

No. 736,673.

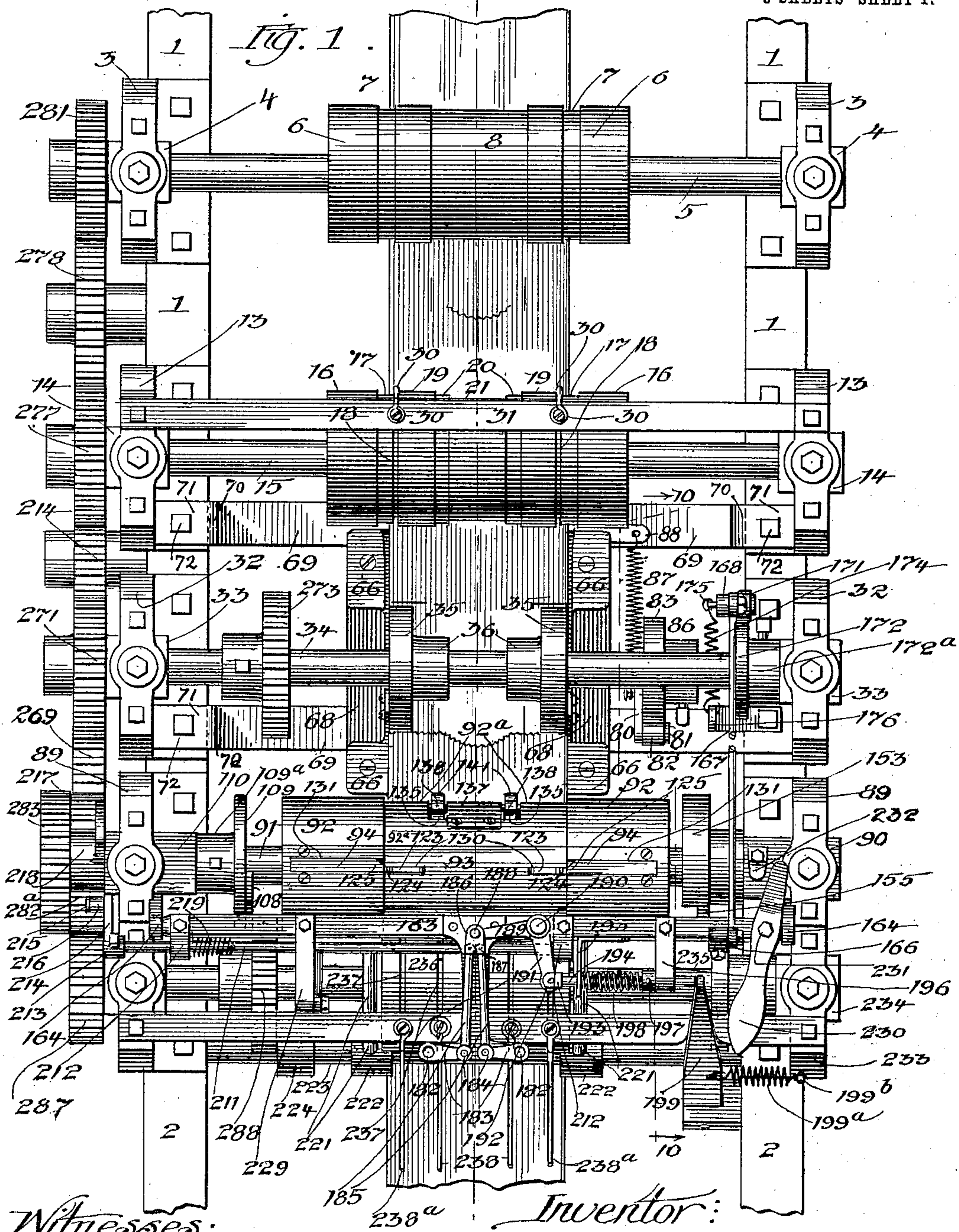
PATENTED AUG. 18, 1903.

P. L. BARTHOLOMEW.
PAPER BAG MACHINE.

APPLICATION FILED FEB. 3, 1903.

NO MODEL.

8 SHEETS—SHEET 1.



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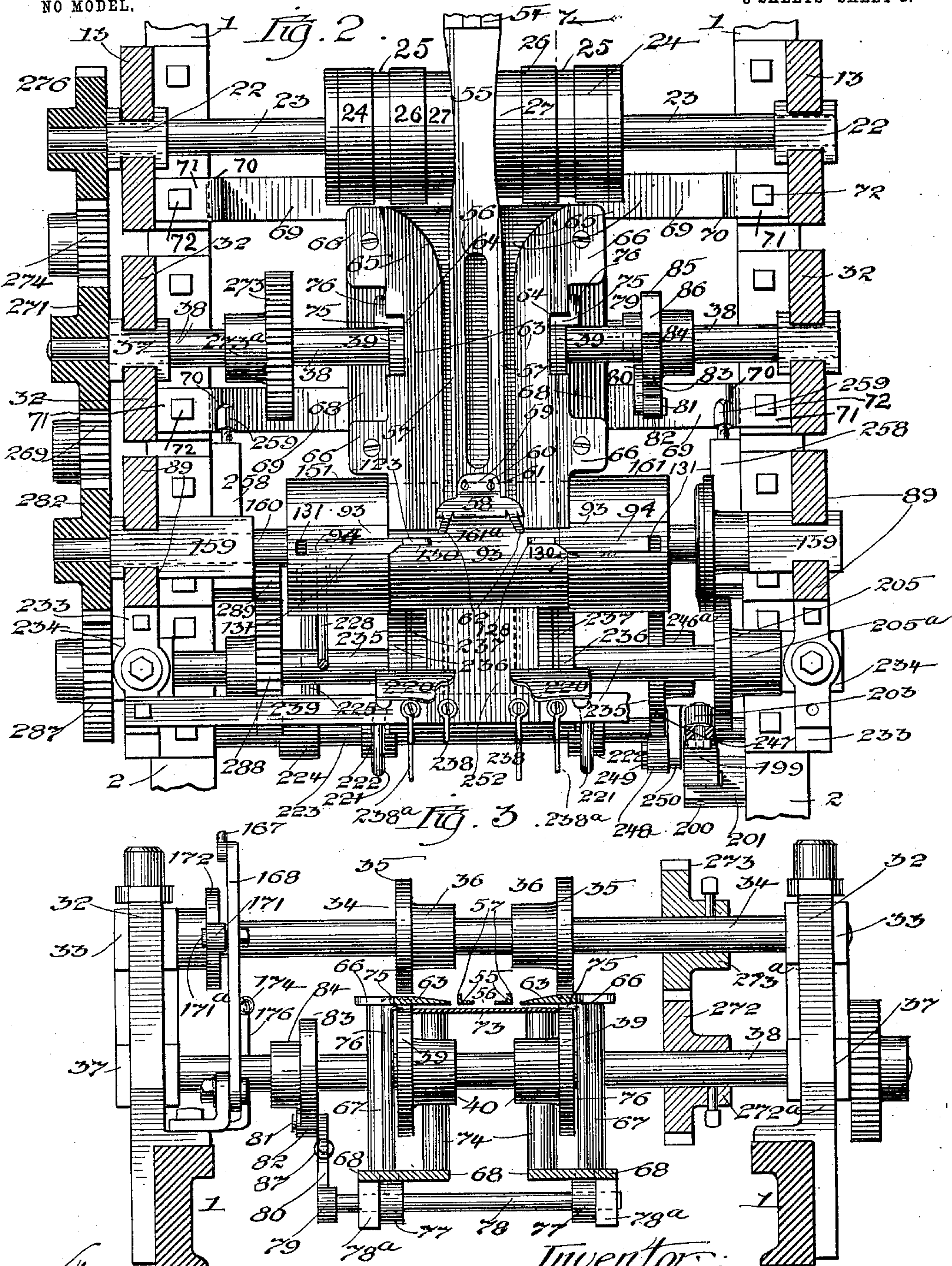
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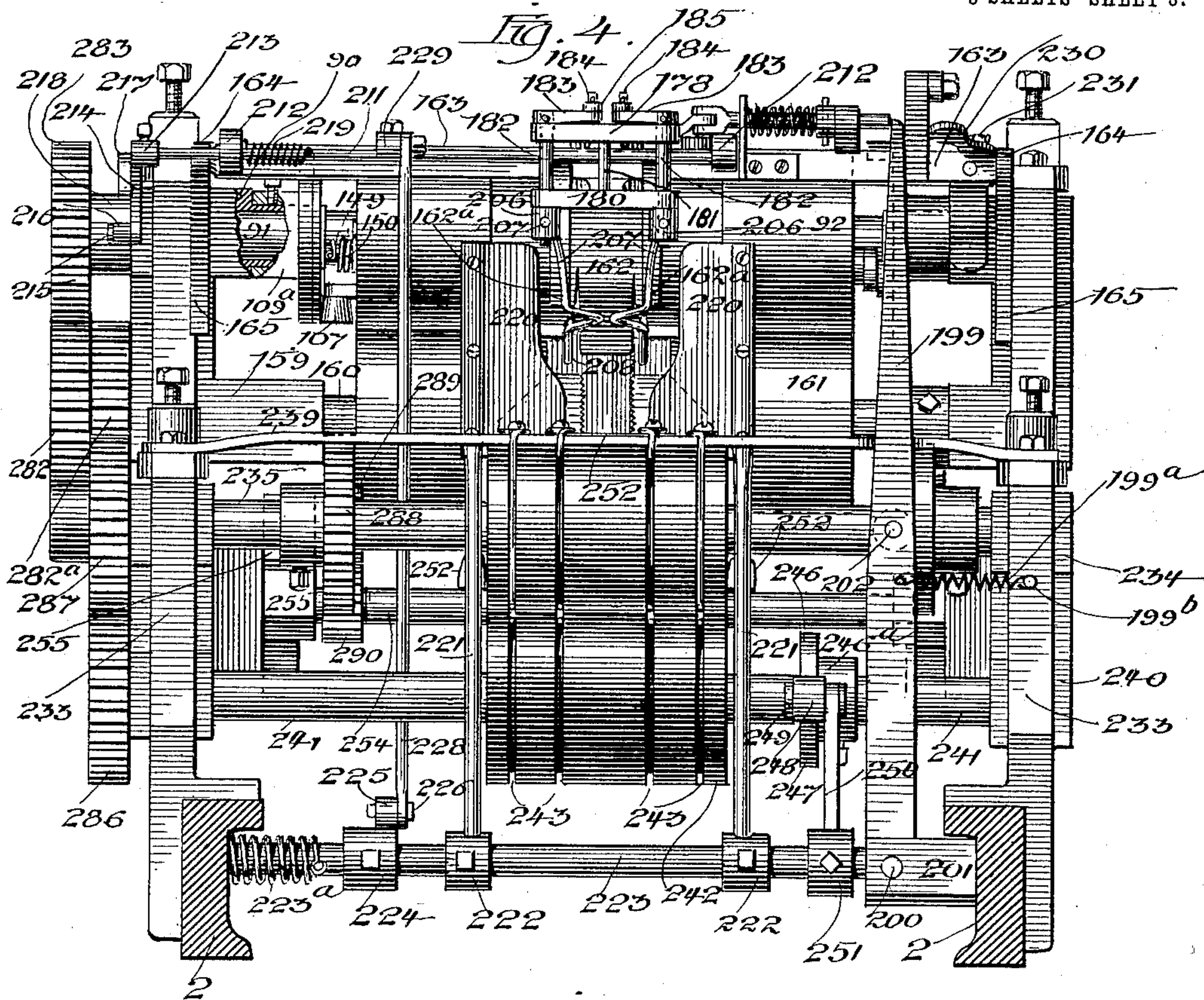
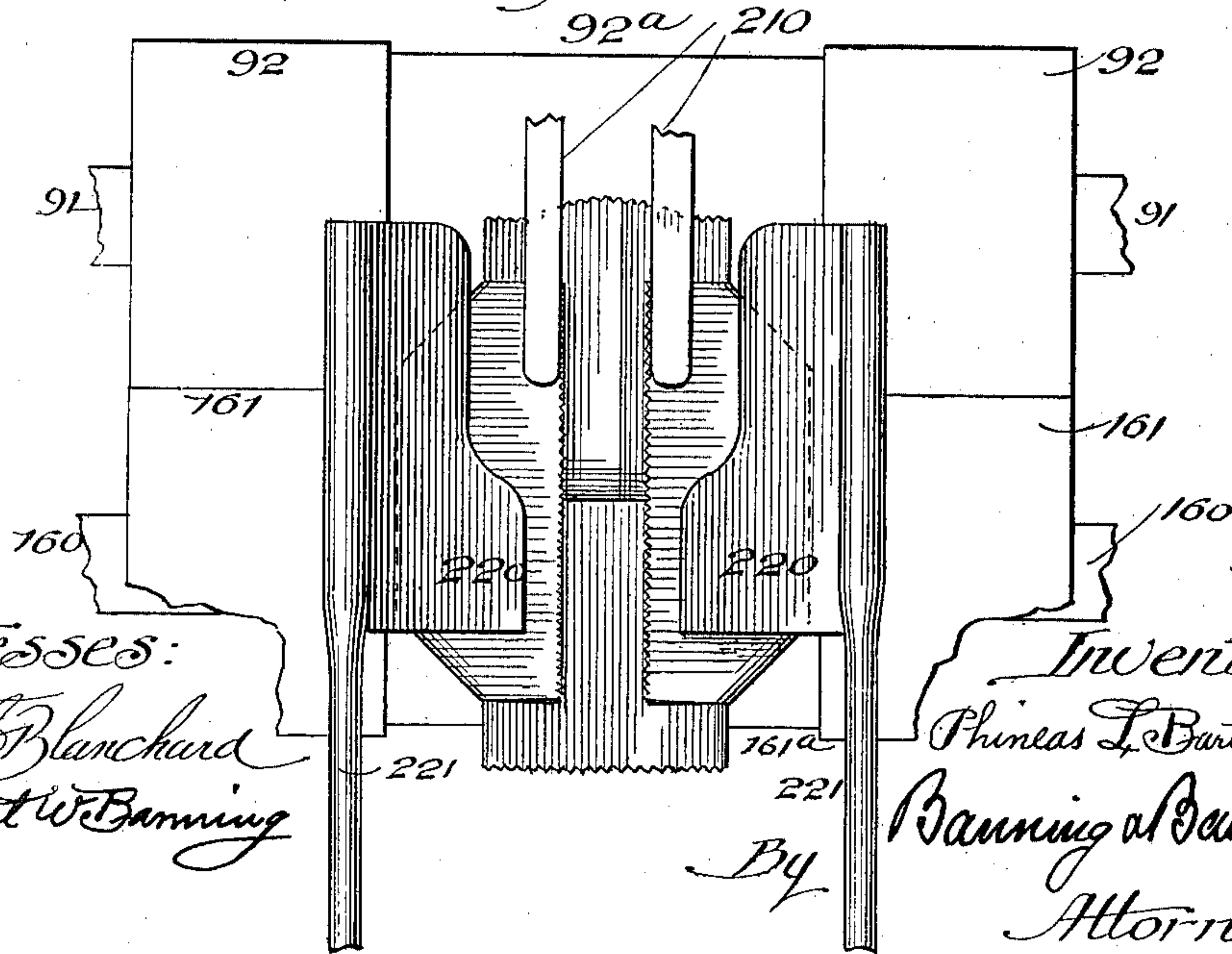


Fig. 5.



