No. 614,123. Patented Nov. 15, 1898.

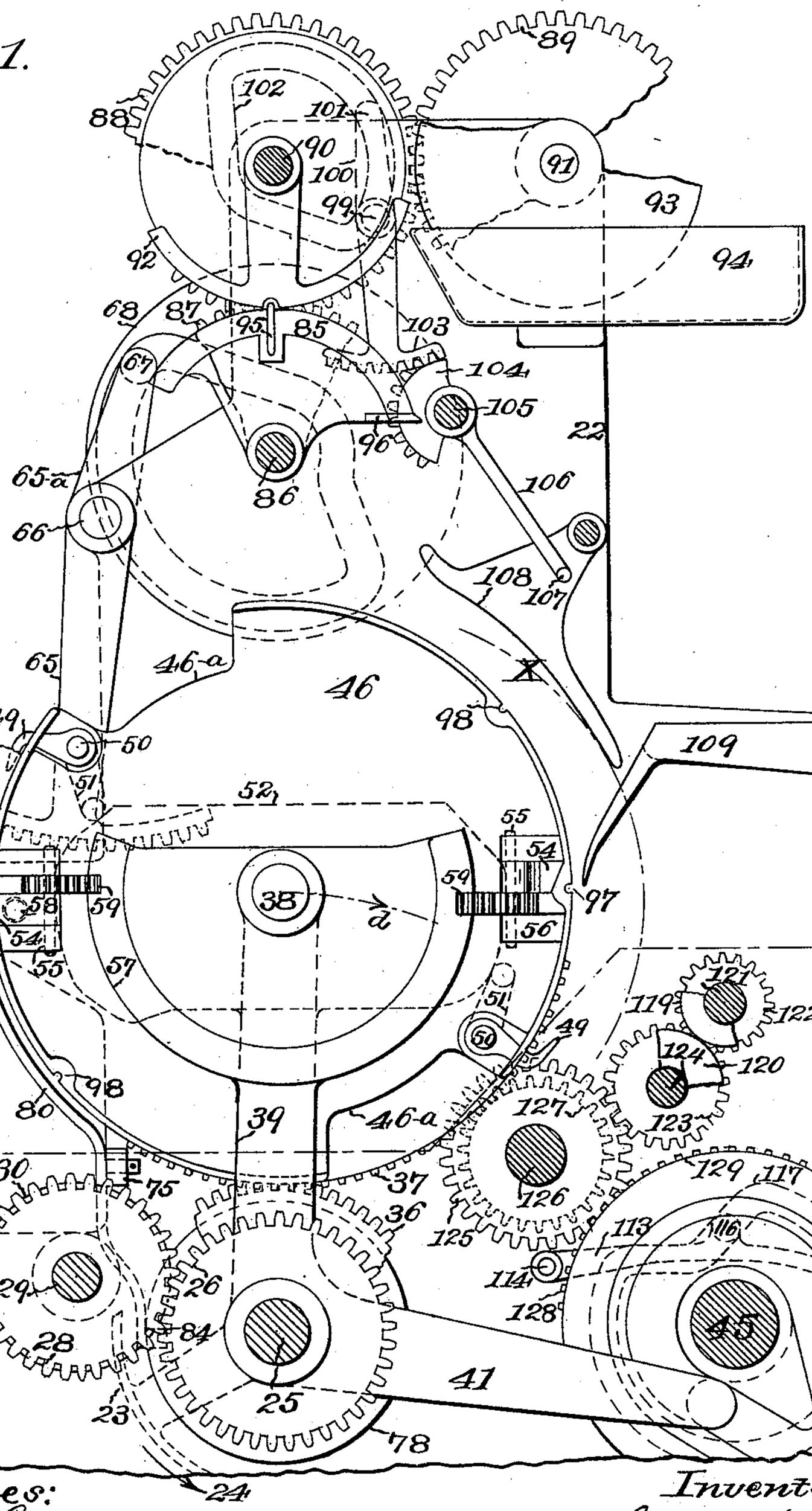
G. MORTSON.

PAPER BAG MACHINE.

(Application filed Oct. 8, 1897.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.



Witnesses:
Ed. E. Claussen
Janette S. Ellsworth.

Inventor:
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5 Sheets—Sheet 2.

Fig. 2.

