and having the two cylindrical bearing portions 111 and 112, which are mounted to rotate in correspondingly-sized openings in the ears 108. These bearing portions 111 and 112 are connected by the reduced eccentrically located portion 113, upon which the upper end of the link 107 is pivoted. A pin or screw 114 passes through whatever one of the apertures 110 may be in position for the adjustment desired and into the recess 115 in the ear 108 to hold the parts in the desired position of adjustment. When any change is to be made, the pin 114 is withdrawn and the disk 109 is rotated until the desired adjustment is attained, when the pin is inserted and operations can be resumed. This form of adjustment is particularly adapted for the general arrangement of parts employed on account of the difficulty there would be of getting at the ordinary turnbuckle adjustment if that were employed. To hold the left-hand lever 97 normally in its uppermost position, a strong helically-coiled expanding-spring 116 is located between the under side thereof and the top of the plate 78, the spring being sufficiently strong to resist any tendency that the spring 96 might have to carry the lever down prematurely.

To provide for the endwise movements of the levers 97, I provide the face-cams 117, secured on the outer ends of the sleeves 85, and coöperating with the antifriction-rollers 118 on the lower end of the arms 119, which are rigidly secured to the rock-shafts 120, mounted in the bearings 121 and 122, formed on the inner faces of the brackets 82. Secured to the inner end of the rock-shaft 120 in the plane of the center line of the levers 97 are the arms 123, the upper ends of which are provided with bearing-heads 124, which take into recesses of the proper size in the levers 97, so that the action of the cams 117 will be to throw the levers and the jaws 68 and 68ª inward after they have been first moved vertically. To return the jaws to their normal position, I employ the helically-coiled contractile springs 125, connected at one end to the sides of the inner ends of the levers 97 and at their other ends to the standards 79. To limit the amount of horizontal outward movement of these levers 97, I employ the set-screws 126, screwed through the plates 127, connecting the outer edges of the standards 79 and contacting with the outer ends of the levers 97 in their outermost positions. The jaws 68 and 68ª are secured on suitable flat bearing-surfaces formed on the upper surfaces of the inner ends of the levers 97 and are adjusted by means of the set-screws 128, screwed through the lugs 129, formed on the upper surface of the levers 97 and abutting against the upturned ends of the jaws, which have slightly-elongated slots therein (not shown) through which pass the set-screws 129ª, which are screwed into the ends of the levers 97 to secure the jaws in any desired position of adjustment.

To guide the blanks 64 with absolute accuracy to this bending apparatus, as will be apparent is absolutely necessary, I secure upon the tops of the front ends of the standards 66 the blank-guides 130, which consist of the angle-bars projecting forward in front of the jaws and having the vertical sides projecting upward and the horizontal sides projecting inward, the upper surfaces of which are flush with and form a continuation of the clamping-surfaces of the jaws 65 and 65ª. The edge guides formed by the inner sides of the vertical portions of these bars 130 are continued alongside the jaws and as far past them as possible without interfering with the folding-wing-operating levers (to be described) by the extensions 131 and 131ª, which are secured to the front of the left-hand lever 97 beneath the jaw 68 and to the top of the jaw 68ª, respectively, as seen in Fig. 5, so that the continuity of the vertical guide-surface is unbroken until the blanks are carried beneath the bending-jaws.

The machine is designed to be used for different-sized cans, and for this purpose it will be apparent that the bending mechanism herein shown must be arranged so that the jaws can be brought nearer to or farther from each other, as may be necessary for the different lengths of blanks upon which the machine will have to operate. For this purpose I provide the hand-wheel 132 on the outside of the machine, which is secured to and rotates the adjusting screw-rod 133, the outer portion of which is of a certain diameter, while the inner portion 134 is of a reduced diameter. The inner end of the larger portion and the outer end of the reduced portion are oppositely screw-threaded, but with threads of the same number to the inch, these screw-threaded portions coöperating with the nuts 135, secured to the brackets 86. If the rod 133 is held from longitudinal movement, it will be apparent that as it is rotated the jaws will both move at the same rate toward or from each other, as the case may be, thus uniformly adjusting the bending mechanism, as the entire mechanism is placed on the slides 78, which are moved by the screw, as

seen, and slide back and forth in the recesses constituting the greater portion of the upper side of the casting 26.

As the horn and allied mechanism to be described are stationary, it becomes of vital importance to be able to adjust the bending mechanism thereto in order that the blank may be accurately delivered to the horn, and for this purpose I confine the rod 133 by means of the collar 136 in the exteriorly-screw-threaded bearing-block 137, which is screwed into a suitable nut 138, formed in the cross-piece 24 of the casting and secured in any desired position of adjustment by the nut 139. By this mechanism it will be apparent that I can instantly and without any separate movements of the jaws adjust the center of the blank exactly to the center line of the horn. It will be apparent that the reduction of a portion of the rod 133 is made to facilitate the insertion thereof in the machine.

To hold the upper half of the chain horizontal throughout the operative portion, I provide the angle-iron supports 140, arranged with the vertical portions pointing upward and the horizontal portions pointing inward, so as to support the outer edges and bottom of the chain. These supports are carried upon the I-shaped block 141, bolted to the top of the middle portion 142 of the casting 26, which is not cut away at this point, as the plates 78 do not reach this far inward, and to strengthen the casting at this portion I provide the two vertical webs 143. (Best shown in Fig. 4.) The rear ends of these supports 140 are also secured upon the top of the vertical tubular bearing 144, as best seen in Fig. 6. These supports hold the chain perfectly horizontal as it passes beneath the bending mechanism and the horn. To hold the sheets flat and prevent their buckling, I provide the horizontal plates 145, with the under surfaces of their outer ends beveled slightly and extending over the longitudinal distance covered by the bending apparatus and supported by the vertical arms 146, bolted to the casting 147, upon which the horn is supported. This horn-supporting casting 147 is a heavy substantial casting of the shape shown and strongly bolted to the cross-piece casting 27.

Before describing the details of construction of the blank folding, hooking, and bumping mechanism I desire to describe the mode of operation of the parts thereof in order that the construction and operation of the mechanism for moving the parts will be more readily understood, and for this purpose reference is made to Figs. 6, 14, and 15. The blank after having the hooks formed on its edges is fed forward by the chains beneath the horn 148, which projects rearwardly from the bottom of the aforesaid casting 147 and consists of the stationary portion, which is preferably formed integrally with said casting and has its outer surface curved on the arc of a circle of the interior diameter of the can to be formed and extends over about two hundred degrees. A wing 149, having its outer surface curved on the same circle, is pivotally mounted thereon by the elongated bearing 150. The movable portion is also connected with the fixed portion by the expanding-slide 151, to be more fully described, which slides in the way 152, formed in the center of the side of the fixed portion of the horn. After the blank is in position beneath the horn a clamp 153, having its upper surface curved on the arc of the same circle as the horn and extending the length of the horn, is brought up against the under surface thereof and serves to clamp the blank firmly in position, preferably, however, with a yielding pressure. The outer ends of the blank are now over the folding wings 154, which are now in the dotted-line position shown in Fig. 6. These wings are immediately swung into engagement with the horn, folding the blank into a circle about the horn, as shown in Fig. 14. It may be stated that the wing on the left-hand side of the machine, standing at the front, rises somewhat in advance of the other, so that the left-hand hook pointing upward will be beneath the right-hand hook pointing downward, as shown in said figure. The expanding-slide 151 is in such position that the horn is at its smallest diameter and the hooks are not engaged. The expander-slide 151 is then moved, carrying the wing 149 to the position shown in Fig. 15 and drawing the left-hand hook into engagement with the right-hand hook, which remains stationary, thus insuring the locking of the seam. At the same time the bumper 155 is descending and holds the right-hand hook down, so that it cannot help being engaged by the left-hand hook, and the instant the engagement is effected the continued descent of the bumper presses the seam firmly into the channel 156, formed in the upper surface of the seaming-bar 157, set into the top of the stationary portion of the horn. The bumper 155 now rises, the expanding-slide 151 retreats and draws the wing 149 back to the contracted position of the horn, the folding-wings 154 are carried back to their lowermost position, the can is free to be carried off from the horn at the next movement of the chain, whose inwardly-directed lugs 34 take into the recesses 158, extending the length of the horn, and the can is easily removed, as its interior area is represented by the expanded horn, while the horn is now contracted, leaving the can loose on the horn.