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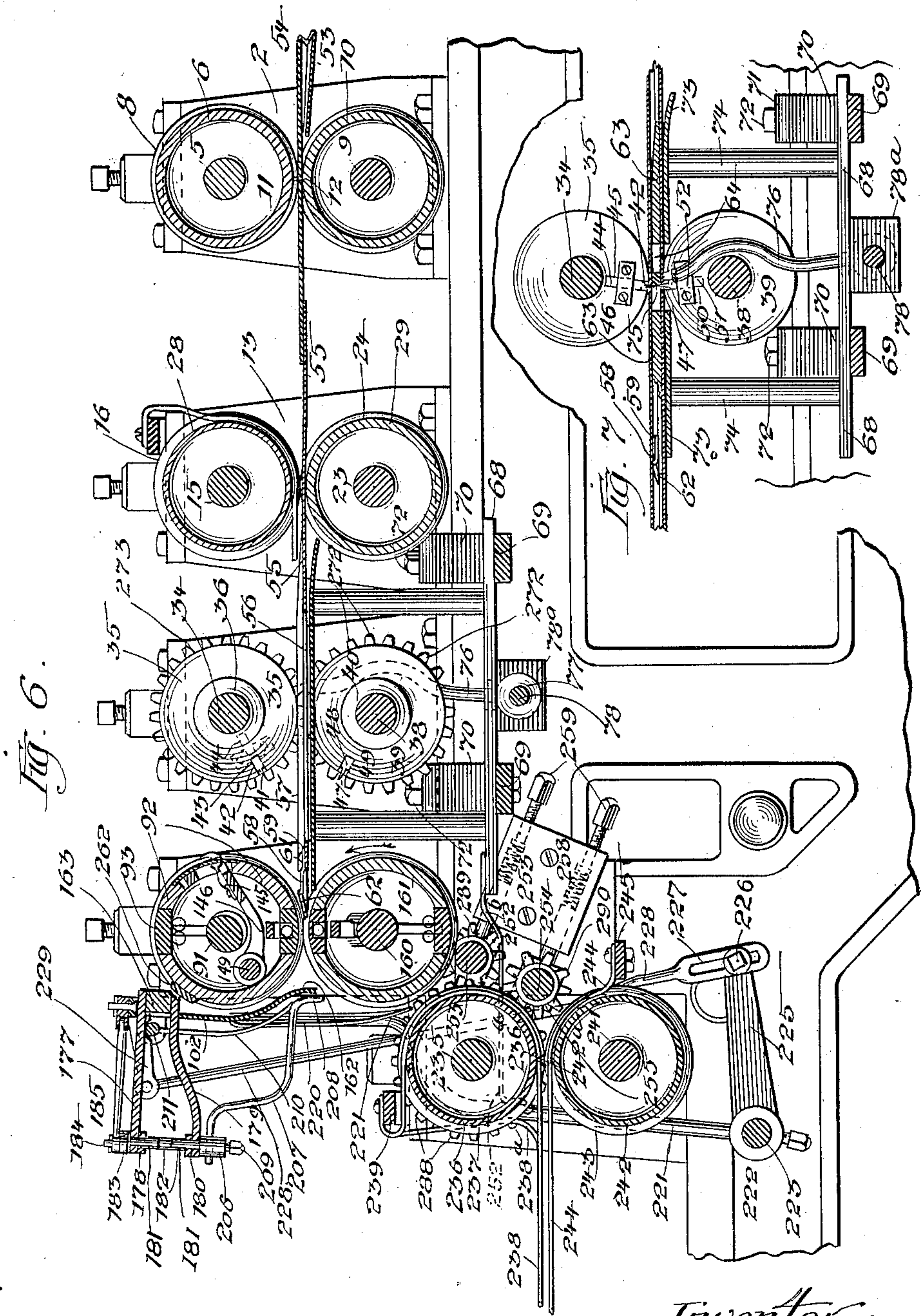
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8 SHEETS—SHEET 4.



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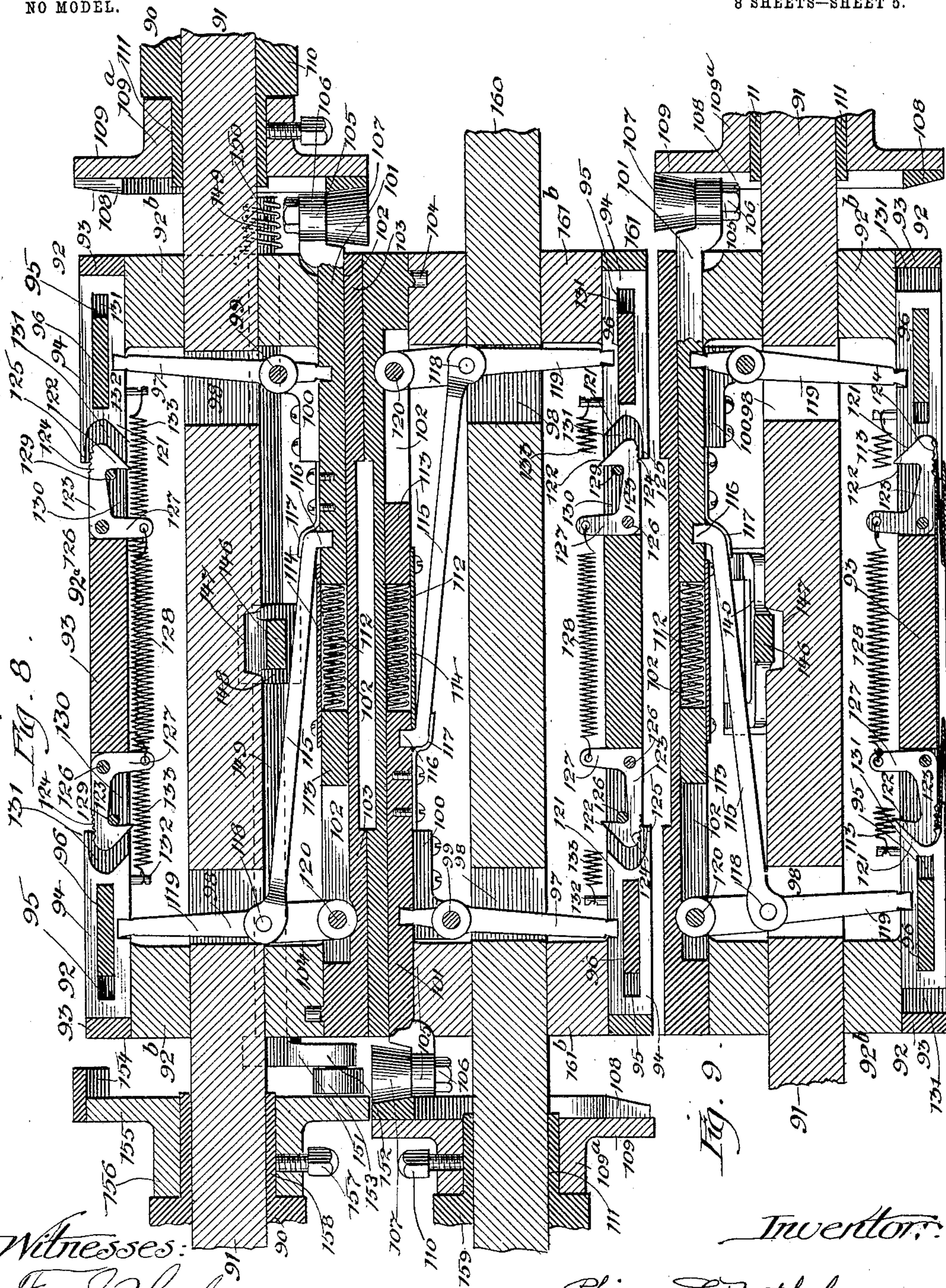
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NO MODEL.

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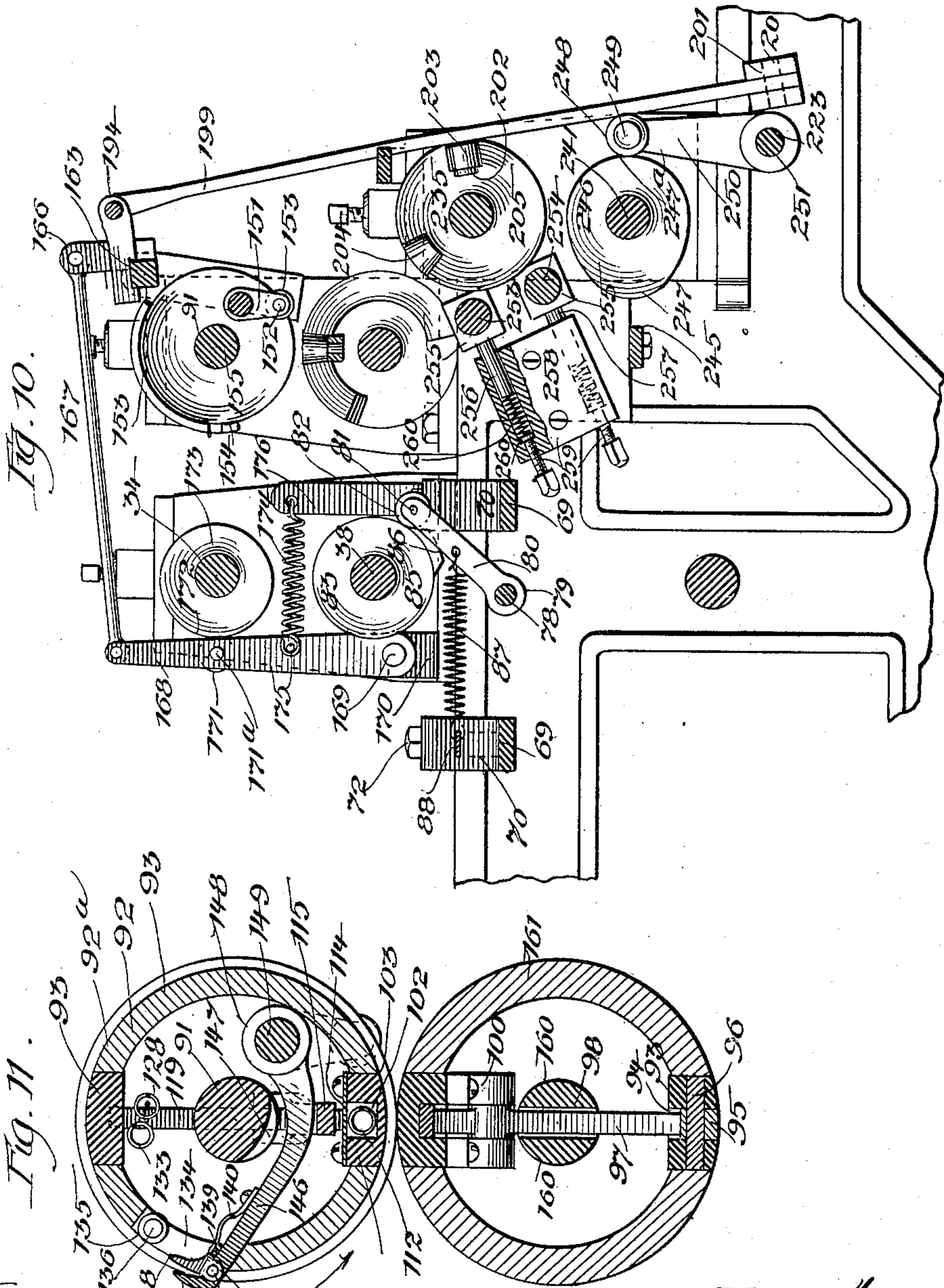
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APPLICATION FILED FEB. 3, 1903.

NO MODEL.