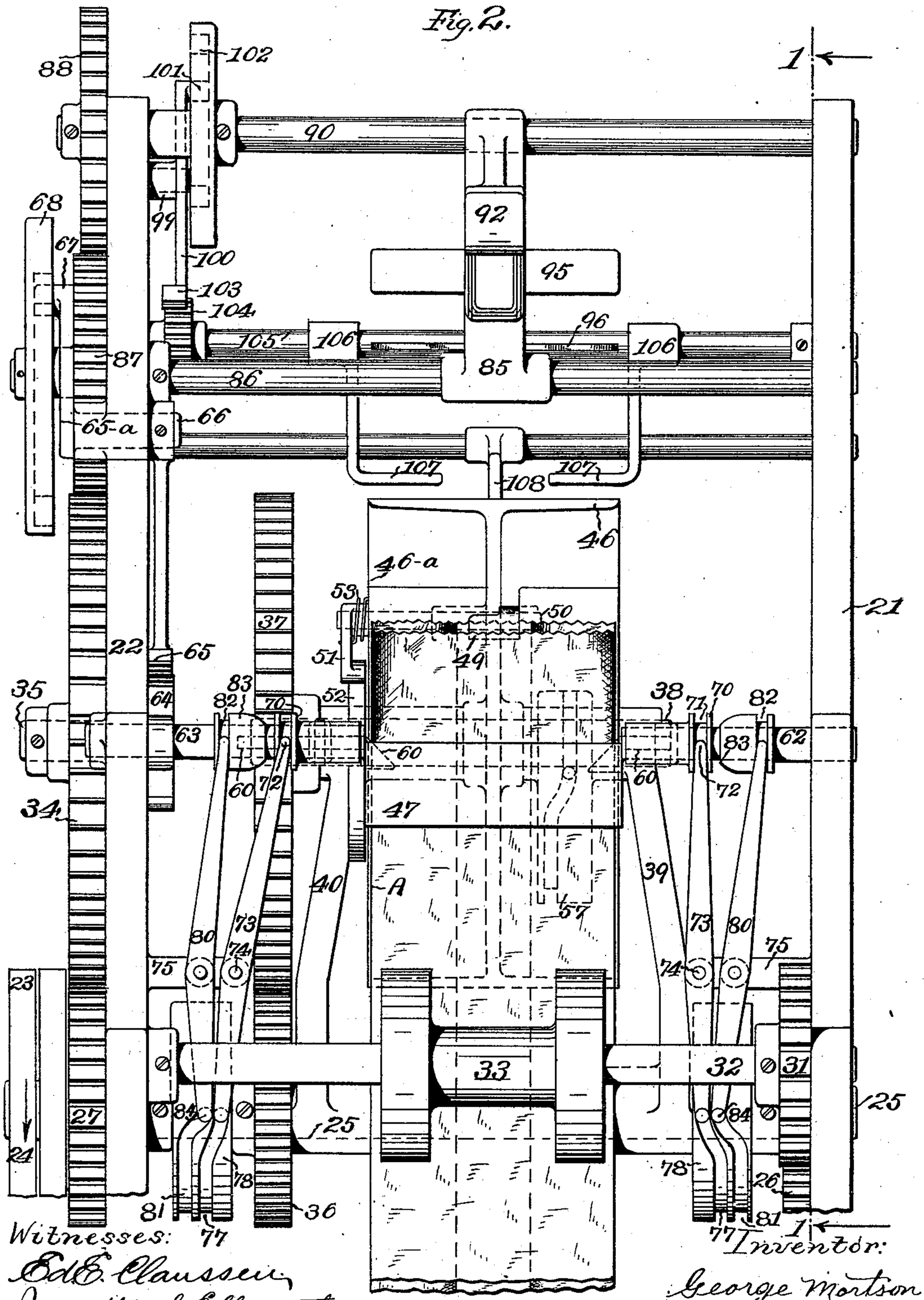

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Fig. 3.