The clamp 153, as best seen in Fig. 9, is preferably pivotally mounted by means of an elongated bearing-lug 159 between a pair of ears formed in the top of the sliding rod 160, which is mounted to slide in a sleeve 161, which in turn slides in the vertical bearing 144. The rod 160 and sleeve 161 are both held from possible rotation by the spline-strip

162, secured in apertures in the sleeve 144 and extending through slightly-elongated but otherwise snugly-fitting apertures in the rod and sleeve. The pivoting of the clamp 153 enables it to adjust itself exactly to any inequality in the tin or movement of the horn, and the upper surface of the outer end thereof is beveled off, as seen at 163, to facilitate the entrance of the blanks. The sleeve 161 has the yoke 164 on the bottom thereof, which carries the antifriction-roller 165, which coöperates with the cam 166 on the shaft 55, substantially at its middle, to raise the sleeve and clamp the blank while it is being operated on and to permit the clamp to descend while the formed can-body is being removed and the fresh blank is being fed into position. In order that the clamp 153 may yield and hold the blank yieldingly in spite of the positive movement given by the cam, as well as to furnish a yielding resistance to the blank as it is being fed beneath the horn, and thereby prevent any possible overthrow, I reduce the lower portion of the rod 161, as seen at 167, and pass it through an aperture formed in the bottom of the sleeve 161 and interpose a helically-coiled expanding-spring 168 between the shoulder formed by the reduced portion and the bottom of the sleeve. A set-nut 169 and a coöperating jam-nut 170 on the lower screw-threaded end of the reduced portion 167 enable me to adjust the position of the clamp 153 and vary the amount of tension it exerts upon the horn, as well as the resistance to the feeding of the blank.

I may employ in connection with the edge-bending mechanism a stop-gage to limit the forward movement of the blanks to position beneath the clamping-jaws and horn and prevent any possible overthrow, but I do not find it to be essential. This mechanism is best shown in Figs. 4, 5, and 9, where it will be seen that I pivot between the ribs 143 upon the bearing-rod 171 a lever 172, which has the offset 173 thereon, which brings the antifriction-roller 174 on its power end in the plane of the cam 175, rigidly secured on the shaft 55 and conveniently mounted on the sleeve constituting the bearing-support of the cam 166. Screwed into an enlargement 176 of the lever 172 is a set-screw 177, provided with a jam-nut 178. In the hollowed upper end of the set-screw 177 rests the reduced end of the rod 179, which is mounted to slide in the vertical sleeve 180, secured in the bearing-aperture 181, formed in the portion 142 of the casting 26. On the upper end of the rod 179 is secured the U-shaped cross-piece 181, which has the helically-coiled contractile spring 182 secured to the under surface thereof and to the top of the portion 142 of the casting 26, so as to tend to hold the gage in its lowermost position. Secured on the inner faces of the vertical outer edges of the cross-piece 181 in any desired manner are the elongated gage-bars 183, having the front stop-fingers 183^a and the rear stop-fingers 183^b, which are thrown upward by the cam 175 just previous to the completion of the feeding movement of the chain, so as to positively stop the blanks beneath the bending-jaws and horn and prevent any possible overthrow, while the spring 182 serves to draw the gage-fingers down some time previous to the beginning of the feed movement of the chain, so as to prevent the possibility of the fingers 183^a being in the way to interfere with the forward movement of the blank which has just had its edges bent. The gage-bars 183 extend along just outside of and in contact with the vertical portions of the chain guide-bars 140, which prevent any possibility of their being displaced and spoiling the accuracy of their guiding action.

The folding-wings 154 are rigidly secured to and preferably formed integral with the substantially right-angular arms 184, which are pivoted by their inner ends upon the bearing-pins 185, screwed into the top of the bearing 144, as best shown in Fig. 9. Pivotally mounted in the recesses 186, formed in the semicylindrical rib 187, formed on the bottom of the wing and connecting the upper ends of the arms 184, is the inner end of the lever-arm 188, the other end of which is pivoted to the swinging fulcrum-link 189, which in turn is pivoted to the ears 190, projecting upward from the rear of the casting 26, as best seen in Fig. 6. These links 188 are connected by the links 191, provided with the turnbuckle adjustments 192, to the wing-operating face-cams 193, secured upon the horizontal shaft 194, journaled in the bearings 196, formed on the top of the standards 23, and in the auxiliary bearing 197, formed on the top of the standard 198, projecting from the transverse casting 27. The face of one of the cams 193 is shown in Fig. 18, and it will be seen that the upper end of the link 191 is provided with the elongated slot 199, embracing the shaft 194 and provided with the bearing-pin or antifriction-roller 200, projecting into the groove 201 of the cam. These cams are set one slightly in advance of the other, and it will be apparent from a consideration of Fig. 6 that as the shaft 194 is rotated in unison with the shaft 55 by reason of the transverse shaft 202, mounted in the bearings 203, projecting from the sides of the standards 23 and having the bevel-pinion 204 on its ends meshing with the bevel-pinions 205 on the shaft 194 and 206 on the shaft 55, the wings will be reciprocated in the proper manner and at the proper time to fold the blank about the horn. This particular mounting of the wing mechanism enables the wing operating with the movable half of the horn to yield, as is necessary when the horn is expanded.