8 SHEETS—SHEET 6.



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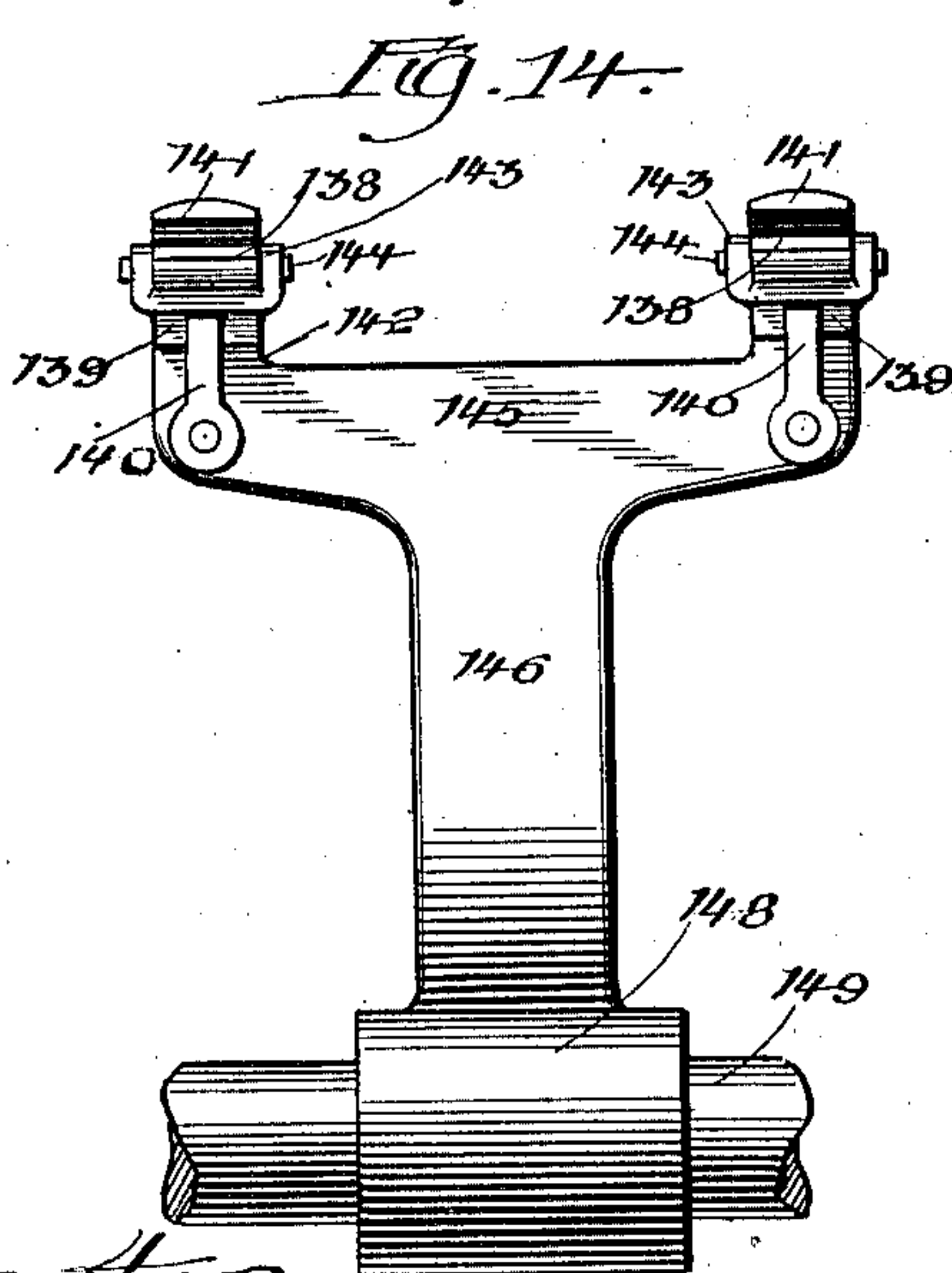
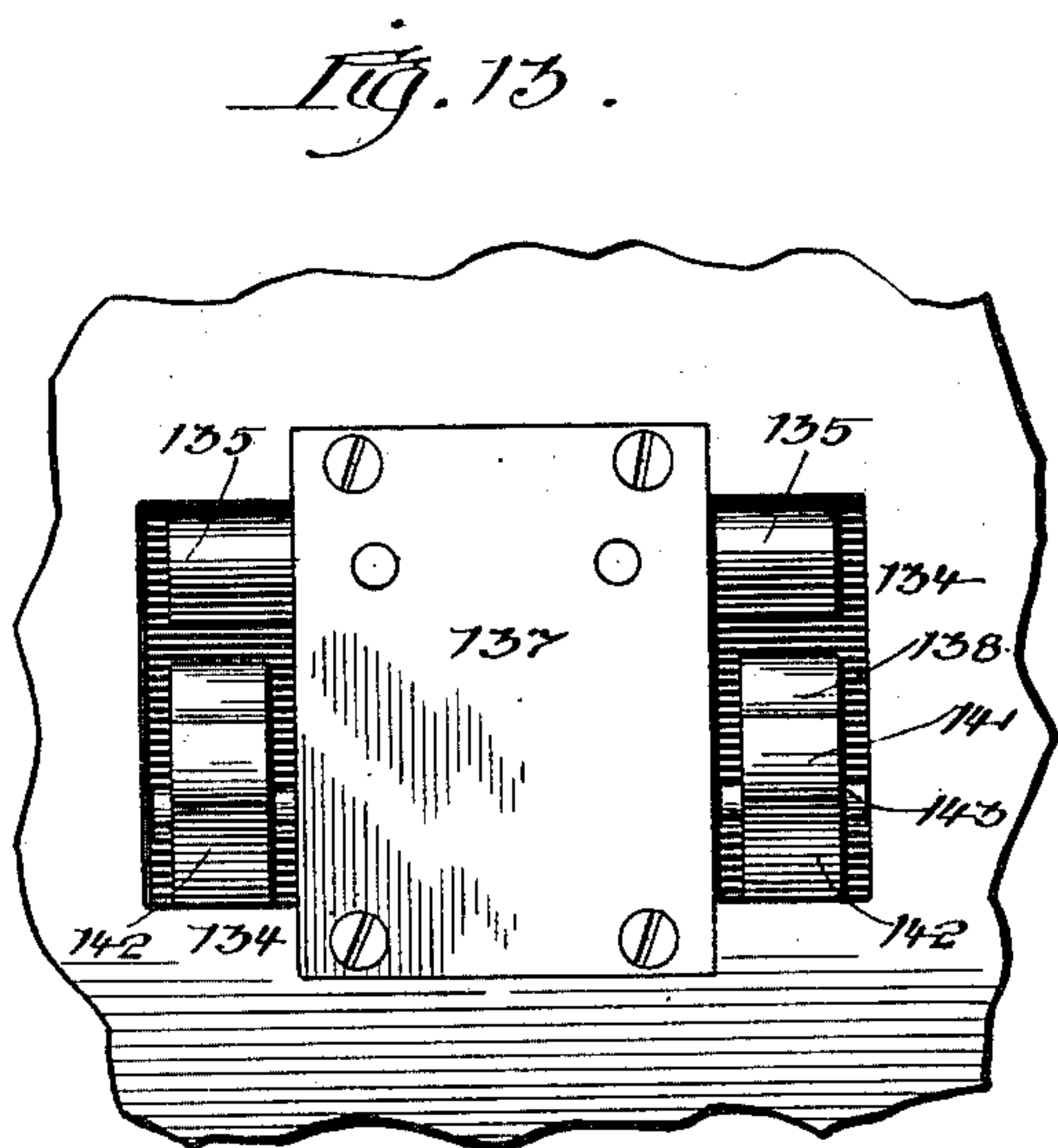
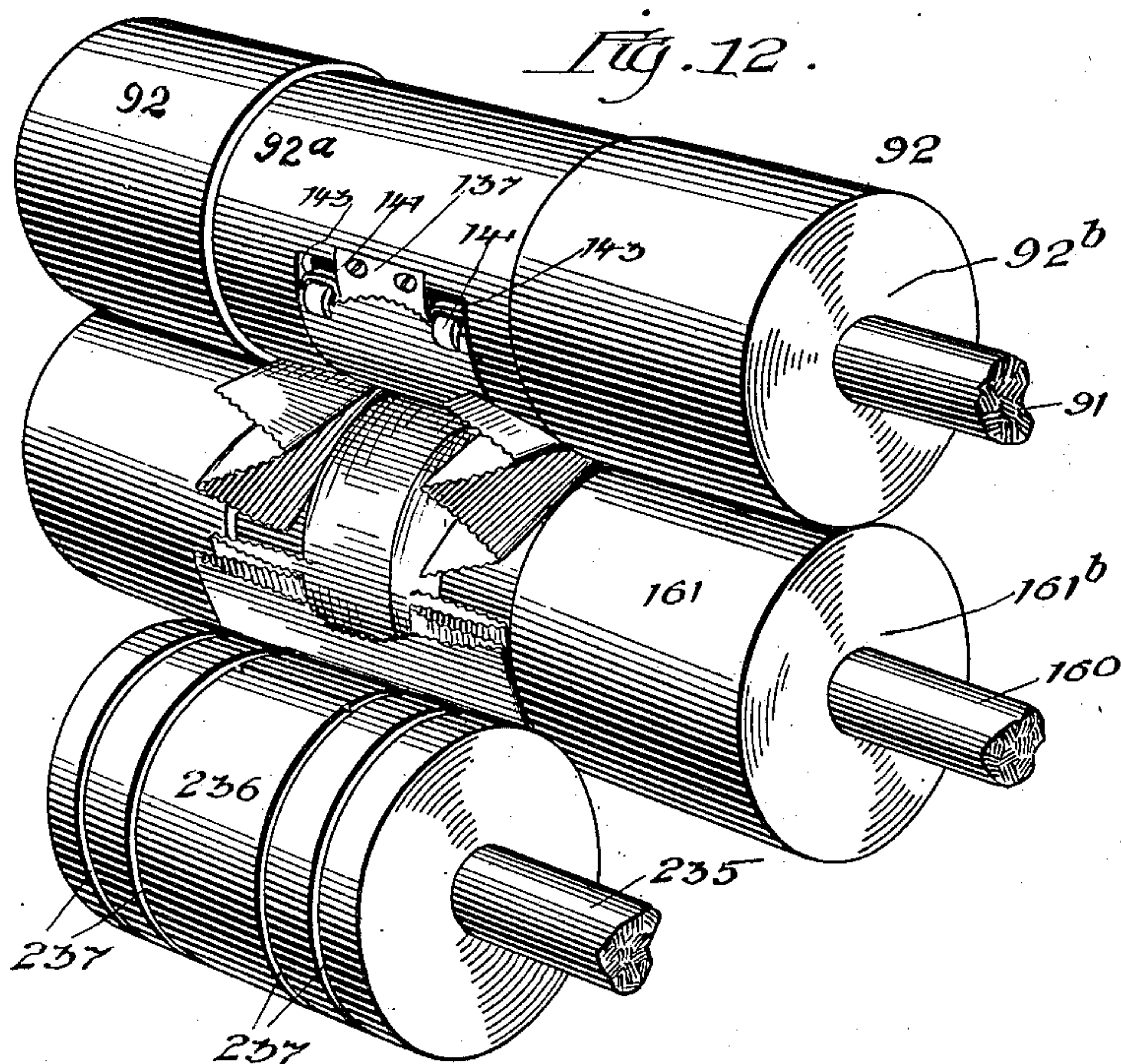
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APPLICATION FILED FEB. 3, 1903.

NO MODEL.

8 SHEETS—SHEET 7.



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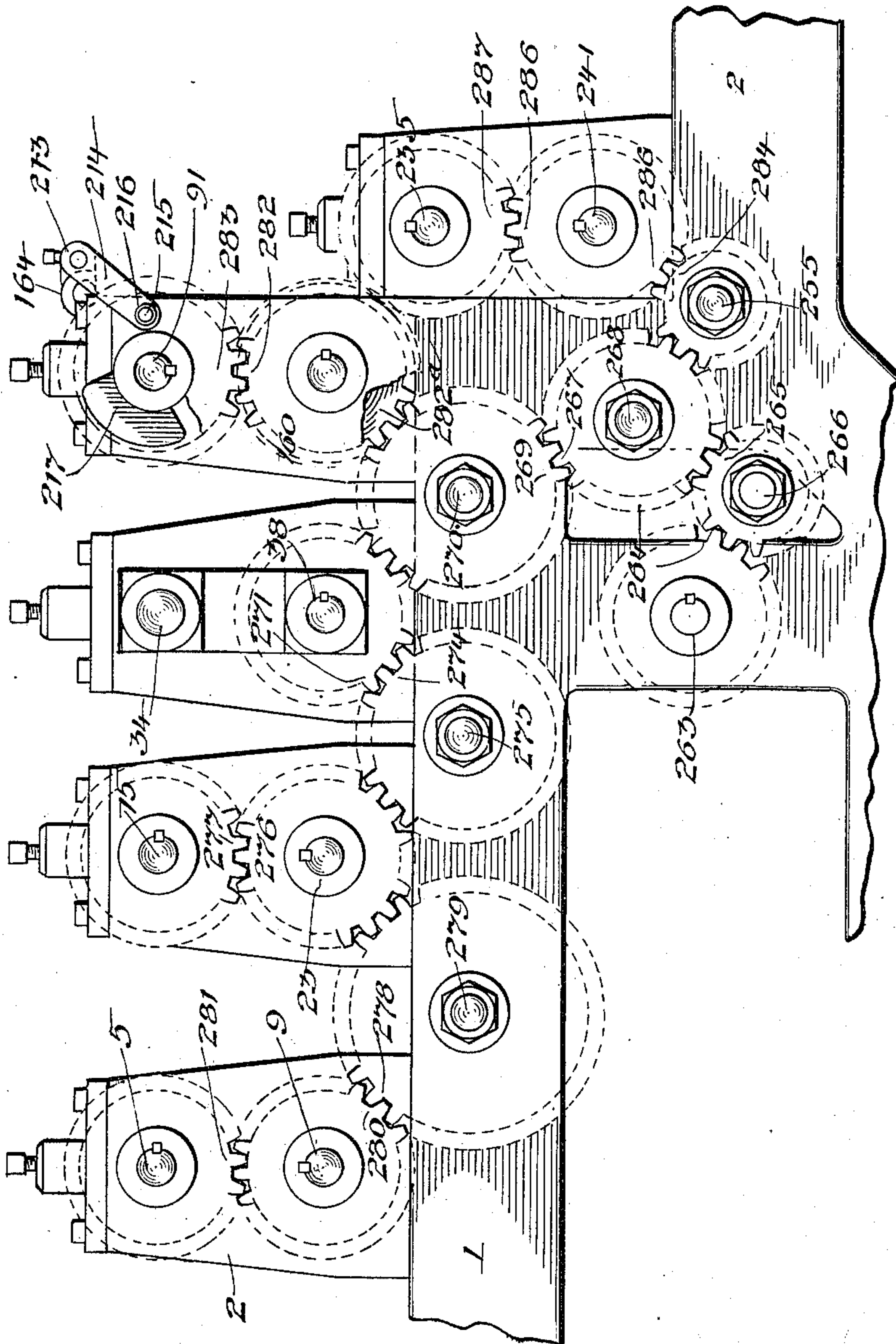
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8 SHEETS—SHEET 8.

Fig. 15.



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UNITED STATES PATENT OFFICE.

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PAPER-BAG MACHINE.

SPECIFICATION forming part of Letters Patent No. 736,673, dated August 18, 1903.

Application filed February 3, 1903. Serial No. 141,676. (No model.)

To all whom it may concern:

Be it known that I, PHINEAS L. BARTHOLOMEW, a citizen of the United States, residing at Aurora, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Paper-Bag Machines, of which the following is a specification.

The invention relates to that type of paper-bag machines in which a diamond fold is formed for the bottom of the bag, the body of the bag being formed of a bellows-folded tube; and the invention pertains particularly to the mechanism employed for making the diamond-folded bottom of the bag. The particular type of machines is that type in which the diamond fold for the bottom is formed by the use of folding-rollers and grippers.