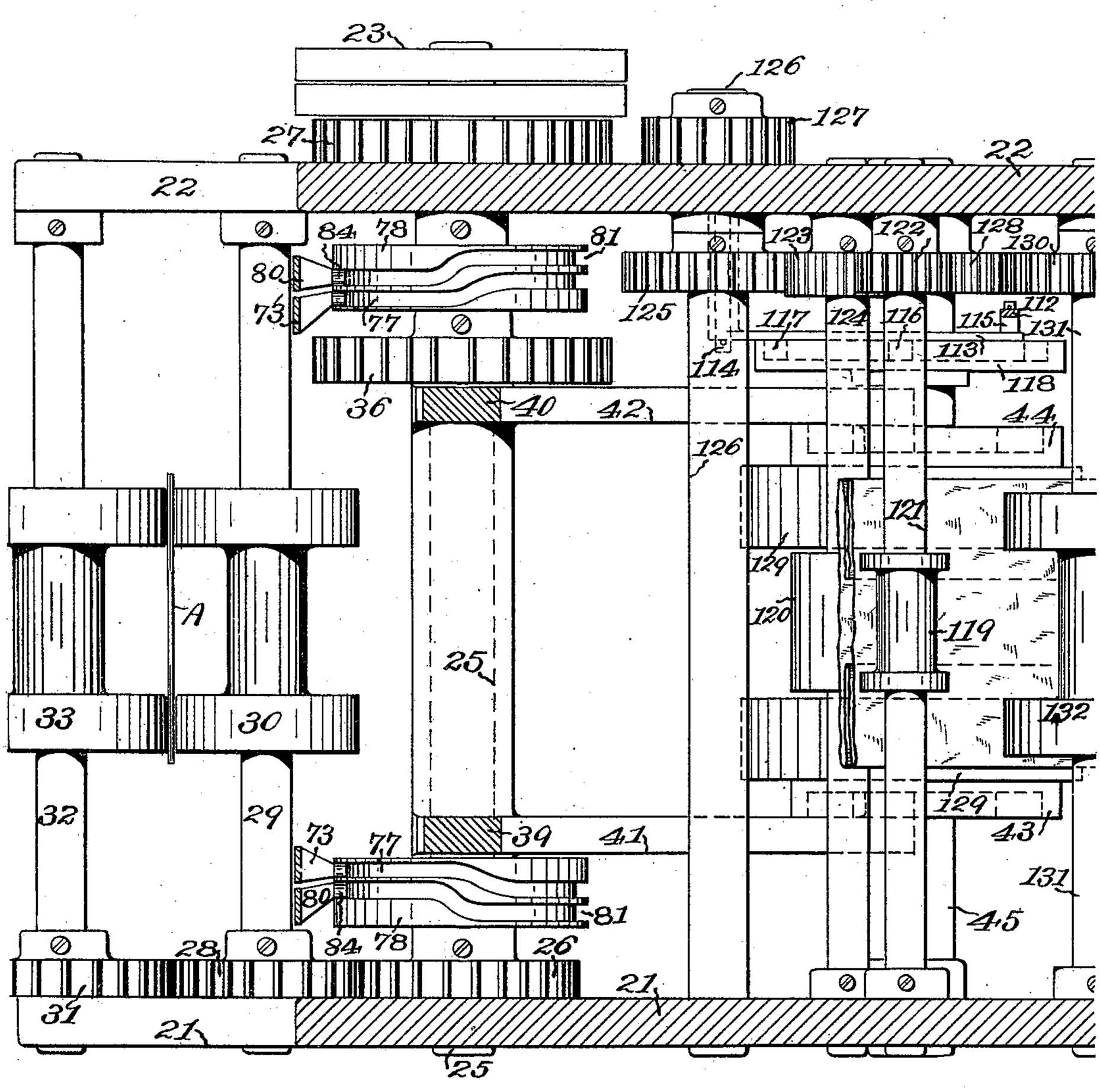
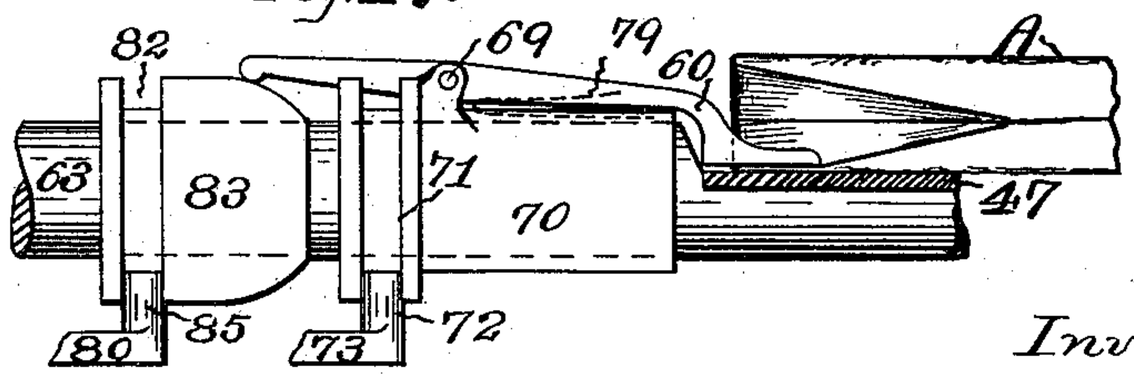


Fig. 17.



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(No Model.) 5 Sheets—Sheet 4.

Fig. 4.