The mechanism for expanding the horn at the proper instant is best shown in Figs. 5, 9, 14 to 17, and 19, and consists of the face-

cam 207, secured near the center of the shaft 194 and having the cam-groove 208 therein, (shown in Fig. 19,) in which extends the pin or antifriction-roller 209, secured on the upper end of the arm 210, the lower end of which is rigidly secured to the rock-shaft 211, mounted to rock in the bearings 212, formed on the top of the horn-supporting bracket 147. Between the bearings 212 is the upper end of the arm 213 of the expander-operating lever, which is rigidly secured to the rock-shaft 211, so that the movement of the cam is transferred to the adjustable collar 214, screwed on the rounded and reduced end 215 of the expander-slide 151, which projects through an aperture in the bottom of the bracket 147 by means of the ears 216, engaging the annular groove in the collar and pivoted in suitable bearings formed in the ends of the yoke 217, forming the lower end of the arm 213. A jam-nut 218, coöperating with the collar 214, serves to secure it in any desired position of adjustment as may be necessary to regulate the amount of expansion given to the horn. The slide 151, as seen in Figs. 16 and 17, is provided with the pair of channels therein having the straight portions 219 and the inclined portions 220, into which fit the pins 221, projecting downward from the ledge 222, projecting inward from the movable wing 149 into the channel 223, formed on the face of the rigid portion 148 above the slide 151. From an examination of Figs. 15 and 16 it will be apparent that by adjusting the position of the slide 151 by the mechanism previously described the amount of throw given to the movable wing can be regulated as may be desired.

To insure the blank 64 being folded squarely about the horn with its ends meeting exactly, I employ the mechanism (best shown in Fig. 10) which consists of the inwardly-pointing adjusting-stops 224, fastened onto the tips of the rear and upper ends of the wings and having the beveled inner edges 225. These gages project inside of the periphery of the wings, and the stationary portion of the horn is cut away at 226 and the movable wing at 227 to receive these gage-fingers when the wings are folded. As will be seen from an examination of Fig. 10, the sheet as it is fed forward reaches substantially to the inclined portion of the gages, but does not contact with them, as they are slightly below the plane of the blank, and as the wings swing up toward the end of their movement the gages catch the edges of the tin and bring them into alinement if they happen to be out, which is forced by the other edges of the blank taking against the portion of the support for the horn, as at 228, thus forming two positive surfaces from which the blank cannot escape and necessitating their meeting squarely at the time the edges are brought together and hooked. The yielding clamp 153 permits any movement of the blank that may be necessary to bring the blank into perfect alinement.

The bumper 155 and its operating connections, as best seen in Figs. 2, 4, 6, and 9, consists of a bar having the head 229 fitting into a socket 230, formed in the bottom of a sleeve 231, splined to and mounted to slide in the bearing 232, formed in the enlargement 233 of the casting 27. The sleeve 231 is hollow and has pivoted in the lower end thereof on the bolt 234 the link 235, the upper end of which is secured to the eccentric-strap 236, coöperating with an eccentric (not shown) on the shaft 194. A turnbuckle adjustment 237, with the customary set-nuts, is employed in connection with this link to raise or lower the position of the bumper, as may be desired to adjust it to the horn and vary the amount of pressure put upon the seam.

The fixed portion of the horn 150 is preferably provided with the extension 238, to which is secured the bar 239, forming the basis of the soldering-horn. To fill out the horn and keep the can in shape as it passes over the same, I bolt to the bar 239 the four strips of angle-iron 240, as shown in cross-section in Figs. 11 and 1ª. Between the horizontal flanges of the angle-irons is formed a pathway for the fingers 241 of the can-carrying chains 242, which are carried upon the sprocket-wheels 243 at their inner ends and 244 at their outer ends. The sprocket-wheels 243 are secured upon the upper ends of the vertical shafts 245, (best shown in Fig. 11,) which are journaled in the bearings 246, formed in the castings 247, which are bolted to the angle-bars 32. The lower ends of these shafts have secured thereon the bevel gear-pinions 248, which mesh with the bevel gear-wheels 249, secured upon the shaft 47, so that every time the blank-carrying mechanism is operated to bring forward a fresh blank the can-carrying mechanism is simultaneously operated to carry away the completed can delivered to it by the blank-carrying mechanism. The sprocket-wheels 244 are secured upon the upper ends of the short shafts 250, which are journaled in bearings 251, mounted to slide in the ways 252, secured on the inner surfaces of the channel-beams 32. To keep the chains taut, I preferably interpose the helically-coiled expanding-springs 253 (shown in dotted lines in Fig. 1) between the ends 257 of the bearings 251 and the abutments 256, formed on the ends of the set-screws 255, passed through the threaded lugs 254, secured on the inside of the channel-bars 32. By means of these set-screws 255 I can vary the amount of tension given to the chain.

To accurately position the blank-feeding chains, I preferably secure upon the shaft 47, conveniently upon the hub of one of the bevel-gears 249, a disk 256, which has eight equidistant conical depression 257, formed near the periphery thereof and in position to co-

operate with a spring-pressed plunger 258, mounted in a suitable housing in the standard 29.

To support the outer end of the soldering-horn 239, I locate beneath it a wheel 259, upon which the horn rests and which is journaled in suitable bearings 260, secured to the under side of the channel-bars 32.

Any desired form of soldering mechanism may be used in connection with my apparatus, and I have shown a conventional form consisting of the flux-cup 261, suitably supported above the fluxing-roller 262, supported by the bracket 263, bolted to the rear of the transverse casting 27. Soldering-pots 264, supported from the channel-bars 32, may be employed, and any desired form of solder feeding and cutting mechanism 265 may be employed and conveniently operated by a sprocket-chain running to a sprocket-wheel 266, secured upon the shaft 267, mounted in the bearings 268, secured to any suitable portion of the machine and terminating in the gear-pinion 269, engaging the pinion 59, or the power might be taken directly from the shaft 194.

The operation of the complete device will be readily understood from the foregoing description. To facilitate the comprehension of the relative movements of the parts and their timing, I show in Fig. 20 a table in which the relative time and duration of all the movements of the parts are shown graphically. From this it will be apparent that during the first one hundred and twenty degrees of rotation of the two shafts the chain feed is moving forward and advancing a fresh blank, the blank with its edges bent, and the hooked can-body to their new positions. From the period of eighty degrees up to one hundred degrees the gage is being raised ready to meet the blank and the blank with its edges bent at the end of their movements—*i. e.*, at one hundred and twenty degrees. At one hundred and twenty degrees, with the blanks in their new positions, five degrees is given to allow the parts to settle, and simultaneously from one hundred and twenty-five degrees to one hundred and forty-five degrees the blank-clamps come down to secure the blanks prior to bending their edges. At the same time the lower compressor comes up to clamp the blank just fed beneath the horn firmly against the bottom thereof. From one hundred and forty-five degrees to one hundred and seventy degrees the vertical bending-jaws are moving down or up, as the case may be, and from one hundred and seventy degrees to one hundred and ninety-five degrees they are moving inward to complete the hooks. At the same time that these movements have been completed on the new blank the one beneath the horn has been folded by reason of the left wing rising from one hundred and forty degrees to two hundred and ten degrees and the right wing rising from one hundred and fifty-five degrees to two hundred and twenty-five degrees. From one hundred and ninety-five degrees to two hundred and twenty-five degrees, after the blanks have been operated on, the gage descends, and from two hundred degrees to two hundred and twenty-five degrees the horizontal bending-jaws move back, and from two hundred and twenty-five degrees to two hundred and fifty degrees they move up or down, as the case may be, to their normal position. From two hundred and fifty degrees to two hundred and seventy degrees the blank-clamps rise, and for the remaining ninety degrees of movement none of the edge-bending parts are in operation; but they are all ready for the new blank at the beginning of a new rotation. At two hundred and twenty-five degrees the blank had been folded about the horn by the wings, and from two hundred and twenty-five degrees to two hundred and forty-five degrees the expander operates to hook the seam, and at one hundred and ninety-five degrees the bumper, which has been moving down since one hundred and fifteen degrees, completes its downward movement and bumps the seam, firmly securing it together. From two hundred and ninety-five degrees to three hundred and fifty degrees the left wing moves down and similarly the right wing from three hundred and ten degrees to three hundred sixty-five degrees. The expander retracts from three hundred and thirty-five degrees to three hundred and fifty-five degrees before the feed takes the locked seam-body off of the horn in order to permit it to be withdrawn easily. From three hundred and thirty-five degrees to three hundred and fifty degrees the lower compressor is also dropped to release the can from the horn and permit its easy withdrawal.