The objects of the invention are to improve the feeding of the bellows-folded tube to the diamond-fold-forming mechanism for the bottom; to improve the severance of the section of the tube for the length of bag from the continuous tube; to improve the construction and operation of the cutting rollers and disks for severing the bag-section from the main tube; to improve the means for spreading apart the top and bottom or upper and lower sides of the tube at the advance end for the operation of the devices by which the diamond fold for the bottom of the bag is produced; to improve the construction and operation of the rollers and the grippers carried thereby for opening out the end of the bag into the condition for folding the bottom of the bag into a diamond fold; to improve the construction and operation of the side clamps which enter the bellows fold and grasp the upper and lower plies of the bellows fold; to improve the construction and operation of the grippers which grasp the top or upper portion of the end of the bag and open the end of the bag into shape for making the diamond fold for the bottom; to improve the construction and operation of the devices for entering the bottom end of the bag and completing the diamond fold, and to improve generally the construction and operation of the several elements which enter into the construction and operation of the mechanism for forming the diamond fold for the bottom of the bag.

The invention consists in the features of construction and combination of parts hereinafter described and claimed.

In the drawings, Figure 1 is a top or plan view of so much of a paper-bag machine as is necessary for illustrating the invention, showing the tube for the bag with its advance end approaching the diamond-fold-forming mechanism; Fig. 2, a sectional plan view with the upper set of cutting-cylinders, cutting-disks, and upper diamond-fold roller removed; Fig. 3, a cross-sectional elevation showing the cutting-disks for severing the extreme side edge of the upper portion of the tube and showing the plates for opening the advance end of the bag-tube; Fig. 4, an end elevation of the parts shown in Fig. 1 looking toward the delivery end of the machine; Fig. 5, a detail, being an elevation of the folding or gripper cylinders and the pressure-strips, showing the bag in its initial diamond-fold condition for the bottom of the bag; Fig. 6, a central longitudinal sectional elevation of the machine; Fig. 7, a detail in section, showing the cutting-disks for severing the extreme side edges of the upper portion of the bag-tube and showing the table and risers for opening the advance end of the bag-tube; Fig. 8, a central sectional elevation, enlarged as compared with the preceding figures, of the upper and lower folding or gripper cylinders or rollers; Fig. 9, a central longitudinal sectional elevation of the upper folding or gripper cylinder or roller, showing the same reversed in position to that shown in Fig. 8; Fig. 10, a detail, partly in section, showing the cams, the rollers for the cams, and the oscillating arms and connecting-arms for operating some of the elements of the bottom-folding mechanism; Fig. 11, a cross-section taken on line 11 of Fig. 8 looking in the direction of the arrow; Fig. 12, a perspective view of the folding or gripper cylinders and the upper receiving-cylinder, showing the position of the bottom end of the bag as it is leaving the folding or gripper cylinders; Fig. 13, an enlarged detail of the upper folding or gripper cylinder, showing the grippers and the coacting rollers; Fig. 14, an enlarged detail of the grippers and the arm carrying the same; and Fig. 15 a side elevation of a portion of the

frame, showing the arrangement of the gears and idlers for driving the various cylinders or rollers.

The machine has the usual appliances for forming a bellows-folded tube from a continuous roll of paper; but as such devices can be of any of the usual and well-known forms of construction they are not shown, it being deemed necessary to only show so much of the machine as will illustrate the location and operation of the mechanism for folding the bottom of the bag into a diamond fold. The frame of the machine is composed of side rails, one for each side of the machine, each side rail having a raised portion 1 and a depressed portion 2, the raised portion of the frame having thereon the bellows-folding devices, (not shown,) the cutting cylinders and disks, and the folding or gripper cylinders, and the mechanism coacting with said cylinders to initially open the end of the bag into shape for the diamond fold, and the lower portion of the frame having thereon the knife cutting-cylinders and the final folding and pasting devices, the latter of which are not shown.

Each side rail 1 has extending up therefrom standards 3, which receive and support journal-boxes 4, having mounted therein a shaft 5, on which is a cylinder 6, having a depression 7 near each end and a depression 8 at the center. These standards 3 also carry and support journal-boxes located below the journal-boxes 4 and having mounted therein a shaft 9, on which is a cylinder 10, corresponding to the cylinder 6, and the cylinder 6 on the full portion on each side of the depressed center carries a creasing-blade 11, which coacts with a groove 12 in the cylinder 10 and forms a crease inwardly extending from the edge of the bag-tube on each side to facilitate the turning of the tube on itself to form the diamond fold of the bottom.

Each side rail has extending upwardly from its portion 1 a standard 13, each of which carries and supports a journal-box 14, in which is mounted a shaft 15, on which is a cylinder 16, the cylinder having each end thereof full in diameter, with a depressed face 17 adjacent to the full end and a groove 18 adjacent to the depressed face, next to which is a full face 19, adjacent to which is a depressed face 20, with a depressed center 21, as shown in Fig. 1. Each standard 13 carries a lower journal-box 22, in which is mounted a shaft 23, having thereon a cylinder 24, the ends of which are full, with a depressed face 25 adjacent to each full end and a full face 26 adjoining the depressed face 25, and between the full faces 26 is a depressed center 27, as shown in Fig. 2. Each full face 19 of the upper cylinder 16 has fixed therein a cutting-blade 28, which coacts with a groove 29 in each full face 26 of the lower cylinder and severs the paper tube crosswise from the central cut to a point adjacent to each edge, crossing the longitudinal slit in the upper and lower sides

of the tube, leaving an uncut portion adjacent to each side edge or margin of the tube. Each groove 18 has entered therein a guide-wire 30, attached at its upper end to a cross-bar 31, secured at its ends to the top of the standards 13 in the construction shown, and the wires 30 extend around the rear portion of the cylinder 16 and terminate at a point forward of the bite or central contact between the upper cylinder 16 and the lower cylinder 24, as shown in Fig. 6, and these wires serve to hold the bag-tube in place on the forward end of the former in passing between the cutting and feeding cylinders 16 and 24 in the operation of feeding and cutting the tube into bag lengths.

Each side rail has extending upward from its elevated portion 1 a standard 32, each standard carrying an upper journal-box 33, in which is mounted the ends of a shaft 34, having thereon two disks 35, each disk having a hub 36, by means of which and a suitable set-screw the disks can be adjusted endwise on the shafts and when adjusted locked in their adjusted position. Each standard 32 carries a lower journal-box 37, in which journal-boxes the ends of a shaft 38 are mounted, on which shaft are disks 39, each disk having a hub 40, a set-screw by means of which the disks can be adjusted endwise on the shaft and when adjusted locked in their adjusted position. The disk 35 carries a cutting-blade 41 on a head 42, which enters a cross-slot 43 through the body of the disk at the periphery, and the head 42 has a stem 44, which enters a groove 45 in one side face of the disk, which permits the blade to be advanced and retracted into proper cutting position for its edge, and when the blade is adjusted it is clamped and held in its adjusted position by a cross-plate 46, which bears against the outer face of the stem 44, holding the stem, and with it the blade, firmly in position. The disk 39 also carries a cutting-blade 47 on a head 48, which head enters a cross-slot 49 in the body of the disk at the periphery, and the head 48 has a stem 50, which enters a groove 51 in one side face of the disk 39, permitting the cutting edge of the blade 47 to be advanced and retracted, as may be required for the cutting operation, and when adjusted the stem and blade are held in the adjusted position by a cross-plate 52, which bears against the side face of the stem. The two blades 41 and 47 are adjusted in relation to each other, and the disks 35 and 39 are also adjusted in relation to each other, so that when the disks in their revolution approach the bite or vertical center between the two disks the cutting edges of the knives will come in contact with the uncut margins of both the upper side or top or the under side or bottom at each side edge of the bag-tube and sever the uncut marginal portions at each edge of the tube, completely severing the section for the bag from the main portion of the tube except the central tongue on the under side or bottom of the tube,

which is left uncut or unsevered, retaining the section for the bag connected with the main body of the tube.

The forward end only of the bone or central former for the bellows fold is all that is shown; but this former consists, as usual, of a lower plate or section 53 and an upper plate or section 54, the two sections or plates coming together rearwardly of the bite of the creasing-cylinders 6 and 10, as shown in Fig. 6, and the upper section or plate 54 of the bone or central former is continued forward, passing between the upper cylinder 6 and the lower cylinder 10 in the depressed central portion of said cylinders. A plate 55, in the form of a narrow strip, continues from the terminal end of the section or plate 54 and, as shown, is a separate piece from the plate 54, but could be a continuation of such plate, if so desired. The plate or strip 55 extends forwardly, passing between the cutting and feeding cylinders 16 and 24 in the central depressed portions of said cylinders, and forward of the cylinders 16 and 24 the strip is cut out, forming a central opening 56, which serves to lighten the strip and also enables access to be had beneath the strip for the purpose of removing the paper in case of breakage or wedging as the tube is advanced. The plate or strip 55 at its forward end on each side has risers or ledges 57 upwardly extending, and at the extreme forward end of the plate or strip 55 is a cross-plate 58, having a tongue 59 with slots 60 for the passage of set-screws 61, by means of which the cross-plate 58 is adjustably connected to the forward end of the plate or strip 55, enabling the cross-plate to be properly adjusted in relation to the first folding or gripper cylinders. The upper portion or side of the bag-tube passes above the plate 55 and the lower portion or side of the bag-tube passes below the strip or plate 55, and with the advance of the bag-tube the upper portion or side thereof rides up on the raised side risers or ledges 57 and passes over the plate 58, raising the upper portion or side of the bag-tube and opening the advance end of such tube, and the lower portion or side of the tube is held down by fingers 62, downwardly curved from the plate 58 at each end thereof, thus opening and holding the advance end of the bag-tube open and in position for the upper side of the tube to be caught by the grippers on the upper folding or gripper cylinder, as hereinafter described.

The fold for the bellows-tube on each side is entered by guide-plates 63, one on each side of the forward end of the strip or plate 55, and each guide-plate has an opening 64 to enable the cutting-blades 41 and 47 to pass through the slots and cut or sever the edge margin of the bag-tube on the top and bottom, and each guide-plate in order to facilitate the passage of the bag-tube forward has its receiving end 65 on a curve, which allows the bellows fold on each side of the tube to

readily pass over the guide-plate, and when over the lower ply of the bellows fold will be held down by the guide-plates on each side, leaving the upper ply of the bellows fold free to rise as the top or upper side of the bag-tube rides upon the side risers or ledges 57 of the strip or plate 55 as the bag-tube advances toward the first or initial folding-cylinders. Each guide-plate at the front and rear end thereof has a side ear 66, by means of which the plate is secured to the upper ends of posts 67, the lower ends of which posts are attached to a longitudinal plate 68 on each side, and, as shown, the longitudinal plates are supported by cross-plates 69, each cross-plate at each end having an upward bend 70 and an outward turn 71 for the outward turn to lie on the side rails or on the base-plates of the standards and be there secured by a bolt or screw 72 or in any other suitable manner, thus furnishing a support for the side guides. A table or plate 73 is located below the forward end of the strip or plate 55 and the inner edges of the guide-plates 63, as shown in Fig. 3, and this plate or table 73 is supported on the upper ends of standards 74, attached at their lower ends to the longitudinal plates 68, so that these plates furnish a support for the side guides and the center plate or table.

The edges of the bellows fold on each side at the margin to be severed by the blades 41 and 47 is held up at the top and bottom, so that the blades or cutters will act properly and sever the marginal edge by a follower 75, which enters the bellows fold and travels forward with the paper until the point of severance is reached, at which time the follower and the cutting-blades 41 and 47 are in the position shown in Fig. 7 and the blades have cut or severed the marginal edges at the top and bottom on each side of the bag-tube. A follower 75 is provided for the bellows fold on each side of the tube, and each follower is carried by an arm or rod 76, each arm or rod having a socket or bearing 77, secured by a set-screw or otherwise to a shaft 78, supported in suitable boxes or pendants 78^a, attached to the under side of each supporting-plate 68. The shaft 78 at one end has attached thereto by a socket 79 an arm 80, on the outer end of which is a journal-pin 81, carrying an anti-friction-roller 82, which runs against the face of a disk 83, which disk has a hub 84, attached by a suitable set-screw or otherwise to the shaft 38. The periphery of the disk has thereon a rise, having an inclined face 85 and a bearing-face 86, forming, in effect, a cam on the periphery of the disk for the cam to revolve with the shaft and cause its acting face through engagement with the anti-friction-roller 82 to rock the arm 80 in one direction, giving a corresponding rocking movement to the shaft 78, by which the rods 76 will be advanced, carrying with them the followers 75 to travel with the paper, and, as shown, the followers are returned to normal position by a coiled spring 87, one end

of which is attached to a pin on the arm 80 and the other end of which is attached to a lug 88, extending out from the upright portion of one of the bars 69 in the arrangement shown. The cam-disk 83 is so set in relation to the revolving of the shaft 38 as to cause the cam-face thereon to engage the roller 82 and carry the arm 80 downward to rock the shaft 78 and advance the followers as the knives 41 and 47 approach each other to sever the marginal edges of the bag-tube and have the action of the cam cease as the knives perform the severing operation, at which time the cam leaves the roller and the spring 87 acts to return the rollers to normal position.