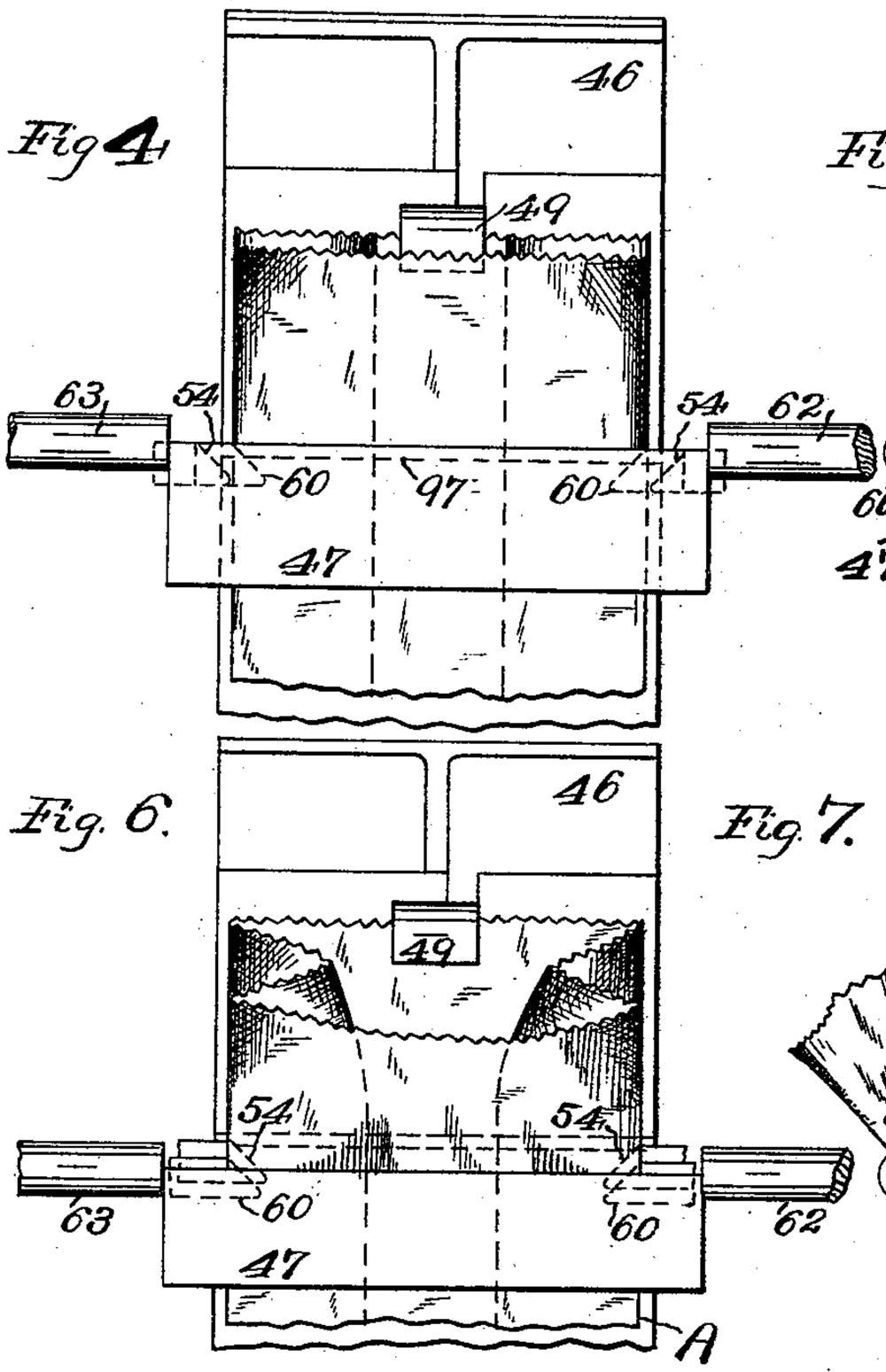

Fig. 5.

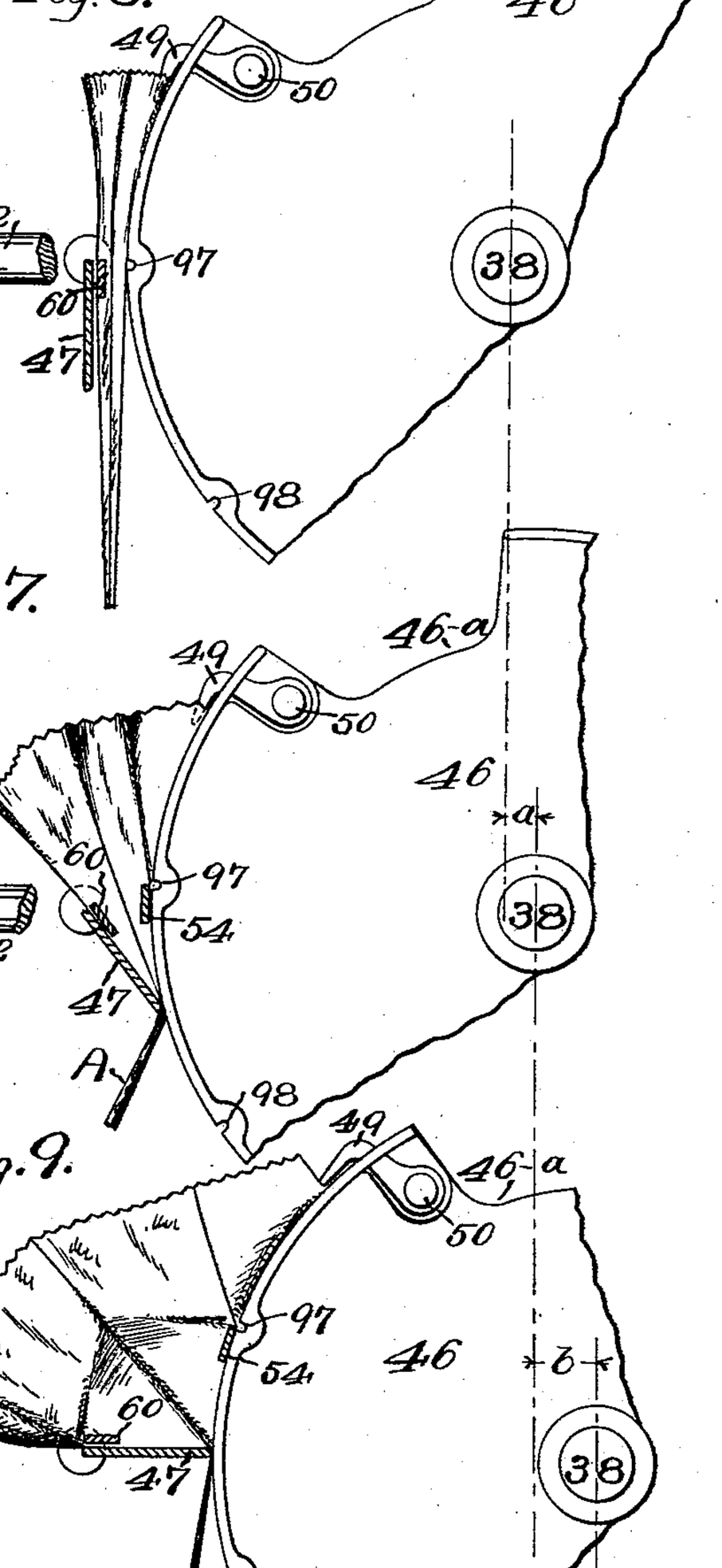

Fig. 6.