While I have shown my improvements as embodied in a locked-seam machine, it will be understood that some of them might be employed in a lapped-seam machine and that I do not desire to be limited to their employment in a locked-seam machine except in combinations pertaining exclusively to that class of machines.

While I have shown my invention as embodied in the forms which I at present consider best adapted to carry out its purposes, it will be understood that it is capable of modifications and that I do not desire to be limited in the interpretation of the following claims except as may be necessitated by the state of the prior art.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a device of the class described, the combination with the main shaft, a single blank-feeding mechanism to and from the edge-bending mechanism and blank-folding mechanism, edge-bending mechanism, and operating connections between said mechanisms and shaft;

of the auxiliary shaft, blank-folding mechanism, hook-engaging mechanism, seam-bumping mechanism, and operating connections between said blank-folding, hook-engaging and seam-bumping mechanism and said auxiliary shaft; and driving connections between said shafts.

2. In a device of the class described, the combination with the main shaft, a single blank-feeding mechanism to and from the edge-bending mechanism and blank-folding mechanism, edge-bending mechanism, body-feeding mechanism, and operating connections between all of said mechanisms and said shaft; of the auxiliary shaft, blank-folding mechanism, hook-engaging mechanism, seam-bumping mechanism, and operating connections between said blank-folding, hook-engaging and seam-bumping mechanisms and said auxiliary shaft; and driving connections between said shafts.

3. In a device of the class described, the combination with the main shaft, blank-feeding mechanism, edge-bending mechanism, stop-gage mechanism, and operating connections between all of said mechanisms and said shaft; of the auxiliary shaft, blank-folding mechanisms, hook-engaging mechanism, seam-bumping mechanism, and operating connections between said blank-folding, hook-engaging and seam-bumping mechanisms and said auxiliary shaft; and driving connections between said shafts.

4. In a device of the class described, the combination with the main shaft, blank-feeding mechanism, edge-bending mechanism, body-feeding mechanism, stop-gage mechanism, and operating connections between all of said mechanisms and said shaft; of the auxiliary shaft, blank-folding mechanism, hook-engaging mechanism, seam-bumping mechanism, and operating connections between said blank-folding, hook-engaging and seam-bumping mechanisms and said auxiliary shaft; and driving connections between said shafts.

5. In a device of the class described, the combination with the main shaft, the auxiliary shaft, and driving connections between said shafts; of the blank-feeding mechanism, edge-bending mechanism, blank-folding mechanism, positively-actuated hook-engaging mechanism, and seam-bumping mechanism; and driving connections between said shafts and mechanisms, the blank-feeding and edge-bending mechanisms being operated directly by the main shaft, and the blank-folding and hook-engaging mechanisms being operated directly by the auxiliary shaft.

6. In a device of the class described, the combination with the main shaft, the auxiliary shaft, and driving connections between said shafts; of a single blank-feeding mechanism to and from the edge-bending mechanism and blank-folding mechanism, edge-bending mechanism, blank-folding mechanism, and seam-bumping mechanism; and driving connections between said shafts and mechanisms, the blank-feeding and edge-bending mechanisms being operated directly by the main shaft, and the blank-folding and seam-bumping mechanisms being operated directly by the auxiliary shaft.

7. In a device of the class described, the combination with the main shaft, the auxiliary shaft, and driving connections between said shafts; of the blank-feeding mechanism, edge-bending mechanism, blank-folding mechanism, positively-actuated hook-engaging mechanism, and seam-bumping mechanism; and driving connections between said shafts and mechanisms, the blank-feeding and edge-bending mechanisms being operated directly by the main shaft, and the blank-folding, hook-engaging and seam-bumping mechanisms being operated directly by the auxiliary shaft.

8. In a device of the class described, the combination with the main shaft, the auxiliary shaft, and driving connections between said shafts; of the blank-feeding mechanism, the edge-bending mechanism, the blank-folding mechanism, the hook-engaging mechanism, the seam-bumping mechanism, and the body-feeding mechanism; and driving connections between said shafts and mechanisms, the blank-feeding, edge-bending, and body-feeding mechanisms all being operated directly by the main shaft, and the blank-folding and hook-engaging mechanisms being operated directly by the auxiliary shaft.

9. In a device of the class described, the combination with the main shaft, the auxiliary shaft, and driving connections between said shafts; of the blank-feeding mechanism, the edge-bending mechanism, the blank-folding mechanism, the hook-engaging mechanism, the seam-bumping mechanism, and the stop-gage mechanism; and driving connections between said shafts and mechanisms, the blank-feeding, edge-bending, and stop-gage mechanisms all being operated directly by the main shaft, and the blank-folding and hook-engaging mechanisms being operated directly by the auxiliary shaft.

10. In a device of the class described, the combination with the main shaft, the auxiliary shaft, and driving connections between said shafts; of the blank-feeding mechanism, the edge-bending mechanism, the blank-folding mechanism, the hook-engaging mechanism, the seam-bumping mechanism, and the body-feeding mechanism; and driving connections between said shafts and mechanisms, the blank-feeding, edge-bending and body-feeding mechanisms all being operated directly by the main shaft, and the blank-folding and seam-bumping mechanisms being operated directly by the auxiliary shaft.

11. In a device of the class described, the combination with the main shaft, the auxiliary shaft, and driving connections between said shafts; of the blank-feeding mechanism,

the edge-bending mechanism, the blank-folding mechanism, the hook-engaging mechanism, the seam-bumping mechanism, and the stop-gage mechanism; and driving connections between said shafts and mechanisms, the blank-feeding, edge-bending and stop-gage mechanisms all being operated directly by the main shaft, and the blank-folding and seam-bumping mechanisms being operated directly by the auxiliary shaft.

12. In a device of the class described, the combination with the main shaft, the auxiliary shaft, and driving connections between said shafts; of the blank-feeding mechanism, the edge-bending mechanism, the blank-folding mechanism, the hook-engaging mechanism, the seam-bumping mechanism and the body-feeding mechanism; and driving connections between said shafts and mechanisms, the blank-feeding, edge-bending and body-feeding mechanisms all being operated directly by the main shaft, and the hook-engaging and seam-bumping mechanisms being operated directly by the auxiliary shaft.