Each side rail has upwardly extending from its raised portion 1 a standard 89, and each standard carries an upper journal-box 90, in which journal-boxes are mounted the ends of a shaft 91, on which is the upper folding or gripper cylinder 92, which cylinder is full at each end and has a depressed center 92^a of a length corresponding to the width of the bag-tube. The cylinder 92 has entered therein on one side a plate 93, which plate has each end raised, and is depressed at the center to correspond with the full ends and depressed center of the cylinder. Each end of the plate 93 has entered therein a sliding dog or jaw 94, having a longitudinal transverse slot 95, through which passes a cross-bar or plate 96 on the plate 93, the slot being of a greater length than the width of the cross-bar or plate 96, so as to allow the sliding dog or jaw 94 to be advanced and receded. A rocking lever 97 has its upper end entered into a recess in the inner face of the sliding jaw 94, and this lever passes through a transverse slot 98 in the shaft 91 and is pivotally mounted on a pin or pivot 99 between two ears or supports 100 on a sliding bar or plate 101, having a recess in its inner face into which is entered the lower end of the lever 97, as shown in Figs. 8 and 9. The sliding bar or plate 101 is mounted in a longitudinal slot 102 of a plate 103, located in a groove of the cylinder 92 on the opposite side to the plate 93 and held at one end in the construction shown by a stud 104, entered into one of the heads 92^b of the cylinder 92. The sliding bar or plate 101 extends through a head 92^b of the cylinder 92 and has a neck terminating in an eye 105, through which passes a pin or bolt 106, carrying a roller 107, having a tapered exterior in the construction shown, which antifriction-roller 107 is in engagement with at certain times a cam-ring 108 on a disk 109, which disk has a hub 109^a, through which on one side a set-screw 110 passes for locking the hub to the end 111 of the journal-box 90, giving the disk 109 and its cam 108 a fixed position, while the roller 107 revolves with the cylinder 92. The sliding bar or plate 101 is forced and held in its advanced position by a spring 112, located in the recess 102 between the end of the sliding

bar or plate 101 and a stop-block 113 on the plate 103 across the slot or groove 102, and the spring is held in the recess thus formed by a guard-plate 114, extending from the stop-block 113, to which one end of the guard-plate is secured across the space for the spring and over the end of the sliding bar or plate 101, as shown in Fig. 8. An arm or link 115 is connected by a turned end 116 thereof with the sliding bar or plate 101, and the turned end 116 of the arm or link 115 is entered into a hole therefor in the sliding bar or plate and is held in place by a lap-plate 117, attached by screws or otherwise to the sliding bar or plate and extending over the end of the arm or link. The opposite end of the arm or link is slotted and has a pivot or pin 118, connecting the end of the arm or link with a lever 119, entered between the ears of the slotted end of the arm or link, and one end of the lever 119 is pivotally mounted on a pin or pivot 120, extending across the slotted groove 102 of the plate 103, so that the lever is free to swing on the pin or pivot. The free end of the lever 119 is entered into a recess in the inner face of the companion sliding dog or jaw 94, so that both dogs or jaws will be simultaneously advanced and receded, one through the lever 97 and the other through the lever 119, by the action of the sliding bar or plate 101, the roller thereon, and the cam. The roller as the cylinder 92 revolves comes in contact with the cam 108, which acts to move the sliding bar or plate 101 inwardly, moving the upper end of each lever 97 and 119 outwardly and carrying the sliding dogs or jaws both to the limit of their receded movement and into their open position, as shown in Fig. 8, and when the roller 107 leaves the cam 108 the spring 112 acts to force the sliding bar or plate 101 outwardly, moving the upper end of each arm or lever 97 and 119 inwardly, and carrying the sliding dogs or jaws inwardly or to their closed position, as shown in Fig. 9.

The inner end of each of the companion sliding dogs or jaws 94 is recessed, and the lower face of the recess has a point 121, with an inclined face, which face with the advance of the dog or jaw contacts the inclined face of a point 122 on the movable dog or jaw. Each movable dog or jaw consists of an arm 123, having a serrated outer face 124 at its end which coacts with the finger 125 of the sliding jaw to grasp between the serrated face and the finger the edge of the top of the bel-lows-folded tube. Each movable dog or jaw is mounted on a pivot or pin 126, so as to be free to swing thereon, and each movable dog or jaw has an arm 127, extending beyond the inner face of the plate 93, with the two arms 127 connected by a spring 128, the tendency of which is to return the arm 123 of the movable dog or jaw to normal position, resting on a cross-pin 129, extending across a slot 130 in the plate 93, in which slot the movable

dog or jaw is located and operates and is a continuation of but of less width than the slot 131, in which the sliding dog or jaw is located and operates. Each sliding dog or jaw in the construction shown has a pin 132 extending from its inner face, to which pin 132 are attached the ends of a coiled spring 133, which spring tends to assist the advance of the sliding dog or jaw to its closed position.

The release of the sliding bar or plate 101 by the roller 107 dropping from the cam-face 108 allows the spring 112 to act and advance the sliding dogs or jaws simultaneously on each side, and when each sliding dog or jaw has reached a point in its advance movement where the inclined face of its point 121 engages with the inclined face of the point 122 the arm 123 of the movable dog will be raised for the edge of the upper ply of the bellows fold to be grasped between the serrated edge of the arm 123 and the lip 125 of the sliding dog or jaw, and this operation of the two dogs or jaws for the upper folding or gripper cylinder will occur after the upper side of the bag-tube at the open end for the bottom of the bag has been caught by the grippers, as hereinafter described. The lower folding-cylinder is constructed similar to the construction of the upper folding-cylinder as regards arrangement, construction, and operation of the sliding dog or jaw and the pivoted or movable dog or jaw, the levers for operating the sliding dogs or jaws, the connection between the levers, the sliding plate or bar, the roller, the cam, and the fixed disk carrying the cam, except that the fixed disk and the parts co-acting with the cam of the disk are located at the opposite end of the cylinder to the location of the same parts for the upper folding-cylinder, or, in other words, the mechanism for actuating the jaws or clamps to grab or grasp the lower ply of the bellows fold are reversed in their relation to the lower cylinder as compared with the same parts for the upper folding-cylinder, as clearly shown in Fig. 8. The corresponding parts in the construction of both the upper and lower folding-cylinders are designated by the same reference characters—that is to say, the sliding dogs or jaws are numbered 94 and the other parts accordingly, as in the reference-numbers for the parts carried by the upper folding-cylinder, and these parts therefore are not specifically described for the lower folding-cylinder.

It will be seen that when the dogs or jaws constituting the clamps for the upper folding-cylinder are in a certain position, as shown in Fig. 8, for instance, the dogs or jaws constituting the clamp for the lower folding-cylinder are on the opposite side of the lower cylinder to that occupied by the clamps for the upper folding-cylinder, and the arrangement of the clamps for the lower folding-cylinder shown is one to catch and hold the lower ply of the bellows fold and retain their grasp on the ply for a longer period of time than do the clamps for the upper ply of the

bellows fold, by which arrangement the upper ply of the bellows fold is released while the lower ply of the bellows fold is still caught and held, which is desirable in the operation of forming the diamond fold for the bottom of the bag.

The upper folding-cylinder at its center longitudinally has a transverse slot 134 therein, and adjacent to each end of the transverse slot, at one side thereof, is a roller 135, carried by a pin or pintle 136, attached to a plate 137, extending across the slot. On each side of the plate 137 and in line with the roller 135 is a movable jaw 138 of a gripper, which jaw has a tail 139, engaged by the free end of a spring 140, which acts to hold the jaw in its receded or open position, and the jaw is advanced or forced to its closed position by the contact of its end with the roller with which it coacts. A fixed jaw 141 coöperates with the movable jaw in grasping the raised upper side of the open end of the bag-tube, and the fixed jaw is on the end of an arm 142, to which arm the movable jaw is pivotally attached by ears 143 on the movable jaw and a pivot-pin or pintle 144, passing through the ears and the arm of the fixed jaw, as shown in Figs. 11, 13, and 14. A fixed jaw is provided for each movable jaw, and the two sets of movable and fixed jaws constitute the gripper for grasping the edge of the upper side of the bag-tube and carrying such edge between the folding-rollers, maintaining their hold on the edge until the advance end of the bag has passed through and beyond the folding-rollers, as shown in Fig. 12, opening the end of the bag to form the diamond fold for the bottom of the bag. The arms 142 of the fixed jaws of the grippers are carried by a cross bar or arm 145 on an arm or bar 146, which arm or bar extends between the shaft 91 and the inner surface of the cylinder 92, and, as shown, the shaft 91 has a recess 147 on one side to allow of the necessary oscillation of the arm or bar 146 to advance and recede the grippers; but with a shaft of the proper diameter or by curving the arm 146 so as to clear the shaft the slot or recess 147 can be dispensed with, if so desired. The arm 146 projects from a socket 148, attached by a set-screw or otherwise to a rock-shaft 149, which shaft extends longitudinally through the cylinder from end to end and is supported in the heads 92^b of the cylinder, and at one end a coiled spring 150 is attached at one end thereof to the shaft and at the other end to the head 92^b of the cylinder, which spring 150 serves to return the rock-shaft to normal position with the jaws of the gripper open, as shown in Fig. 11. The other end of the shaft 149 has fixed thereto an arm 151, having at its end a journal-pin 152, on which is an antifriction-roller 153, engaged by a cam-rim 154 on a disk 155, having a hub 156, attached by a set-screw 157 to the end 158 of a journal-box 90, so as to enable the cam rim or ring 154 to be properly adjusted and when adjusted locked in its ad-

justed position. The disk 155 and its cam rim or ring 154 has a fixed relation, and the roller 153 is revolved with the cylinder 92, and with the engagement of the roller with the under face of the cam rim or ring the arm 151 is depressed, rocking the shaft 149, raising the arm 146, and with it the jaws of the gripper, for the movable jaws to contact the rollers 135 and close the gripper onto the edge of the end of the paper-bag tube, and the jaws of the gripper will be closed and held closed so long as the roller 153 remains in contact with the under face of the cam rim or ring, and with the passing of the roller 153 from above the cam rim or ring 154 the spring 150 acts and restores the rock-shaft to normal position, allowing the spring 140 to act on the tail of the movable jaw and open such jaw, releasing the caught edge of the paper from the grippers, which release will occur after the end of the bag has been carried between the folding-rollers and opened out into the position shown in Fig. 12. The side clamps and the grippers act in unison, and it will be seen that in operation the side clamps and the grippers instead of hugging the paper of the bag close to the folding-cylinders operate to hold the paper-bag tube clear of the face of the cylinders, thus giving a free passage for the paper between the folding-cylinders and a clearance for the end of the bag which is to have the diamond fold for the bottom formed thereon, by which the turning or folding of the end of the bag into the diamond fold is facilitated, as the end of the bag is perfectly free for the action of the diamond-forming devices without the restriction of friction from the cylinders in making the diamond fold.

Each standard 89 carries a lower journal-box 159, in which is mounted the ends of the shaft 160, carrying the lower folding-roller 161, which roller is provided with side clamps similar in construction and operation to the side clamps of the upper folding-roller, as already described. The end of the bag is opened out, as already described, by the action of the grippers, and the side clamps and the line of overfold or cross fold for the bottom of the bag at the point of opening out of the end of the bag is the creasing-line defined by the action of the creasing-rollers 6 and 10, as already described. The end of the bag after it is opened out and in condition to complete the diamond fold and when released from the diamond-folding mechanism is given a straight-line deflection or travel downwardly by a guide-plate 162, depending from a rock-bar 163, the ends of which are journaled in bearings 164, each bearing on a plate 165, attached to the standards 89 in the arrangement shown, so that the rock-shaft is free to be oscillated to advance and recede the guide-plate 162 in its relation to the folding-rollers.

The rock-bar 163 has extending up therefrom an arm 166, to which is pivotally connected the end of a rod 167, the other end of which

rod is pivotally connected to the upper end of a lever 168, pivotally mounted at its lower end on a pin or pivot 169, extending out from a bracket-plate 170, attached to the side rail of the frame. A roller 171 is mounted on a journal pin or pivot 171^a, projecting out from the lever 168, and this roller 171 comes in contact with a cam having a projected face 172 and a circular face 173 for the projected face when engaged with the roller to move the upper end of the lever 168 rearwardly and through the pitman or rod 167 and arm 166 oscillate the rock-bar 163 in the direction to carry the guide-plate 162 away from the rollers, at which time the end of the bag is being opened out by the action of the grippers and side clamps. The cam for engaging the roller 171 is fixedly attached to the shaft 34 by a hub 172^a on the disk of the cam and a suitable set-screw or other means, so as to have the cam revolve with the shaft, and the cam is properly adjusted in relation to the cams which actuate the grippers and side clamps to properly adjust the guide-plate in correlation with the movements of the grippers and side clamps in grasping and releasing the end of the bag. The lever 168 has its roller 171 held in contact with the face of the cam by a coiled spring 174, one end of which is attached to a pin 175 on the lever and the other end of which is attached to a standard 176, extending upward in the construction from the turned end 71 of a cross-bar 69 for the spring to be under tension at all times, maintaining the roller against the face of the cam whether the projected face or the circular face is in engagement with the roller.

A plate 177, having at its forward end a cross-head 178, is attached to the upper face of the rock-bar 163 at the longitudinal center of said bar, and a plate 179, having at its forward end a cross-head 180, is attached to the under face of the cross-bar 163 in the line with the plate 177, the plate 179, as shown, having a downward curve or bend separating the cross-heads a greater distance apart than the thickness of the rock-bar. The cross-heads 178 and 180, as shown, are united one to the other by a central post 181, and at each end of the cross-heads and suitably journaled in the cross-heads is a rock-shaft 182, each rock-shaft having attached to its projected upper end an arm 183, and the outer end of each arm has an upwardly-projecting pin or pivot 184, which passes through the end of a rod or link 185, of which the other end of one link may be rigidly attached to a head 186, while the other end of the companion link is pivotally connected with the head 186 by a pin or pivot 187, though as shown the ends of both links are pivotally attached to the head, which permits of the necessary free movement for the oscillation of the arms 183 without straining or affecting the relation between the arms 183, the links 185, and the head 186 in the operation of the devices. The head 186 is pivotally mounted on a pin or pivot