Fig. 7.

Fig. 8.

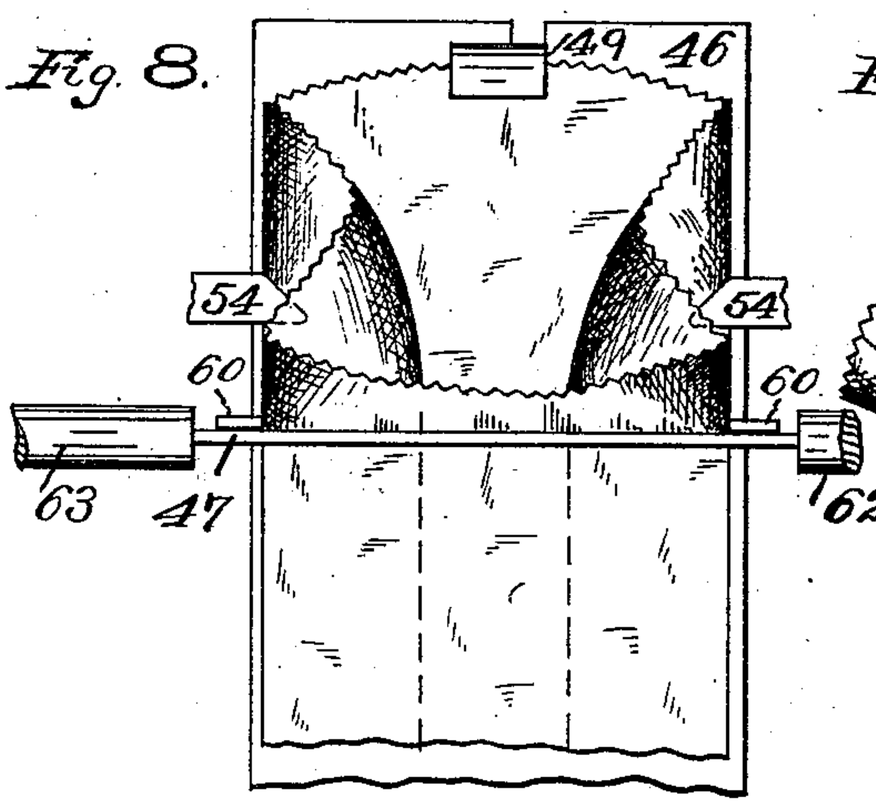

Fig. 9.

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(No Model.) 5 Sheets—Sheet 5.

Fig. 10.

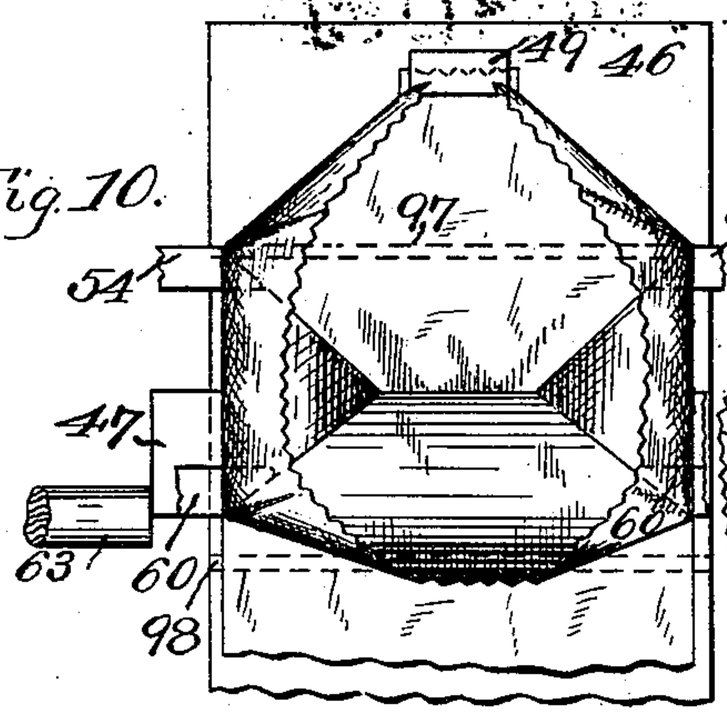


Fig. 11.