13. In a device of the class described, the combination with the main shaft, the auxiliary shaft, and driving connections between said shafts; of the blank-feeding mechanism, the edge-bending mechanism, the blank-folding mechanism, the hook-engaging mechanism, the seam-bumping mechanism and the stop-gage mechanism; and driving connections between said shafts and mechanisms, the blank-feeding, edge-bending and stop-gage mechanisms all being operated directly by the main shaft, and the hook-engaging and seam-bumping mechanisms being operated directly by the auxiliary shaft.

14. In a device of the class described, the combination with the horn, bumper, and folding-wings coöperating therewith; of the operating-shafts extending transversely thereof directly above and below the horn, blank-feeding mechanism, the blank-clamping and edge-bending mechanisms in advance of the horn, operating-levers for the blank-clamping and edge-bending mechanisms pivoted in advance of said shafts and having their ends coöperating with cams thereon, and links pivoted to the centers of said levers and connected to the blank-clamping and edge-bending mechanisms.

15. In a device of the class described, the combination with the horn, bumper and folding-wings coöperating therewith, of the operating-shafts extending transversely thereof directly above and below the horn, blank-feeding mechanism, the blank-clamping, edge-bending and stop-gage mechanisms located in advance of the horn, operating-levers for the blank-clamping, edge-bending and stop-gage mechanisms pivoted in advance of said shafts and having their ends coöperating with cams thereon, and links connected to the centers of said levers and connected to the blank-clamping, edge-bending and stop-gage mechanisms.

16. In a device of the class described, the combination with the horn, blank-clamp, bumper, and folding-wings all coöperating with said horn, of the operating-shafts extending transversely thereof directly above and below the horn, blank-feeding mechanism, the coöperating blank-clamping and edge-bending mechanisms in advance of the horn, operating-levers for the blank-clamping and edge-bending mechanisms pivoted in advance of said shafts and having their ends coöperating with cams thereon, and links pivoted to the centers of said levers and connected to the blank-clamping and edge-bending mechanisms.

17. In a device of the class described, the combination with the horn, and the folding-wings, hook-engaging mechanism and bumper all coöperating with said horn, of the operating-shafts extending transversely thereof directly above and below the horn, blank-feeding mechanism, the blank-clamping and edge-bending mechanisms in advance of the horn, operating-levers for the blank-clamping and edge-bending mechanisms pivoted in advance of said shafts and having their ends coöperating with cams thereon, and links pivoted to the centers of said levers and connected to the blank-clamping and edge-bending mechanisms.

18. In a device of the class described, the combination with the horn, and the blank-clamp, folding-wings, hook-engaging mechanism and bumper all coöperating with said horn, of the operating-shafts extending transversely thereof directly above and below the horn, blank-feeding mechanism, the blank-clamping and edge-bending mechanisms in advance of the horn, operating-levers for the blank-clamping and edge-bending mechanisms pivoted in advance of said shafts and having their ends coöperating with cams thereon, and links pivoted to the centers of said levers and connected to the blank-clamping and edge-bending mechanisms.

19. In a device of the class described, the combination with the horn, and the bumper and folding-wings coöperating with said horn, of the operating-shafts extending transversely thereof directly above and below the horn, blank-feeding mechanism, the blank-clamping and edge-bending mechanisms in advance of the horn and consisting of the stationary clamping-jaws, movable clamping-jaws mounted on transversely-swinging levers, edge-bending jaws mounted on longitudinally-movable and transversely-swinging levers, operating-levers for the blank-clamping and edge-bending mechanisms pivoted in advance of said shafts and having their ends coöperating with cams thereon, links connected with

the operating-levers for swinging the blank-clamping and edge-bending levers, and offset-levers for moving the edge-bending jaw-levers longitudinally.

20. In a device of the class described, the combination with the upper and lower parallel horizontal shafts, and means for driving them in synchronism; of the edge-bending mechanism, the blank-feeding mechanism, the blank-folding wings, the expanding-horn and the bumper; mechanism operated by the lower shaft for actuating the edge-bending and sheet-feeding mechanisms; and mechanism on the upper shaft for operating the folding-wings, the expanding-horn and the bumper.

21. In a device of the class described, the combination with the upper and lower parallel horizontal shafts, and means for driving them in synchronism, of the edge-bending mechanism, the blank-feeding mechanism, the reciprocating stop-gage, the blank-folding wings, the expanding-horn, and the bumper; mechanism operated by the lower shaft for actuating the edge-bending and sheet-feeding mechanisms and the reciprocating stop-gage; and mechanism on the upper shaft for operating the folding-wings, the expanding-horn and the bumper.

22. In a device of the class described, the combination with the upper and lower parallel horizontal shafts, and means for driving them in synchronism; of the edge-bending mechanism, the blank-feeding mechanism, the blank-folding mechanism, and the bumper; mechanism operated by the lower shaft for actuating the edge-bending and sheet-feeding mechanisms; and mechanism on the upper shaft for operating the blank-folding mechanism and the bumper.

23. In a device of the class described, the combination with the upper and lower parallel horizontal shafts, and means for driving them in synchronism; of the edge-bending mechanism, the blank-feeding mechanism, the blank-folding mechanism, the horn, the bumping mechanism, and the reciprocating stop-gage; mechanism operated by the lower shaft for actuating the edge-bending and sheet-feeding mechanisms and the reciprocating stop-gage; and mechanism on the upper shaft for operating the blank-folding mechanism and the bumper.

24. In a device of the class described, the combination with the upper and lower parallel horizontal shafts, and means for driving them in synchronism; the blank-feeding mechanism, the blank-folding mechanism, the horn, the bumper, and edge-bending mechanism comprising the clamping-jaws, the edge-bending jaws having the vertical and horizontal movements; cams on the lower shaft and connections therefrom for operating the sheet-feeding mechanism and actuating the clamping-jaws and giving the edge-bending jaws their vertical and horizontal movements in sequence; and mechanism on the upper shaft for operating the blank-folding mechanism and the bumper.

25. In a device of the class described, the combination with the forming-horn, of the blank-folding mechanism and the bumper co-operating therewith, the horizontal shafts above and below said horn, the blank-feeding mechanism, the edge-bending mechanism arranged to operate on the blank in advance of the one operated on by the horn, and the operating-levers for said bending mechanism fulcrumed in advance of the bending mechanism and coöperating with cams on one of said shafts.

26. In a device of the class described, the combination with the forming-horn, of the blank-folding mechanism and the bumper co-operating therewith, the horizontal shafts above and below said horn, the blank-feeding mechanism, the edge-bending mechanism arranged to operate on the blank in advance of the one operated on by the horn, and the operating-levers for said bending mechanism fulcrumed in advance of the bending mechanism and coöperating with cams mounted on sleeves longitudinally adjustable on said lower shaft.

27. In a device of the class described, the combination with the framework having the fixed bearings at one end and parallel rods projecting from the other end, of the bearings mounted on said rods having the vertical standards thereon extending above the top of the wheel, the chain-wheels mounted in said bearings, the blank-carrying chain on said wheels, and the blank-holding plates connecting said standards.

28. In a device of the class described, the combination with the frame, of the two chain-wheels mounted to rotate therein, the blank-carrying chain connecting the wheels, the driving-shaft mounted in the frame between the wheels and inside of the chain, and driving connections between said shaft and one of the wheels for imparting an intermittent forward movement to the wheels and thereby to the chain, said connections consisting of a ratchet on one of the wheels, a swinging arm carrying a pawl engaging said ratchet, a face-cam on the shaft, and a swinging slotted link connected to said arm and embracing the shaft and provided with an antifriction-roller engaging the groove of the cam.