188 on the end of an arm 189 of a bell-crank lever, which lever is mounted on a pin or pivot 190, extending up from the rock-bar 163, and the other arm 191 of the bell-crank lever is connected by a pin or pivot 192 to a slotted head 193 on a sliding rod 194, which rod is mounted in the end of a plate 195, attached to the side face of the rock-bar, and in the end of a support 196, attached to the upper face of the rock-bar in the construction shown. The sliding rod 194 is held against too far outward end movement by a collar 197, attached to the sliding rod by a suitable set-screw or otherwise, and between the face of the collar 197 and the supporting-plate 195 around the sliding rod is a coiled spring 198, one end of which bears against the face of the collar and the other end of which bears against the face of the plate, which spring operates to return the sliding rod after each advance movement to its normal position of rest. The end of the sliding rod 194 projects beyond the support 196 and is contacted by the upper end of a lever 199, the lower end of which lever is pivotally carried by a pin or pivot 200, extending out from a bracket-support 201, attached to the lower section 2 of a side rail or piece of the main frame, as shown in Figs. 2, 4, and 10. The lever 199 has projecting out therefrom a pin or pivot 202, on which is mounted a roller 203, which is contacted by a cam 204 on the face of a disk 205 for the contact of the cam 204 with the roller 203 to swing the lever 199 on its pivot and carry the upper end of such lever inwardly to force the sliding rod 194 forward and turn the L or bell-crank lever on its pivot 190 for the arm 189 of the L or bell-crank lever to move the head 186 rearwardly, carrying with it the links 185 to rock the shafts 182 through the arms 183, and with the passage of the cam 204 from its engagement with the roller 203 the spring 198 acts and returns the sliding rod to normal position, moving the L or bell-crank lever in the opposite direction for the arm 189 of the L or bell-crank lever to move forwardly, carrying with it the head 186 and giving a reverse rock to the shaft 182 through the arms 183 and the connecting-links 185. The lever 199 is returned to normal position after the cam 204 passes the roller 203 by a coiled spring 199^a, one end of which is attached to the lever and the other end of which is attached to a pin 199^b, projecting out from a standard 233 in the arrangement shown. Each rock-shaft 182 at its lower end has fixed thereto a socket or head 206, and each socket or head carries a rod 207, each rod having a downward curve and an inward and outward bend, and from the extremity of the outward bend each rod or wire is upwardly and downwardly turned, forming a vertical finger or end which enters the open end of the bag, and with the spread of the rods or wires outwardly the fingers or ends act as breakers to press outward the infold in making the diamond fold for the

bottom of the bag. Each rod or wire 207 is adjustable in its head 206, and when it is adjusted for its outer or free end to be in proper relation to the plate 162 the rod or wire is locked in its adjusted position by a set-screw 209 or other suitable means. The outer or free ends of each rod or wire when in normal position stand one on each side of the central curved lower end of the guide-plate 162 and below the ends of the side ears or guides 162^a of the guide-plate, so that in spreading the wires or rods the end of the bag will be between the plate 162 and the folding-rollers, leaving a free clearance for the arms to spread outwardly and into the sides of the bellows-folded tube for breaking the side fold on each side for the diamond fold. On each side of the center of the guide-plate 162 are curved strips 210, which bear against the side folds of the bottom and form retainers for holding the upper half of the side folds firmly, while the lower half of each side fold of the bag-bottom is drawn down to complete the diagonal folding for the corners of the bag-bottom between the sides and ends of the bag-bottom, with the ends of the bag-bottom extending each side of the ends of the sides, as shown in Fig. 5. The retaining fingers or strips 210 are carried by a rock shaft or bar 211, suitably journaled in supports 212, attached to the rock-bar 163, so that the rock rod or bar 211 can be oscillated with the movements of the rock-bar 163 to advance and recede the fingers in their relation to the peripheries of the folding-rollers. One end of the rock rod or bar 211 extends beyond its support 212 and has secured thereto by a socket 213 an arm 214, having at its outer end a journal pin or pivot 215, on which is a roller 216, which contacts with a cam 217 on a hub 218, attached by a set-screw or otherwise to the shaft 91 of the upper folding-cylinder, for the cam to rotate with the shaft and by its engagement with the roller 216 move the arm 214 in a direction to rock the bar 211 and throw the fingers or retainers 210 away from the folding-rollers and independently of the rocking movement of the bar 163, giving the rod or bar 211 a rocking movement with and a rocking movement independent of the bar 163, by which it is carried. The rod or bar 211 is returned to normal position after the cam 217 has passed the roller 216 by a coiled spring 219, one end of which is attached to the rod or bar 211 and the other to a support 212 in the construction shown. The cam 217 is so set in relation to the arm 214 as to move the retaining fingers or strips 210 away from the folding-rollers as the end of the bag passes through the folding-rollers, and its upper and lower sides are turned, respectively, upwardly and downwardly to form the end flaps for the diamond fold and to move the retaining fingers or strips inward to hold the turned sides when drawn inwardly and over the end face of the bag-bottom.

The diamond fold for the bottom of the bag is produced by the opening of the end of the bag and the elongation thereof through the action of the center gripper, the side-retaining clamps, and the attached tongue of the lower ply to the preceding bag, which operate to draw the other side or top ply and the under side or bottom ply of the bag respectively upwardly and downwardly through the upward movement of the grippers and the side clamps on the upper cylinder and the downward movement of the tongue from the downward movement of the preceding bag and the downward turning of the side clamps of the lower cylinder, and this drawing of the upper and lower plies of the bag end in opposite directions by the grippers and clamps of the upper and lower folding-rollers makes the diagonal turn for the diamond fold, carrying inwardly the side flaps for the fold, bringing the bottom of the bag into the position shown in Fig. 5. The bottom of the bag when formed to the extent shown in Fig. 5 is released from the grippers and side clamps and is free to be drawn downwardly by the connection of the under flap of the bottom side of the bag with the preceding bag, and to assist in drawing the bag-bottom downwardly and maintaining a straight line of travel therefor guide-plates 220 are located one on each side of the longitudinal center of the folding-rollers, as shown in Figs. 4 and 5, which plates are carried inwardly toward the intumed sides of the bag-bottom, as shown in Fig. 5, and act to prevent the turned end for the bag-bottom from outbending, though the bottom can be formed practically and successfully with the guide-plates 220 omitted, if so desired. Each guide-plate 220 is attached to the upper end of a rod 221, and each rod is secured in a socket or collar 222, attached by a set-screw or otherwise to a rock-shaft 223, on which shaft is a socket or sleeve 224, extending out from which is an arm 225, projecting out from the outer end of which is a pin 226, which enters a slot 227 in the enlarged lower end of a rod 228, the upper end of which is pivotally connected to an arm 229, secured to the rock-bar 163, so that with the upward turn of the rock-bar 163 the shaft 223 will be oscillated upwardly to recede the presser-plates 220 in their relation to the upper and lower folding-rollers. The rock-shaft 223 is returned to normal position by a coiled spring 223^a, one end of which is attached to the shaft and the other end to the side rail 2 of the lower section of the side piece of the frame in the construction shown, which movement of return for the rock-shaft is independent of the movement of the rock-bar and is permitted by reason of the slotted end of the connecting-rod 228, which rod also allows of a certain amount of lost motion in the movement of the rock-bar 163 before acting on the arm 225 to carry the presser-plates 220 away from the folding-rollers. The rock-bar 163

in the arrangement shown has a hand-lever or arm 230, pivotally attached to the rock-bar by a pivot bolt or pin 231, so that the lever or arm can be turned edgewise on the pivot or pin, and for holding the rock-bar 163 in its elevated position, thereby carrying the parts connected therewith out of operative relation to the folding-rollers, a catch 232 is fixed to the frame, under which the end of the arm or lever can be caught, holding the rock-bar raised until the lever or arm 230 is released from the catch.

The lower section 2 of each side rail has extending up therefrom standards 233, each standard carrying and supporting an upper journal-box 234, in which are mounted the ends of a shaft 235, on which shaft are a roller 236, having circumferential grooves 237 for the reception of guide-wires 238 and 238^a, both sets of guide-wires attached to a cross-bar 239, secured at its ends to the tops of the standards 233 in the construction shown. The outer two guide-wires 238 extend down from the cross-bar 239 and enter the grooves 237 adjacent to the ends of the cylinder, and these wires extend forward from the delivery side of the cylinder, while the inner or middle guide-wires 238 pass under the supporting-bar 239 and around the cylinder 236 on the receiving side thereof and extend beneath the cylinder on the delivery side, as shown in Figs. 1 and 6. Each standard 233 carries and supports a lower journal-box 240, in which are mounted the ends of a shaft 241, on which shaft is a cylinder 242, having circumferential grooves 243, corresponding to the circumferential grooves 237 of the cylinder 236, and the grooves 243 receive guide-wires 244, attached to a cross-bar 245, which guide-wires coact with the guide-wires 238 and 238^a and furnish a pathway of travel for the severed bags after leaving the cylinders 236 and 241. The cylinder 242 carries a cutting-blade 242^a at its center longitudinally, and the center 236 has a groove 236^a at the center of the length of the cylinder to coact with the cutting-blade 242^a and sever the connecting strip or tongue between a preceding bag and a succeeding bag as the bags pass between the cutting-cylinders 236 and 242, leaving the ends for the diamond fold in position to be turned over the sides of the diamond fold by suitable fold-rollers (not shown) to complete the formation for the diamond fold of the bottom for the bag. The shaft 241 has secured thereto by a set-screw or otherwise a hub 246^a of a cam 246, having a projected face 247 and a circular face 247^a, which face is in contact with a roller 248 on a journal pin or pivot 249 in the end of an arm 250, having a socket or head 251, attached by a set-screw or otherwise to the rock-shaft 223, so that with the revolving of the shaft 241 the projected face 247 of the cam 246 will act against the roller 248 and move the arm 250 in a direction to oscillate the shaft 223 downward and swing the guide-plate 220 away from the faces of the upper and lower

folding-rollers, and this movement of the rock-shaft 223 is permitted independent of the rod 228 by reason of the slot 227, which allows the pin 226 of the arm 225 to move in the slot without acting against the rod 228, the rod 228 serving the purpose of throwing the guide-plate clear back in case of clogging or for access from other cause to the tube or bag at the folding-rollers. The engagement of the circular face 247^a of the cam with the roller 248 allows the spring 223^a to act and return the guide-plates to normal position, and the limit of return of the presser-plates is controlled by stops 252 on the ends of rods or bars 252^a, one attached to each supporting-piece 68 of the intermediate frame, which stops 252 are located one in the line of movement to and from the folding-cylinders of each rod 221 and prevent the guide-plates from being forced against the end of the bag. After being acted upon by the upper and lower folding-cylinders, the break rods or wires, and the retaining-strips the bags successively pass downward between the folding-cylinders and the guide-plates 220 and enter between the upper cutting-cylinder 236 and the lower cutting-cylinder 242, the bags traveling between the guide-wires 238, 238^a, and 244, and to insure the passage of the bags between the upper and lower cutting-cylinders 236 and 242 guide-rollers 253 and 254 are located adjacent to the cylinder 236, the upper guide-roller 253 being located in the opening between the cylinder 236 and the folding-cylinder 161 and the lower guide-roller 254 being located in the space between the cutting-cylinders 236 and 242, as shown in Fig. 6. Each guide-roller 253 and 254 is mounted in suitable journal-boxes 255, and the journal-boxes for the upper guide-roller 253 are carried by rods or stems 256, and the journal-boxes 255 for the lower guide-roller 254 are carried by stems 257, a stem being provided for each upper and lower journal-box of the respective guide-rollers. Each pair of stems 256 and 257 are free to slide in a supporting-head 258, attached to the side rails of the main frame, or are otherwise supported. A threaded stem 259 is entered into the end of the supporting-head in line with each upper and lower stem, and each stem 259 carries a disk 260, between which and the end of the stem is a coiled spring 261, which allows each upper and lower roller to yield independently one of the other, the amount of yield being sufficient to allow of the passage of any irregularity in the bag without interfering with the progress of the bag in passing from the folding-cylinders to the final cutting-cylinders. The upper folding-cylinder 92 has across its depressed center 92^a a bar 262, the outer face of which is flush with the periphery of the ends of the cylinder and the edges of which as the cylinder revolves furnish a bearing-face across the bag-tube for defining the cross-line for the central backward fold of the diamond fold for the bottom of the bag onto the body

of the bag, so as to insure a straight-line cross-fold for the bottom of the bag in making the diamond fold, this central fold for the bottom of the bag in making the diamond fold being determined and assisted by the crease formed on each side of the bag-tube by the creasing-blades of the cylinders 6 and 10, as already described.

The various devices which enter into the construction of the diamond-fold-forming mechanism for bags should have a unity of movement, and a system of driving-gears for the various cylinders is shown in the drawings. A main shaft 263, having at one end a suitable driving-pulley, (not shown,) is supported in the side rails or pieces of the main frame, and this shaft at the opposite end to the driving-pulley has fixed thereon a gear 264, which meshes with an idler-gear 265 on a journal-pin 266, and the gear 265 meshes with an idler-gear 267 on a journal-pin 268, and the gear 267 meshes with an idler-gear 269 on a journal-pin 270, the various journal-pins being secured to the side pieces of the frame. The gear 270 meshes with a gear 271 on the end of the shaft 38, and on this shaft is a gear 272, which meshes with a gear 273 on the shaft 34 for driving the shafts 34 and 38 of the cutting-disks 35 and 39 for severing the margined edges of the bag-tube. The gear 271 meshes with an idler-gear 274 on a journal-pin 275, extending out from the side rail or piece of the main frame, and the gear 274 meshes with a gear 276 on the end of the shaft 23, and the gear 276 meshes with a gear 277 on the shaft 15 for driving the shafts 15 and 23 of the cutting-cylinders 16 and 24, respectively. The gear 276 meshes with a gear 278 on a journal-pin 279, and the gear 278 meshes with a gear 280 on the end of the shaft 9, and the gear 280 meshes with a gear 281 on the shaft 5 for driving the shafts 5 and 9 of the creasing-cylinders 6 and 10, respectively. The gear 269 meshes with a gear 282^a on the shaft 160, on which shaft, outside of the gear 282^a, is a gear 282, which meshes with a gear 283 on the end of the shaft 91 for driving the shafts 91 and 160 and revolving the upper and lower folding-cylinders, respectively. The gear 267 meshes with an idler-gear 284 on a journal-pin 285, extending out from the side rail or piece of the shaft, and the gear 284 meshes with a gear 286 on the end of the shaft 241, and the gear 286 meshes with a gear 287 on the end of the shaft 235 for driving the two shafts 235 and 241 and revolving the cutting-cylinders 236 and 242, respectively. The shaft 235 has fixed thereon a gear 288, which meshes with a gear 289 on the upper guide-roller 253 and with a gear 290 on the lower guide-roller 254 for driving the two guide-rollers. The idler-gears are so arranged in relation to each other and to the driving-gears of the respective shafts as to give the necessary rotation to the various cylinders and feed-rollers for operating on the bag-tube and forming a diamond-folded bottom for the

bags, and the cams on the various shafts are arranged in proper relation to each other and the devices which they operate to have one device coöperate with the other at the proper time in acting on the bag-tube in turning the end of each bag to form a diamond-folded bottom therefor.