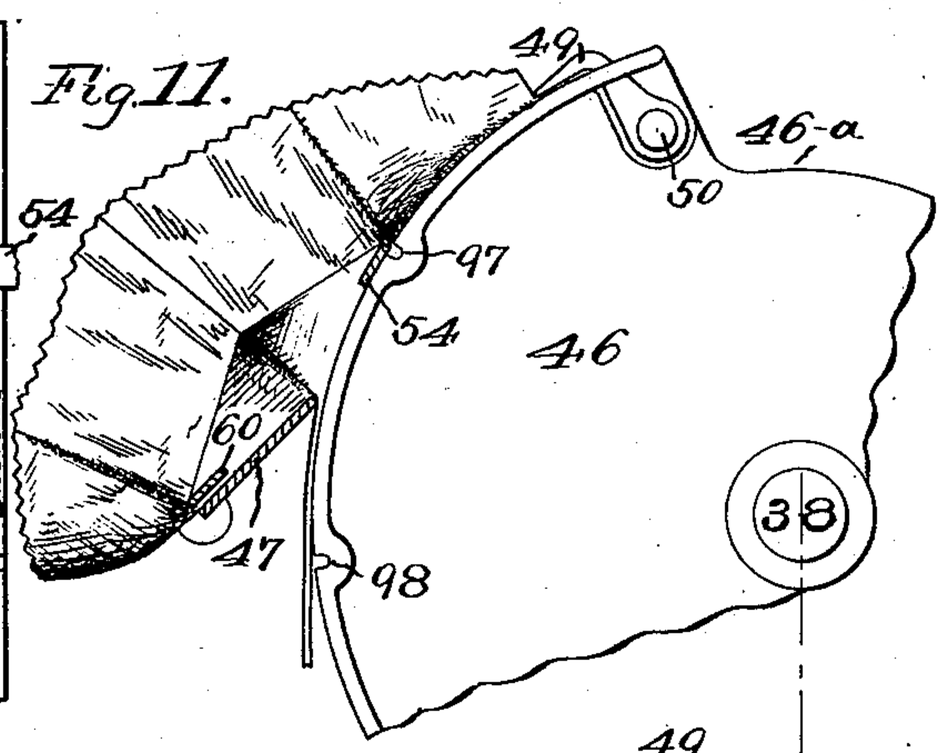


Fig. 12.

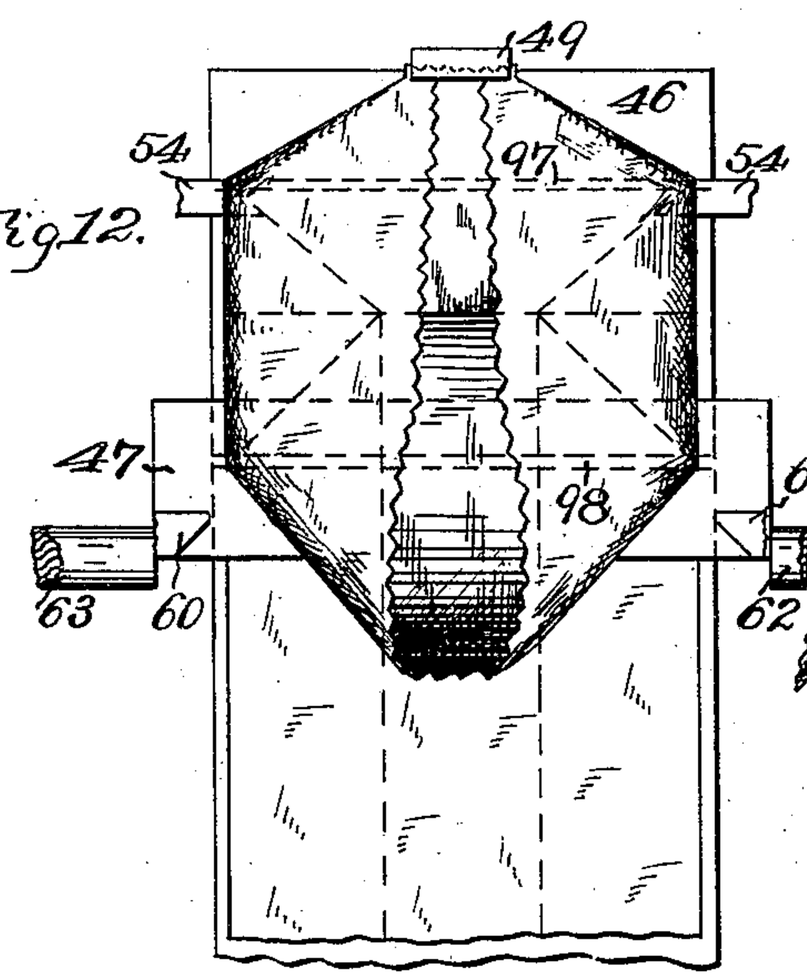


Fig. 13.