29. In a device of the class described, the combination with the horn and the blank-folding mechanism coöperating therewith occupying a relatively fixed position, of the pair of edge-bending mechanisms, blank-feeding mechanism, and means for adjusting the pair of edge-bending mechanism simultaneously without destroying their relative adjustments transversely of the horn to provide for the

accurate delivery of the blank therefrom to the horn.

30. In a device of the class described, the combination with the horn and the blank-folding mechanism coöperating therewith occupying a relatively fixed position, of the edge-bending mechanism consisting of the right and left halves simultaneously adjustable to and from each other for different-sized blanks, blank-feeding mechanism, and means for adjusting the edge-bending mechanism as a whole without destroying the relative adjustment of its halves transversely of the horn to provide for the accurate delivery of the blank therefrom to the horn.

31. In a device of the class described, the combination with the horn and the blank-folding mechanism coöperating therewith occupying a relatively fixed position, of the edge-bending mechanism consisting of the right and left halves movable to and from each other in ways, blank-feeding mechanism, and means for adjusting the halves of the edge-bending mechanism to and from each other for different-sized blanks and for adjusting them simultaneously transversely of the horn to provide for the accurate delivery of the blank therefrom to the horn consisting of a screw-shaft having oppositely-directed threads engaging the two halves of the edge-bending mechanism to move them simultaneously in opposite directions, a collar mounted in the framework in which the screw-shaft rotates and by which it is held from longitudinal movement, and means for adjusting the collar to adjust the bending mechanism as a whole relative to the horn.

32. In a device of the class described, the combination with the horn and the blank-folding mechanism coöperating therewith occupying a relatively fixed position, of the edge-bending mechanism consisting of the right and left halves movable to and from each other in ways, blank-feeding mechanism, and means for adjusting the halves of the edge-bending mechanism to and from each other for different-sized blanks and for adjusting them simultaneously transversely of the horn to provide for the accurate delivery of the blank therefrom to the horn consisting of a screw-shaft having oppositely-directed threads engaging the two halves of the edge-bending mechanism to move them simultaneously in opposite directions, an exteriorly-screw-threaded collar screwed into the framework in which the screw-shaft rotates and by which it is held from longitudinal movement, and means for securing the collar in any position in the frame to which it may be screwed.

33. In a device of the class described, the combination with the stationary clamping-jaws located toward the center of the machine and the vertical standards located toward the sides thereof, of the movable clamping-jaw-supporting levers pivoted in said standards, the bending-jaw-supporting levers having their outer ends mounted to slide and turn in said standards, and operating mechanism for swinging the movable clamping-jaw-supporting levers, and for first swinging and subsequently moving longitudinally the bending-jaw-supporting levers.

34. In a device of the class described, the combination with the stationary clamping-jaws located toward the center of the machine and the vertical standards located toward the sides thereof having the horizontal channels on their inner sides, of the movable clamping-jaw-supporting levers pivoted in said standards, the bending-jaw-supporting levers having antifriction-rollers on their outer ends adapted to roll in said channels, and operating mechanism for swinging the movable clamping-jaw-supporting levers and for first swinging and subsequently moving longitudinally the bending-jaw-supporting levers.

35. In a device of the class described, the combination with the stationary clamping-jaws, of the movable clamping-jaw-supporting levers, the movable clamping-jaws vertically adjustable on the ends of said levers, the bending-jaws coöperating with said clamping-jaws, and means for operating said movable clamping-jaw-supporting levers and bending-jaws at the proper intervals.

36. In a device of the class described, the combination with the stationary clamping-jaws, of the movable clamping-jaw-supporting levers having lugs on their inner ends, the movable clamping-jaws vertically adjustable on the ends of said levers by means of set-screws passing through slots therein and into the levers, set-screws passing through said lugs on the ends of the levers at right angles to the first-mentioned set-screws and contacting with the upper ends of the jaws, the bending-jaws coöperating with said clamping-jaws, and means for operating said movable clamping-jaw-supporting levers and bending-jaws at the proper intervals.

37. In a device of the class described, the combination with the stationary clamping-jaws, the movable clamping-jaws, the vertically-movable edge-bending jaws, and the plate by which they are supported, of the driving-shaft located beneath said plate; and the operating connections between said shaft and the movable jaws including the links 107 connected to the edge-bending jaws and the eccentric connections between said links and jaws for adjusting the vertical position of the jaws.

38. In a device of the class described, the combination with the stationary clamping-jaws, the movable clamping-jaws, the vertically-movable edge-bending jaws, and the plate by which they are supported, of the driving-shaft located beneath said plate; and the operating connections between said shaft and the movable jaws including the links 107

connected to the edge-bending jaws and the eccentric connections between said links and jaws for adjusting the vertical position of the jaws consisting of the pin having the concentric bearing portions for ears on the jaws and the eccentric bearing portion for the end of the link, and means for locking the pin in any desired position of adjustment.

39. In a device of the class described, the combination with the stationary clamping-jaws, the movable clamping-jaws, the vertically-movable edge-bending jaws, and the plate by which they are supported, of the driving-shaft located beneath said plate; and operating connections between said shaft and the movable jaws including the links 107 connected to the edge-bending jaws and the eccentric connections between said links and jaws for adjusting the vertical position of the jaws consisting of the pin having the concentric bearing portions for ears on the jaws and the eccentric bearing portion for the end of the link, and means for locking the pin in any desired position of adjustment consisting of the perforated disk on the pin and a removable pin coöperating with the perforations in said disk and with another perforation in one of the ears on the jaw.

40. In a device of the class described, the combination with the horn, of the radially-moving blank-clamp-supporting bar, and the blank-clamp coöperating therewith and pivotally mounted upon said supporting-bar.

41. In a device of the class described, the combination with the horn, of the vertical bearing located radially thereof, the sleeve sliding in said bearing, the blank-clamp-supporting bar sliding in said sleeve, the helically-coiled expanding-spring interposed between said sleeve and bar, a stop to limit the movement of the bar relative to the sleeve under stress of the spring, the clamping-jaw carried by said bar, and means for moving the sleeve to firmly clamp the blank between the jaw and the horn.

42. In a device of the class described, the combination with the horn, of the vertical bearing located radially thereof, the cylindrical sleeve sliding in said bearing, the blank-clamp-supporting rod sliding in said sleeve, said sleeve and rod having the elongated registering slots of the same width therein, the helically-coiled expanding-spring interposed between said sleeve and rod, a stop to limit the movement of the rod relative to the sleeve under stress of the spring, the clamping-jaw carried by said rod, an elongated spline-strip secured in said bearing and fitting snugly in the slots in the sleeve and rod to permit longitudinal but to prevent angular movement thereof, and means for moving the sleeve to firmly clamp a blank between the jaw and the horn.