The operation is as follows: The bellows-folded tube is threaded into the machine in the usual manner of threading up paper-bag machines with the tube. The tube as it is fed forward is cross-creased by the creasing-rollers 6 and 10, so as to break the tenacity of the paper without injury thereto and form a defining-line to facilitate the laying of the top side of the bag back to follow the bottom half or side as the bag leaves the folding-cylinders. The bag-tube is fed forward by the rollers 16 and 24, which are also cutting-cylinders, the blades of which act to sever the top and bottom of the tube outwardly from the central curved cross-cut, so as to leave a marginal edge, and this edge as the bag-tube is carried or fed forward is severed by the cutting-disks 35 and 39, at which time the forward or leading end of the section for a bag has been caught by the grippers and carried to a point in a central plane with the centers of the folding-cylinders. The bag-tube has its margins on each side unsevered until the leading end of the bag-section is within the folding-cylinders, giving the tube a connection on each side and a central connection on the bottom by the unsevered portion in line with the central circular cut of the top side, by which a straight run or line of travel is insured for the bag-tube until the folding-cylinders are reached, thus preventing any kinking or side draw on either the top or bottom of the bag-tube, by which the tube would be disarranged, so as to interfere with a square fold for the bottom of the bag. The leading end of the bag-tube for each bag-section is raised or opened by reason of the under side of the tube passing below the plate 55, while the upper portion travels forward on the risers or ledges 57, thus opening the leading end of the bag-section, which end is to have formed thereon the bottom of the bag, and the opening of the bag is done solely by the risers or ledges; but to insure positiveness the side guides 63, which enter between the bellows fold of the tube and the fingers or lips on the cross-plate 61, serve to hold the lower side of the bag-tube in its plane of travel forward. The raised upper side of the leading end of the bag-section as the tube is fed forward passes between the open jaws of the grippers of the upper folding-cylinder, and these grippers catch the edge of the tube, one on each side of the central curved cut, so as to give a uniform and straight-line draw or pull on each side of the longitudinal center of the bag-section. The movable jaw 138 of each gripper, after the leading edge of the bag-section is entered between the jaws, is closed against the fixed

jaw by the contact of the movable jaw with the roller 135, which contact is attained by the engagement of the roller 153 with the cam-rim 154, closing the jaws of both grippers and firmly clasping the edge of the paper tube between the jaws, to be there held until released by the departure of the roller 153 from the cam-rim 154, which departure occurs at the point where the grippers have passed, so as to be in a straight vertical plane, or approximately so, with the peripheries of the folding-cylinders. The leading end of the bag-section is carried by the grippers between the upper and lower folding-cylinders, and when the grippers have passed the central vertical line of the folding-cylinders the side clamps of the upper and lower folding-cylinders are closed, catching, respectively, the upper ply and the lower ply of the bellows fold on each side of the tube, and the point of grasping the plies will be at the creased line for the cross-fold made by the creasing-cylinders already described. The continued revolving of the upper and lower folding-cylinders carries the bag-section, still connected at its lower side with the bag-tube, forward with the grippers and the side clamps holding the bag-section, and the grip of the grippers and the side clamps of the upper folding-cylinder will continue until the side clamps of the upper cylinder have reached the vertical plane of the periphery of the folding-cylinders, at which time the grippers and side clamps of the upper folding-cylinders are released, leaving the upper halves of the bag and its bottom free. The spread-rods 207 are opened out just before the side clamps of the upper folding-cylinder reach the vertical line for release, and the free ends of these rods strike against the inbend of the bellows fold and break and open out the fold, so as to form the square folding-line for the bottom of the bag on each side, which line, as well as the diagonal line for the diamond fold, by which the side flaps of the bag are inwardly turned, are formed by the draw of the side clamps and of the grippers for the upper half of the bottom of the bag and are fully formed before the side clamps and the grippers release their hold, and to insure the positive straight-line fold across the bag the binder-strip 262 crosses the bag at the defining-line made by the creasing-cylinders and serves to hold the two parts—that is, the upper and lower sides of the bag—close together, so as to prevent side slipping or spreading apart at the cross-folding line and destroy the straight-line folding for the bottom of the bag. The grippers release slightly before the side clamps of the upper folding-cylinders release, and in the arrangement shown the side clamps of the lower folding-cylinder retain their grip for a short time after the side clamps of the upper folding-cylinder have released their grip; but this is not an absolute necessity, as the side clamps of both cylinders could be made to release simultaneously, the allowing

of the side clamps of the lower folding-cylinder to retain their grip being for the purpose of insuring a downward turn and draw for the lower half of the bottom of the bag. The break-rods 207 after forcing the inbend of the bellows fold outward return to their normal or closed position, so as to be out of the way in the further operation of drawing the side flaps of the bottom of the bag in position, and with the release of the grippers and side clamps of the upper folding-cylinder the pressure-strips 210 are thrown toward the folding-cylinders, pressing against the upper half of each inwardly-turned side flap and holding each side flap against side movement, while the lower half of the bottom of the bag is drawn into its diamond formation by the action of the lower cutting and feeding cylinders and the connected tang or unsevered portion of the bottom side of the bag, the pressure-strips holding with sufficient firmness to prevent side draw on the side flaps of the bottom and at the same time allowing of the free passage of the turned bottom of the bag downwardly, and the downward travel of the turned bottom of the bag is directed and insured by the upper guide 162, which is carried inward as the end of the bag commences to move downward, and by the side plates 220, which are also carried inward as the bag-bottom moves downward, neither the plate 162 nor the side plates 220 pressing with any force against the bottom of the bag, but simply acting as guards to prevent the bottom of the bag from bulging or bearing outward as the bottom of the bag is carried down. The bottom of the bag is carried down and passes between the feeding and cutting cylinders 236 and 242, by which the unsevered strip between the preceding and succeeding bags is severed, wholly detaching the preceding bag, which is then to be carried forward to the folding devices for turning inwardly the end flaps of the bottom and to the pasting devices for the bottom, the end folding and pasting devices being of any usual and well known form of construction. The bellows-tube is continuously fed forward and retains a connection on each side edge until the forward end of a bag-section has been cut by the grippers and carried between the folding-cylinders, thus insuring a straight-line draw for the tube until the folding-cylinders are reached. The advance end of each bag-section is automatically opened before reaching the folding-cylinders and is advanced in its open condition for the upper side of the bag to enter and be caught by the grippers. The grippers are automatically actuated to grasp the upper side of the bag on each side of the central circular cross-cut, giving a straight-line draw for the grippers in the advancing of the bag. The side clamps for the upper and lower plies of the bellows fold are automatically actuated to grasp the plies at the proper time and at the central folding-line for the diamond fold of the bottom of the bag. The

grippers and the side clamps operate to hold the body of the bag clear of the cylinder instead of forcing the bag onto the folding-cylinders, thus relieving the bag of the friction of the cylinders in the advance between the cylinders. The grippers and the side clamps are released when the vertical plane for the peripheries of the folding-cylinders on the delivery side is reached. The infold of the bellows fold for the bottom of the bag is broken or forced outwardly just before the grippers release their hold, so that the sides of the bottom of the bag will be drawn straight by the action of the grippers, the side clamps, and the uncut portion between the preceding and succeeding bags. The side flaps are turned inwardly with a diagonal corner turn by the action of the grippers, the side clamps, and the unsevered portion between the two bags, the preceding and the succeeding one. The side fold for the bottom of the bag is held firmly against side movement and against the projection of an irregular line by the pressure-strips, and the bag is guided and directed in a straight-line travel downward, so as to insure the turned halves being maintained in their proper relation for passage through the final cutting-cylinders. The mechanism of the invention is positive in its operation, possesses great rapidity in the formation of bags, and the movements of the various parts are such as not to readily wear out.

What I regard as new, and desire to secure by Letters Patent, is—

1. In a paper-bag machine, the combination of cutting-cylinders for severing both the top and bottom of the bag-tube outwardly and laterally from the central cross-cut on top of the tube, leaving adjacent to each side edge an uncut margin for maintaining the continuity of the tube, and cutting-disks forward of the cutting-cylinders and in longitudinal alignment with the uncut marginal edges of the tube and operating to sever the marginal edges of the top and bottom of the tube as the forward end of the tube reaches its advanced position rearward of the folding-cylinders for breaking the bottom of the bag, substantially as described.

2. In a paper-bag machine, the combination of cutting-disks for severing an uncut marginal edge on each side of the bag-tube, and a follower entering into the bellows fold of the bag-tube and coacting with the cutting-disks in severing the marginal edges of the bag-tube, substantially as described.

3. In a paper-bag machine, the combination of cutting-disks for severing an uncut marginal edge on each side of the bag-tube, a follower entering into the bellows fold of the bag-tube and coacting with the cutting-disks in severing the marginal edges of the bag-tube, and means for advancing the follower coincident with the travel of the bag-tube, substantially as described.

4. In a paper-bag machine, the combination of cutting-disks for severing an uncut mar-

ginal edge on each side of the bag-tube, a follower entering into the bellows fold of the tube on each side and coacting with the cutting-disks in severing the marginal edges, an arm for each follower, a rock-shaft common to both arms, an arm having at its outer end a roller, and a cam engaging the roller for rocking the shaft and advancing the followers coincident with the travel of the bag-tube, substantially as described.

5. In a paper-bag machine, the combination of cutting-disks for severing an uncut marginal edge on each side of the bag-tube, a follower entering into the bellows fold of the tube on each side and coacting with the cutting-disks in severing the marginal edges, an arm for each follower, a rock-shaft common to both arms, an arm having at its outer end a roller, a cam for engaging the roller, and a coiled spring engaged with the roller-arm, for advancing the followers coincident with the travel of the bag-tube and returning the followers to normal position, substantially as described.

6. In a paper-bag machine, the combination of a plate under and over which the top and bottom respectively of the bag-tube passes, and having on its upper face on each side edge an upwardly-extending and forwardly-inclined riser or ledge for raising the top or upper side of the bag-tube and having at its forward end a cross-plate with depending lips for holding down the bottom or lower side of the bag-tube in opening the advance end of the tube, substantially as described.

7. In a paper-bag machine, the combination of a plate under and over which the top and bottom respectively of the bag-tube passes, and having on its upper face on each side edge an upwardly-extending and forwardly-inclined riser or ledge for raising the top or upper side of the bag-tube and having at its forward end a cross-plate with depending lips for holding down the bottom or lower side of the bag-tube in opening the advance end of the tube, and side guides to enter the bellows fold of the tube, substantially as described.

8. In a paper-bag machine, the combination of a plate under and over which the top and bottom respectively of the bag-tube passes, and having on its upper face on each side edge an upwardly-extending and forwardly-inclined riser or ledge for raising the top or upper side of the bag-tube and having at its forward end a cross-plate with depending lips for holding down the bottom or lower side of the bag-tube in opening the advance end of the tube, and side guides having their rear ends curved to enter the double fold of the tube, substantially as described.

9. In a paper-bag machine, the combination of a plate under and over which the top and bottom respectively of the bag-tube passes, and having on its upper face on each side edge an upwardly-extending and forwardly-inclined riser or ledge for raising the top or upper side of the bag-tube and having at its

forward end a cross-plate with depending lips for holding down the bottom or lower side of the bag-tube in opening the advance end of the tube, side guides to enter the bellows fold of the tube, and a frame supporting the side guides, substantially as described.

10. In a paper-bag machine, the combination of a plate under and over which the top and bottom respectively of the bag-tube passes, and having on its upper face on each side edge an upwardly-extending and forwardly-inclined riser or ledge for raising the top or upper side of the bag-tube and having at its forward end a cross-plate with depending lips for holding down the bottom or lower side of the bag-tube in opening the advance end of the tube, side guides to enter the bellows fold of the tube, a table beneath the plate and side guides, and a frame supporting the side guides and the table, substantially as described.

11. In a paper-bag machine, the combination of cutting-cylinders for severing the bag-tube outwardly from the central cross-cut on each side leaving on each side edge an uncut margin, cutting-disks for severing the uncut marginal edge on each side, a plate extending forwardly from between the cutting-cylinders and having on each side an upwardly-inclined riser or ledge and having at its forward end a cross-plate with depending lips for opening the advance end of the bag-tube, side guides entering the bellows fold of the bag-tube on each side, a table beneath the plate and the side guides, and a frame supporting the side guides and the table, substantially as described.

12. In a paper-bag machine, the combination of cutting-cylinders for severing the bag-tube outwardly from the central cross-cut on each side leaving on each side edge an uncut margin, cutting-disks for severing the uncut marginal edge on each side, followers entering the bellows fold of the bag-tube on each side and coacting with the cutting-disks in severing the marginal edges of the bag-tube, and a plate extending forwardly from between the cutting-cylinders and having on each side an upwardly-inclined riser or ledge and having at its forward end a cross-plate with depending lips for opening the advance end of the bag-tube, substantially as described.

13. In a paper-bag machine, the combination of cutting-cylinders for severing the bag-tube outwardly from the central cross-cut on each side leaving on each side edge an uncut margin, cutting-disks for severing the uncut marginal edge on each side, followers entering the bellows fold of the bag-tube on each side and coacting with the cutting-disks in severing the marginal edges of the bag-tube, a plate extending forwardly from between the cutting-cylinders and having on each side an upwardly-inclined riser or ledge and having at its forward end a cross-plate with depending lips for opening the advance end of the

bag-tube, and side guides entering the bellows fold of the bag-tube on each side, each guide having a curved rearward end, substantially as described.

14. In a paper-bag machine, the combination of a plate under and over which the top and bottom respectively of the bag-tube passes, and having on its upper face on each side edge an upwardly-extending and forwardly-inclined riser or ledge for raising the top or upper side of the bag-tube and having at its forward end a cross-plate with depending lips for holding down the bottom or lower side of the bag-tube in opening the advance end of the tube, an upper folding-cylinder, and grippers carried by the upper folding-cylinder and operating to grip the upper side of the bag-tube at its advance or open end and on each side of its center, substantially as described.

15. In a paper-bag machine, the combination of a plate having on each side edge an upwardly-inclined riser or ledge having at its forward end a cross-plate with depending lips for opening the advance end of the bag-tube, side guides entering the bellows fold of the bag-tube on each side, an upper folding-cylinder, and grippers carried by the upper folding-cylinder and operating to grip the upper side of the bag-tube at its advance or open end, substantially as described.

16. In a paper-bag machine, the combination of an upper folding-cylinder, a lower folding-cylinder, side clamps on the upper folding-cylinder for receiving and holding the upper ply of the bellows fold of the bag-tube, and side clamps on the lower folding-cylinder for receiving and holding the lower ply of the bellows fold of the bag-tube, both the clamps for the upper and lower cylinders operating to hold the tube away from the cylinders, substantially as described.