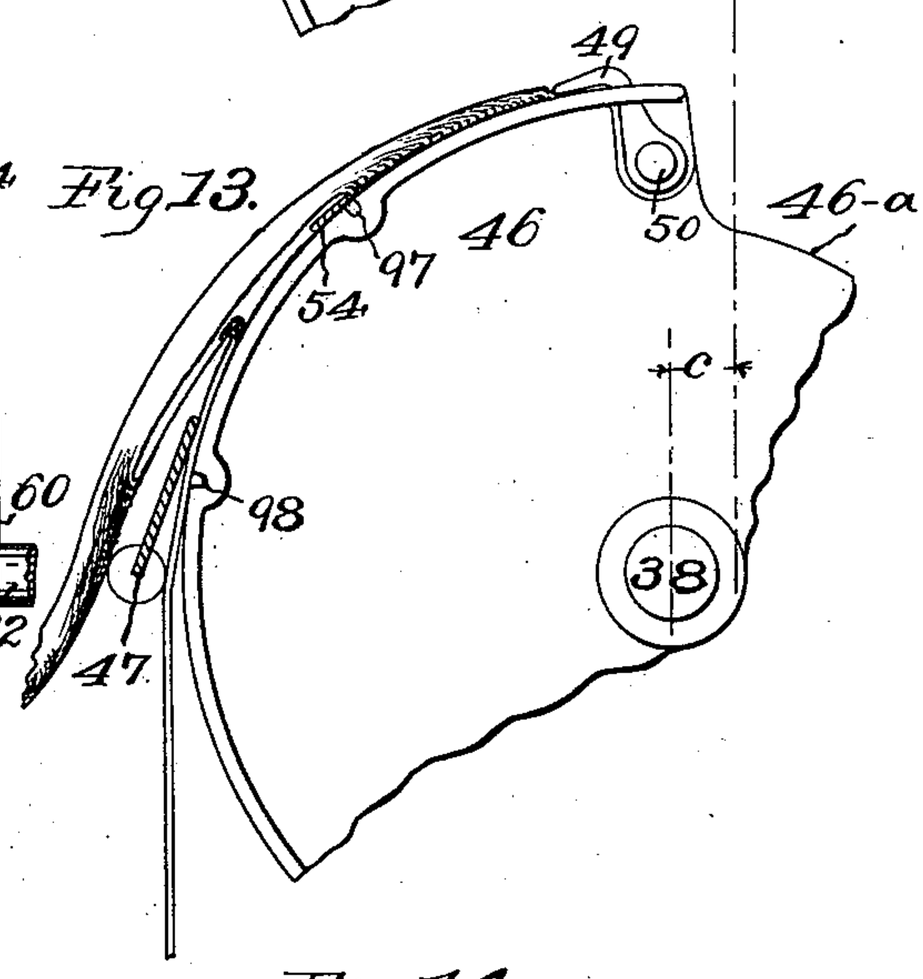


Fig. 14.

Fig. 15.

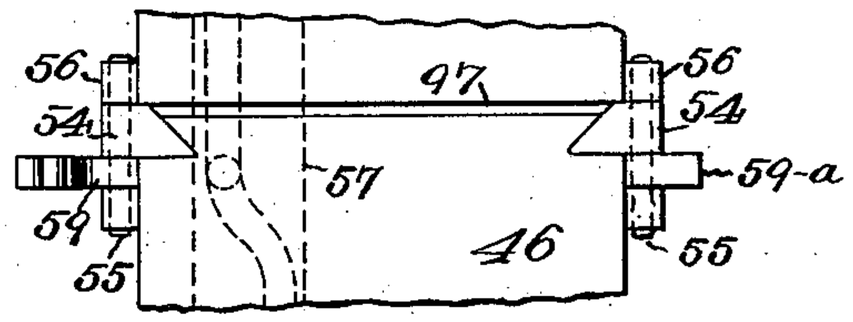
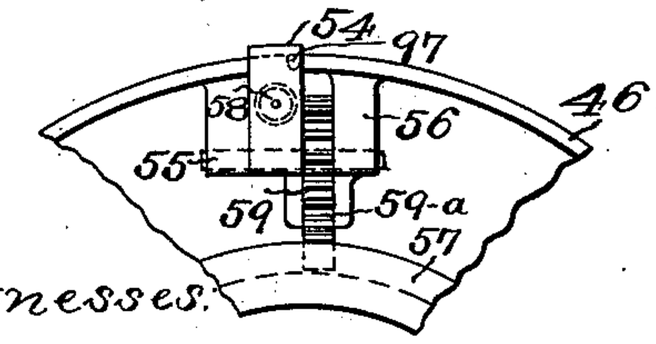
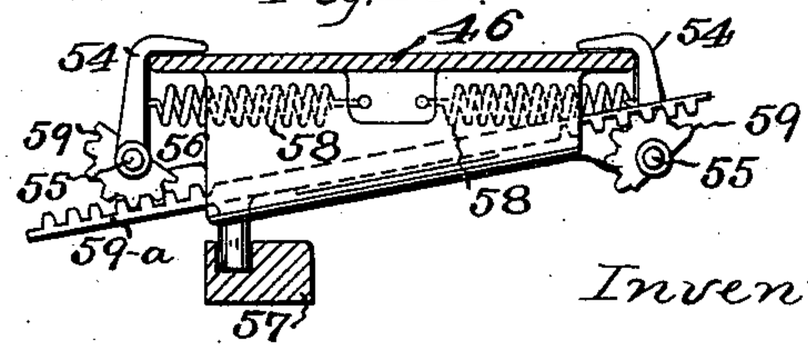


Fig. 16.





Witnesses:

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Inventor:

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UNITED STATES PATENT OFFICE.

GEORGE MORTSON, OF HARTFORD, CONNECTICUT.

PAPER-BAG MACHINE.

SPECIFICATION forming part of Letters Patent No. 614,123, dated November 15, 1898.

Application filed October 8, 1897. Serial No. 654,525. (No model.)

To all whom it may concern:

Be it known that I, GEORGE MORTSON, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Paper-Bag Machines, of which the following is a full, clear, and exact specification.

This invention relates to machinery for automatically manufacturing square-bottom paper bags from tucked-paper tubing, the same having been previously severed into bag-blank lengths, and, as herein shown and described, is especially adapted for manufacturing such bags as those set forth in reissued Letters Patent No. 10,083, although portions of this machine are susceptible of use in other machines for the manufacture of other bags.

The object of this invention is to provide a simple, cheap, and rapid machine with but few parts for taking a tucked tube already severed into bag-blank lengths by any mechanism well known to the art and folding the diamond, which is much more difficult to do on account of the intricacy of the right-angled triangular folds, and finally pasting, cross-folding, and closing the flaps to complete the bag.