43. In a device of the class described, the combination with the horn, of the vertical bearing located radially thereof, the sleeve sliding in said bearing, the blank-clamp-supporting bar sliding in said sleeve, the helically-coiled expanding-spring interposed between said sleeve and bar, the clamping-jaw carried by said bar, means for moving the sleeve to firmly clamp a blank between the jaw and the horn, and the adjustable stop to limit the movement of the bar relative to the sleeve under stress of the spring and to regulate the resistance offered by the clamping-jaw to the passage of the blank between it and the horn.

44. In a device of the class described, the combination with the horn, of the vertical bearing located radially thereof, the sleeve sliding in said bearing, the blank-clamp-supporting bar sliding in said sleeve, the helically-coiled expanding-spring interposed between said sleeve and bar, a stop to limit the movement of the bar relative to the sleeve under stress of the spring, the clamping-jaw carried by said bar, means for moving the sleeve to firmly clamp the blank between the jaw and the horn, bearing-pins secured in said vertical bearing at right angles thereto, folding-wings pivoted on the pins, and means for operating said wings in sequence after the operation of the clamping-jaw to fold the blank about the horn.

45. In a device of the class described, the combination with the horn, of the vertical bearing located radially thereof, the sleeve sliding in said bearing, the blank-clamp-supporting bar sliding in said sleeve having the reduced lower end passing through a correspondingly-sized aperture in the bottom of the sleeve, the helically-coiled expanding-spring interposed between the bottom of said sleeve and the shoulder formed by the reduced portion of the bar, set-nuts on the screw-threaded lower end of the bar outside of the bottom of the sleeve, the clamping-jaw carried by said bar, and means for moving the sleeve to firmly clamp a blank between the jaw and the horn.

46. In a device of the class described, the combination with the horn, of the vertical bearing located radially thereof, the sleeve sliding in said bearing, the blank-clamp-supporting bar sliding in said sleeve having the reduced lower end passing through a correspondingly-sized aperture in the bottom of the sleeve, the helically-coiled expanding-spring interposed between the bottom of said sleeve and the shoulder formed by the reduced portion of the bar, set-nuts on the screw-threaded lower end of the bar outside of the bottom of the sleeve, the clamping-jaw carried by said bar, a yoke on the bottom of the sleeve, an antifriction-roller carried thereby, an operating-shaft, and a cam thereon for engaging the roller to firmly clamp the blank between the jaw and the horn.

47. In a device of the class described, the

combination with the horn, of the folding-wings pivoted adjacent thereto and adapted to fold a blank about it, and actuating mechanism therefor including the levers pivoted to said wings at one end, pivoted fulcrums to which the other ends of said levers are pivoted, and means for swinging said levers.

48. In a device of the class described, the combination with the horn, of the folding-wings pivoted adjacent thereto and adapted to fold a blank about it, and actuating mechanism therefor including the levers pivoted to said wings at one end, movable fulcrums to which the other ends of said levers are pivoted, and means for swinging said levers consisting of the links pivoted thereto intermediate the ends thereof, an operating-shaft, and cams thereon coöperating with the links.

49. In a device of the class described, the combination with the horn, of the folding-wings pivoted adjacent thereto and adapted to fold a blank about it, and actuating mechanism therefor including the levers pivoted to said wings at one end, movable fulcrums to which the other ends of said levers are pivoted, and means for swinging said levers consisting of the operating-shaft, face-cams on said shaft, the links slotted at one end and embracing said driving-shaft and pivoted to the levers at the other end, and antifriction-rollers on the outer ends of said links engaging the grooves in the cams.

50. In a device of the class described, the combination with the horn, of the folding-wings pivoted adjacent thereto and adapted to fold a blank about it, and actuating mechanism therefor including the levers pivoted to said wings at one end, swinging fulcrum-levers to the outer ends of which said first-mentioned levers are pivoted, and means for swinging said first-mentioned levers.

51. In a device of the class described, the combination with the horn, of the folding-wings pivoted adjacent thereto and adapted to fold a blank about it, and actuating mechanism therefor including the levers pivoted to said wings at one end, swinging fulcrum-levers to the outer ends of which said first-mentioned levers are pivoted, and means for swinging said first-mentioned levers consisting of the links pivoted thereto and provided with the turnbuckle adjustments, an operating-shaft, and cams thereon engaging the said links.

52. In a device of the class described, the combination with the horn having an expansible portion, of the folding-wings pivoted adjacent thereto and adapted to fold a blank about it, means for expanding the horn while the wings are folded about it, and actuating mechanism for said wings including the levers pivoted thereto at one end, yielding fulcrums to which the other ends of said levers are secured, and means for swinging said levers.

53. In a device of the class described, the combination with the horn having an expansible portion, of the folding-wings pivoted adjacent thereto and adapted to fold a blank about it, actuating mechanism therefor including the levers pivoted to said wings at one end, movable fulcrums to which the other ends of said levers are secured, means for swinging said levers one slightly in advance of the other to properly overlap the hooked ends of the blank, and means for expanding the horn while the wings are folded about it to engage the hooked edges of the blank.

54. In a device of the class described, the combination with the horn having an expansible portion, of the folding-wings pivoted adjacent thereto and adapted to fold a blank about it, actuating mechanism therefor including the levers pivoted to said wings at one end, movable fulcrums to which the other ends of said levers are secured, means for swinging said levers one slightly in advance of the other to properly overlap the hooked ends of the blank, means for expanding the horn while the wings are folded about it to engage the hooked edges of the blank, a bumper, and means to operate the same to hold down the uppermost hook of the blank as it is being engaged by the lower one and immediately thereafter to press the same.

55. In a device of the class described, the combination with the stationary portion of the horn, of a movable portion connected thereto and movable transversely thereof to increase the area of the horn in cross-section, the blank-folding wings coöperating therewith, and connections between said sections to move the one positively in both directions to expand and contract the horn consisting of the sliding bar having diagonal slots therein connected with one member, and projections connected with the other member coöperating with said slots.

56. In a device of the class described, the combination with the stationary portion of the horn, of a movable portion pivoted thereto longitudinally of the axis of the horn and swinging about said axis to increase the area of the horn in cross-section, the blank-folding wings movable therewith, a way formed in the stationary portion of the horn, and connections between said sections to move the one positively in both directions to expand and contract the horn consisting of the sliding bar having diagonal slots therein mounted in the way in the stationary member, and pins projecting downward from the overhanging portion of the other member and coöperating with said slots.

57. In a device of the class described, the combination with the stationary portion of the horn, of a movable portion connected thereto and movable transversely thereof to increase the area of the horn in cross-section, the blank-folding wings coöperating therewith,

connections between said sections to move the one positively in both directions to expand and contract the horn, and means for adjusting the amount of movement given to the movable portion.

58. In a device of the class described, the combination with the stationary portion of the horn, of a movable portion connected thereto and movable transversely thereof to increase the area of the horn in cross-section, the blank-folding wings coöperating therewith, and connections between said sections to move the one positively in both directions to expand and contract the horn consisting of the sliding bar having the slots therein each having a longitudinal and a diagonal portion sliding in one member, projections connected with the other member coöperating with said slots, means for moving said bar a uniform distance at each cycle of movements, and means for adjusting the normal position of the slide to determine what position in the diagonal portion of the slot the pin shall occupy at the end of the movement.