17. In a paper-bag machine, the combination of an upper folding-cylinder, a lower folding-cylinder, side clamps on the upper folding-cylinder for receiving and holding the upper ply of the bellows fold of the bag-tube, side clamps on the lower folding-cylinder for receiving and holding the lower ply of the bellows fold of the bag-tube, the clamps of both cylinders each consisting of a sliding jaw and a swinging jaw, central grippers on the upper folding-cylinder receiving and holding the upper side of the bag-tube at each side of the center, the side clamps and the grippers operating to hold the bag-tube away from the cylinders, substantially as described.

18. In a paper-bag machine, the combination of a folding-cylinder having adjacent to each end thereof a clamp for receiving and holding the ply of a bellows-folded bag-tube, each clamp consisting of a sliding dog or jaw and a swinging dog or jaw, and means for advancing the sliding dog or jaw and operating the swinging dog or jaw to clamp the ply of the bellows-folded tube and hold the tube

away from the cylinder, substantially as described.

19. In a paper-bag machine, the combination of a folding-cylinder having adjacent to each end thereof a clamp for receiving and holding the ply of a bellows-folded bag-tube, each clamp consisting of a sliding dog or jaw and a swinging dog or jaw, a lever for each sliding dog or jaw, a sliding plate having one of the levers directly connected therewith, a link connecting the other lever with the sliding plate, a roller on the sliding plate, and a fixed cam against which the roller runs in contact for simultaneously receding both of the sliding dogs or jaws, substantially as described.

20. In a paper-bag machine, the combination of a folding-cylinder having adjacent to each end thereof a clamp for receiving and holding the ply of a bellows-folded bag-tube, each clamp consisting of a sliding dog or jaw and a swinging dog or jaw, a lever for each sliding dog or jaw, a sliding plate having one of the levers directly connected therewith, a link connecting the other lever with the sliding plate, a roller on the sliding plate, a fixed cam against which the roller runs in contact for simultaneously receding both of the sliding dogs or jaws, a point on each sliding dog or jaw having an inclined face engaging an inclined face on a point of the swinging or pivoted dog or jaw for raising the pivoted dogs or jaws with the advance of the sliding dogs or jaws, substantially as described.

21. In a paper-bag machine, the combination of a folding-cylinder having adjacent to each end thereof a clamp for receiving and holding the ply of a bellows-folded bag-tube, each clamp consisting of a sliding dog or jaw and a swinging dog or jaw, a lever for each sliding dog or jaw, a sliding plate having one of the levers directly connected therewith, a link connecting the other lever with the sliding plate, a roller on the sliding plate, a fixed cam against which the roller runs in contact for simultaneously receding both of the sliding dogs or jaws, and a coiled spring engaging the sliding plate and operating to simultaneously advance both of the sliding dogs or jaws, substantially as described.

22. In a paper-bag machine, the combination of a folding-cylinder having adjacent to each end thereof a clamp for receiving and holding the ply of a bellows-folded bag-tube, each clamp consisting of a sliding dog or jaw, and a swinging dog or jaw, a lever for each sliding dog or jaw, a sliding plate having one of the levers directly connected therewith, a link connecting the other lever with the sliding plate, a roller on the sliding plate, a fixed cam against which the roller runs in contact for simultaneously receding both of the sliding dogs or jaws, a coiled spring engaging the sliding plate and operating to simultaneously advance both of the sliding dogs or jaws, a point on each sliding dog or jaw having an in-

clined face engaging an inclined face on a point of the swinging or pivoted dog or jaw for raising the pivoted dogs or jaws with the advance of the sliding dogs or jaws, and a spring connecting the two swinging or pivoted dogs or jaws for returning the dogs or jaws to normal position, substantially as described.

23. In a paper-bag machine, the combination of a folding-cylinder having in its body an opening leading from the interior to the exterior of the cylinder, a roller in the opening, a movable jaw of a gripper located at the outer periphery of the opening and closed by contact with the roller, and a fixed jaw outside of and having the movable jaw pivoted thereto and having an oscillating movement, and means for giving the fixed jaw its oscillating movements, substantially as described.

24. In a paper-bag machine, the combination of a folding-cylinder having in its body an opening, a roller in the opening, a movable jaw of a gripper closed by contact with the roller, a fixed jaw of the gripper having a stem on which the movable jaw is pivoted, an arm carrying the fixed jaw, and means for oscillating the arm to bring the movable jaw of the gripper in engagement with the roller and close the gripper, substantially as described.

25. In a paper-bag machine, the combination of a folding-cylinder having in its body an opening, a roller in the opening, a movable jaw of a gripper closed by contact with the roller, a fixed jaw of the gripper having a stem on which the movable jaw is pivoted, an arm carrying the fixed jaw, a rock-shaft on which the arm is mounted, a crank-arm on one end of the rock-shaft, a roller on the crank-arm and a fixed cam against which the roller travels for rocking the shaft and raising the arm and closing the gripper-jaws, substantially as described.

26. In a paper-bag machine, the combination of a folding-cylinder having in its body an opening, a roller in the opening, a movable jaw of a gripper closed by contact with the roller, a fixed jaw of the gripper having a stem on which the movable jaw is pivoted, an arm carrying the fixed jaw, a rock-shaft on which the arm is mounted, a crank-arm on one end of the rock-shaft, a roller on the crank-arm, a fixed cam against which the roller travels for rocking the shaft and raising the arm and closing the gripper-jaws, and a coiled spring engaged with the rock-shaft for returning the arm and the gripper to normal position, substantially as described.

27. In a paper-bag machine, the combination of a folding-cylinder having in its body an opening, a cross-plate for the opening, a roller on each side of the cross-plate, a movable jaw for each roller closed by contact with the roller, a fixed jaw for each movable jaw and having a stem on which the movable jaw is pivoted, a cross-arm for the stems, a vibratable arm for the cross-arm, and means

giving the vibratable arm its movements, substantially as described.

28. In a paper-bag machine, the combination of an upper and a lower folding-cylinder, a rock-bar on the delivery side of the cylinders, a guide-plate carried by the rock-bar and depending therefrom adjacent to the delivery side of the upper folding-cylinder and terminating at its lower end at the top plane of the lower folding-cylinder, and means for rocking the bar and advancing and receding the lower end of the guide-plate in relation to the folding-cylinders, substantially as described.

29. In a paper-bag machine, the combination of folding-cylinders, a rock-bar on the delivery side of the cylinders, a guide-plate carried by the rock-bar, a standard on the rock-bar, a link pivotally attached at one end to the standard, an oscillating lever having the other end of the link pivotally connected thereto, a roller on the oscillating lever, and a cam in engagement with the roller for rocking the bar and moving the plate away from the folding-cylinders, substantially as described.

30. In a paper-bag machine, the combination of folding-cylinders, a rock-bar on the delivery side of the cylinders, a guide-plate carried by the rock-bar, a standard on the rock-bar, a link pivotally attached at one end to the standard, an oscillating lever having the other end of the link pivotally connected thereto, a roller on the oscillating lever, a cam in engagement with the roller for rocking the bar and moving the plate away from the folding-cylinders, and a coiled spring connected with the oscillating lever for returning the rock-bar and the plate to normal position, substantially as described.

31. In a paper-bag machine, the combination of folding-cylinders, a rock-bar on the delivery side of the folding-cylinders, supporting-plates extending out from the rock-bar, rock-shafts journaled in the supporting-plates, spread rods carried by the rock-shafts, and means for rocking the shaft to open and close the spread rods, substantially as described.

32. In a paper-bag machine, the combination of folding-cylinders, a rock-bar on the delivery side of the folding-cylinders, supporting-plates extending out from the rock-bar, rock-shafts journaled in the supporting-plates, spread rods carried by the rock-shafts, a crank-arm for each rock-shaft, a link for each crank-arm and pivotally connected to the arm, a head having one of the links pivotally connected thereto, a bell-crank lever carrying the head, and means for oscillating the bell-crank lever to open and close the spread rods, substantially as described.

33. In a paper-bag machine, the combination of folding-cylinders, a rock-bar on the delivery side of the folding-cylinders, supporting-plates extending out from the rock-bar,

rock - shafts journaled in the supporting-plates, spread rods carried by the rock-shafts, a crank-arm for each rock-shaft, a link for each crank-arm and pivotally connected to the
 5 arm, a head having one of the links pivotally connected thereto, a bell-crank lever carrying the head, a sliding rod pivotally connected with the bell-crank lever, a lever contacting with the end of the sliding rod, a roller on
 10 the lever, a disk, and a cam on the disk engaging with the roller for advancing the sliding rod to move the bell-crank lever and open the spread rods, substantially as described.

34. In a paper-bag machine, the combination of folding-cylinders, a rock-bar on the delivery side of the folding-cylinders, supporting-plates extending out from the rock-bar, rock - shafts journaled in the supporting-plates, spread rods carried by the rock-shafts,
 15 an arm for each rock-shaft, a link for each crank - arm and pivotally connected to the arm, a head having one of the links pivotally connected thereto, a bell-crank lever carrying the head, a sliding rod pivotally connected
 20 with the bell-crank lever, a lever contacting with the end of the sliding rod, a roller on the lever, a disk, a cam on the disk engaged with the roller for advancing the sliding rod to move the bell-crank lever and open the spread
 25 rods, a coiled spring engaged with the sliding rod, and a coiled spring engaging with the lever for returning the parts to normal position and closing the spread rods, substantially as described.

35. In a paper-bag machine, the combination of an upper folding - cylinder, a lower folding-cylinder, end clamps for each cylinder for receiving and holding the plies of the bellows folds of the bag-tube clear of both
 40 cylinders, a central gripper on the upper folding-cylinder operating on each side of the center of and receiving and holding the end of the upper side of the bag - tube, a rocking guide-plate suspended from above on the delivery
 45 side of the upper folding-cylinder and terminating at its lower end above the periphery of the lower folding - cylinder, and spread fingers to enter the opened-out end of the bag-tube on the delivery side of the
 50 folding-cylinders, each spread finger having a downwardly-turned end to engage with and break down and straighten out the bellows fold on each side of the bag-tube, substantially as described.

36. In a paper-bag machine, the combination of an upper folding-cylinder, a lower folding-cylinder, end clamps for each cylinder for receiving and holding the plies of the bellows folds of the bag-tube clear of both
 60 cylinders, a central gripper on the upper folding-cylinder operating on each side of the center of and receiving and holding the end of the upper side of the bag-tube, a rocking guide-plate suspended from above on the delivery
 65 side of the upper folding-cylinder and terminating at its lower end above the pe-

riphery of the lower folding-cylinder, spread fingers to enter the opened-out end of the bag-tube on the delivery side of the folding-cylinders, each spread finger having a downwardly-turned end to engage with and break
 70 down and straighten out the bellows fold on each side of the bag-tube, and a defining-plate on the upper folding-cylinder for the cross fold of the bag-tube in overlaying the
 75 diamond-folded bottom of the bag onto the body of the bag, substantially as described.

37. In a paper-bag machine, the combination of an upper folding - cylinder, a lower folding-cylinder, end clamps for each cylinder for receiving and holding the plies of the bellows fold of the bag-tube, a central gripper on the upper folding-cylinder receiving and holding the end of the upper side of the bag-tube, a guide-plate on the delivery side
 80 of the folding-cylinders, spread fingers to enter the opened-out end of the bag-tube on the delivery side of the folding-cylinders, retaining-strips for the folded side flaps of the bag-bottom, and guide-plates for the folded end
 85 of the bottom of the bag, substantially as described.

38. In a paper-bag machine, the combination of an upper folding-cylinder, a lower folding-cylinder, end clamps for each cylinder for receiving and holding the plies of the bellows folds of the bag-tube clear of both cylinders, a central gripper on the upper folding-cylinder operating on each side of the center of and receiving and holding the end
 95 of the upper side of the bag-tube, a rocking guide-plate suspended from above on the delivery side of the upper folding-cylinder and terminating at its lower end above the periphery of the lower folding-cylinder, spread
 100 fingers to enter the opened-out end of the bag-tube on the delivery side of the folding-cylinders, each spread finger having a downwardly-turned end to engage with and break down and straighten out the bellows fold on
 105 each side of the bag-tube, and cutting-cylinders for severing the central tag connecting the advance bag with the next succeeding bag, substantially as described.

39. In a paper-bag machine, the combination of an upper folding-cylinder, a lower folding-cylinder, end clamps for each cylinder for receiving and holding the plies of the bellows fold of the bag-tube, a central gripper on the upper folding-cylinder receiving and holding the end of the upper side of the bag-tube, a guide-plate on the delivery side of the folding-cylinders, spread fingers to enter the opened-out end of the bag-tube on the delivery side of the folding-cylinders, retaining-strips for the folded side flaps of the bag-bottom, guide-plates for the folded end of the bottom of the bag, cutting-cylinders for severing the central tag connecting two bags, and guide-rollers for directing the bags from
 115 the folding-cylinders into the cutting-cylinders, substantially as described.

40. In a paper-bag machine, the combination of means for severing the bag-tube laterally from the center outwardly leaving an uncut marginal edge, means for severing the
5 marginal edge, means for opening the advance end of the bag-tube, an upper folding-cylinder, a lower folding-cylinder, side clamps on both cylinders receiving and holding respectively the upper and lower plies of the
10 bellows-folded tube, and grippers on the upper side of the bag-tube and maintaining the tube away from the cylinder in its passage between the cylinders, substantially as described.

15 41. In a paper-bag machine, the combination of means for severing the bag-tube laterally from the center outwardly leaving an uncut marginal edge, means for severing the marginal edge, means for opening the advance
20 end of the bag-tube, an upper folding-cylinder, a lower folding-cylinder, side clamps on both cylinders receiving and holding respectively the upper and lower plies of the bellows-folded tube, grippers for the upper
25 side of the bag-tube and maintaining the tube away from the cylinder in its passage between

the cylinders, and means for spreading the sides of the bag on the delivery side of the folding-cylinder, substantially as described.

42. In a paper-bag machine, the combination of means for severing the bag-tube laterally from the center outwardly leaving an uncut marginal edge, means for severing the
30 marginal edge, means for opening the advance end of the bag-tube, an upper folding-cylinder, a lower folding-cylinder, side clamps on both cylinders receiving and holding respectively the upper and lower plies of the
35 bellows-folded tube, grippers for the upper side of the bag-tube and maintaining the tube away from the cylinders in its passage between the cylinders, means for spreading the sides of the bag on the delivery side of the
40 folding-cylinders, and cutting-cylinders operating to sever the connecting-tag between a preceding and succeeding bag after the bags leave the folding-cylinders, substantially
45 as described.

PHINEAS L. BARTHOLOMEW.

Witnesses:

OSCAR W. BOND,

WALKER BANNING.