59. In a device of the class described, the combination with the stationary portion of the horn, of a movable portion connected thereto and movable transversely thereof to increase the area of the horn in cross-section, the blank-folding wings coöperating therewith, and connections between said sections to move the one positively in both directions to expand and contract the horn consisting of the bar sliding in a way in the stationary portion of the horn and having the slots having the longitudinal and diagonal portions, pins projecting downward from the overhanging portion of the movable member into said slots, a lever given a uniform stroke at each movement and terminating in a yoke, pins in said yoke, and an adjustable collar on the end of said slide engaged by said pins.

60. In a device of the class described, the combination with the edge-bending mechanism, of a blank-feeding mechanism adapted to deliver blanks thereto, vertically-movable stop-gage fingers in the line of movement of the blanks, and means for projecting said fingers into the plane of the blanks during the movement of the feeding mechanism after the passing of one blank and before the arrival of the next, and for retracting them between the feed movements.

61. In a device of the class described, the combination with the edge-bending mechanism, of a blank-feeding mechanism adapted to deliver blanks thereto, vertically-movable stop-gage fingers in the line of movement of the blanks, and means for projecting said fingers into the plane of the blanks during the movement of the feeding mechanism after the passing of one blank and before the arrival of the next, and for retracting them between the feed movements consisting of a vertically-sliding bar carrying the fingers, a cam for operating said bar, and a spring to retract it.

62. In a device of the class described, the combination with the edge-bending mechanism, of a blank-feeding mechanism adapted to deliver blanks thereto, vertically-movable stop-gage fingers in the line of movement of the blanks, and means for projecting said fingers into the plane of the blanks during the movement of the feeding mechanism after the passing of one blank and before the arrival of the next, and for retracting them between the feed movements consisting of a vertically-sliding bar having the fingers transversely adjustable thereon, a cam for operating said bar, and a spring to retract it.

63. In a device of the class described, the combination with the horn and blank-folding mechanism coöperating therewith, of a blank-feeding mechanism adapted to deliver blanks thereto, vertically-movable stop-gage fingers in the line of movement of the blanks, and means for projecting said fingers into the plane of the blanks during the movement of the feeding mechanism after the passing of one blank and before the arrival of the next, and for retracting them between the feed movements.

64. In a device of the class described, the combination with the edge-bending mechanism, of the horn and blank-folding mechanism coöperating therewith, a blank-feeding mechanism adapted to deliver blanks intermittently first to the edge-bending mechanism and subsequently to the horn and blank-folding mechanism, two pairs of vertically-movable stop-gage fingers in the line of movement of the blanks adjacent to the edge-bending mechanism and the horn respectively, and means for projecting said fingers into the plane of the blanks during the movement of the feeding mechanism after the passing of one pair of blanks and before the arrival of the next and for retracting them between the feed movements.

65. In a device of the class described, the combination with the edge-bending mechanism, of a blank-feeding mechanism adapted to deliver blanks thereto, vertically-movable stop-gage fingers in the line of movement of the blanks, and means for projecting said fingers into the plane of the blanks during the movement of the feeding mechanism after the passing of one blank and before the arrival of the next, and for retracting them between the feed movements consisting of a lever having a set-screw mounted therein transversely of the center, a cam for operating said lever, a vertically-sliding bar carrying the fingers and resting upon the set-screw, and a spring to retract said bar.

66. In a device of the class described, the combination with the edge-bending mechanism, of a blank-feeding mechanism compris-

ing a pair of chains having fingers thereon adapted to deliver blanks to said edge-bending mechanism, angular chain-supporting bars, a vertically-movable T-shaped head, gage-fingers secured thereto extending alongside the outer edge of the chain-supporting bars, and means for projecting said fingers into the plane of the blanks during the movement of the feeding mechanism after the passing of one blank and before the arrival of the next.

67. The combination with the two blank-carrying chain-wheels mounted on horizontal axes, of the blank-carrying chain carried thereby, means for rotating one of said wheels, a pair of can-body-carrying chain-wheels on vertical axes in a plane somewhat above the top of the blank-carrying chain-wheels, the can-body-carrying chain on its wheels, a bevel-pinion on the bottom of one of the can-body-chain-carrying-wheel axes, and a bevel-gear on the axis of the adjacent blank-carrying chain-wheel engaging therewith.

68. In a device of the class described, the combination with the two blank-carrying chain-wheels mounted on horizontal axes, of the blank-carrying chain carried thereby, means for rotating one of said wheels, the pair of can-body-carrying chain-wheels on vertical axes in a plane somewhat above the top of the blank-carrying chain-wheels and extending beyond the blank-carrying chain, the can-body-carrying chain on its wheels, a bevel-pinion on the bottom of the innermost can-body-carrying chain-wheel axis, a bevel-gear on the axis of the adjacent blank-carrying chain-wheel engaging therewith, and means for adjusting the outermost axes of said wheels to take up the slack in the chains.

69. In a device of the class described, the combination with the two blank-carrying chain-wheels mounted on horizontal axes, of the blank-carrying chain carried thereby, means for rotating one of said wheels, the pair of can-body-carrying chain-wheels on vertical axes in a plane somewhat above the top of the blank-carrying chain-wheels and extending beyond the blank-carrying chain, the can-body-carrying chain on its wheels, a bevel-pinion on the bottom of the innermost can-body-carrying chain-wheel axis, a bevel-gear on the axis of the adjacent blank-carrying chain-wheel engaging therewith, and spring-tension mechanism coöperating with the axis of the outermost can-body-carrying chain-wheel.

70. In a device of the class described, the combination with the two blank-carrying chain-wheels mounted on horizontal axes, of the blank-carrying chain carried thereby, means for rotating one of said wheels, the pair of can-body-carrying chain-wheels on vertical axes in a plane somewhat above the top of the blank-carrying chain-wheels and extending beyond the blank-carrying chain, the can-body-carrying chain on its wheels, a bevel-pinion on the bottom of the innermost can-body-carrying chain-wheel axis, a bevel-gear on the axis of the adjacent blank-carrying chain-wheel engaging therewith, and spring-tension mechanism coöperating with the axis of the outermost can-body-carrying chain-wheel consisting of the ways in which the bearings for the wheel-axes slide, and a helically-coiled expanding-spring interposed between an abutment and the bearing.

71. In a device of the class described, the combination with the two blank-carrying chain-wheels mounted on horizontal axes, of the blank-carrying chain carried thereby, means for rotating one of said wheels, the pair of can-body-carrying chain-wheels on vertical axes in a plane somewhat above the top of the blank-carrying chain-wheels and extending beyond the blank-carrying chain, the can-body-carrying chain on its wheels, a bevel-pinion on the bottom of the innermost can-body-carrying chain-wheel axis, a bevel-gear on the axis of the adjacent blank-carrying chain-wheel engaging therewith, and spring-tension mechanism coöperating with the axis of the outermost can-body-carrying chain-wheel consisting of the ways in which the bearings for the wheel-axes slide, a helically-coiled expanding-spring interposed between an abutment and the bearing, and a set-screw for the said abutment and coöperating with said spring to increase its tension.

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

JOHN HOWARD McELROY.

Witnesses:
HAROLD G. BARRETT,
LOUIS B. ERWIN.