The mechanisms herein shown and described have the folding-bed represented as a cylinder adapted for vibratory motion upon a shaft to the extent required to permit the tucker-plate, which is mounted in stationary bearings and adapted for oscillatory motion, to oscillate from the normal vertical position through the path of a circle of about one hundred and eighty degrees. The cylinder is provided with mutilations or has a portion broken away which permits the tucker-plate to oscillate back from its upper position into its normal position. In my present invention I accomplish these objects as follows: A tucked tube severed into bag-blank lengths is delivered from a set of drawing-rolls into the bottom-forming mechanisms for forming the characteristic primary transverse folding-line, unfolding the tucks, and forming the inside triangular folds. The pasting, cross-folding, and closing of the flaps may be done by any of the well-known methods, but in the preferred construction here shown depend partly upon the vibratory motion of that cylinder to accomplish the same.

The bottom-forming mechanism consists of an oscillatory tucker-plate provided with bevel-edged side nippers trunnioned in stationary frames and arranged to vibrate above the tubular blank in such a manner that as the bottom-forming end of the tube passes along beneath the same the bevel-edged side nippers swing into the tucks of the tube and clasp and hold them to the tucker-plate substantially in that position where the corners of the bag-bottom are to be located. The bed upon which the bag-blank rests and upon which it is carried around is represented as a cylinder, and this cylinder is also provided with a pair of bevel-edged side clips and a front clip, the former adapted to swing into the tucks of the bellows-sided tube and hold the plies of the lower tucks substantially in that position where the corresponding corners of the bag-bottom are to be located, and the latter arranged to swing down on the lower ply of the tube and hold the same to the cylinder. The tube being thus held by the tucker-plate on one side and the cylinder on the other, the tucker-plate is caused to vibrate in its stationary trunnions and the cylinder simultaneously vibrating in the direction away from the tucker-plate and rotating forward the tube is unfolded, the primary transverse folding-line across the tubular blank is defined, and when the cylinder recedes the tube is refolded and the inside triangular folds formed, producing the well-known diamond.

Figure 1 represents a right-hand side sectional elevation of the machine, the section being taken on line 1 1 of Fig. 2 and in the direction of the arrows, showing the tubular blank held by the bottom-forming mechanism ready to be operated upon. Fig. 2 is a front elevation of that represented in Fig. 1. Fig. 3 is a sectional plan view taken on the dash-and-dot line 3 3 of Fig. 1 and in the direction of the arrows. Figs. 4 to 13, inclusive, show diagrammatic plan and edge views of the bag-blank at successive stages of the completion of the diamond form. The views are drawn on an enlarged scale and show the relative positions of the oscillating tucker-plate with its nippers and the positions of

the cylinder produced by the combination of its rotary and vibratory motions and with its side and front clips thereon. Figs. 14, 15, and 16 are respectively a front, plan, and side view of the oppositely-disposed bevel-edged side clips mounted on the cylinder. Fig. 17 is an enlarged view of the nipper and mode of operating the same.

In the following specification, of which the accompanying drawings form a part, similar letters or numerals of reference designate like or equivalent parts wherever found throughout the several views.

The bed, which may be of any suitable construction to support the various frames and mechanism, has projecting upward and on each side thereof the uprights 21 and 22, in which the various shafts and mechanism are journaled, as hereinafter more fully described.

Motion is communicated to the machine by means of the pulley 23, driven in the direction of the arrow 24, (see Figs. 1 and 2,) fastened to the shaft 25, which is journaled in the uprights 21 and 22 and carries on the inner side of the upright 21 a gear 26 and on the outer side of the upright 22 a gear 27, from which the different motions and mechanisms are driven. The gear 26 meshes into the gear 28, which is fastened to the shaft 29, which is journaled in the uprights 21 and 22 and has fixed upon it the rear drawing-roll 30. The gear 28 meshes into the gear 31, which is fastened to the shaft 32, also journaled in the uprights 21 and 22, and has fastened thereto the front drawing-roll 33.

By the means above described a continuous rotary motion is transferred from the driving-pulley and shaft to the drawing-rolls, and thereby the tucked-paper tube-blanks A, which have been previously severed into bag-blank lengths, are delivered into the bottom-forming mechanism, which performs its respective functions as will now be explained.

On the left-hand side of the upright 22 and fastened upon the shaft 25, as previously stated, is the gear 27, which meshes into the large intermediate gear 34, which is rotatably mounted on the stud 35, fastened to the upright 22, and from which the upper part of the machine is driven. The shaft 25 has also fastened to it the gear 36, meshing with the cylinder-gear 37, which is fastened upon the end of shaft 38, which in turn is journaled in the arms 39 and 40, which are mounted for oscillation on the shaft 25, and whose downward and rearward extending cam-arms 41 and 42 engage, by means of their projections, the grooves of the cams 43 and 44, which are fastened to the shaft 45, which is rotatably journaled in the uprights 21 and 22.

The cam-grooves of the cams 43 and 44 are of such shape as to cause the cylinder 46, which is mounted for rotation upon the shaft 38, which is journaled in the hubs of the upward-extending arms 39 and 40, to vibrate rearward in the direction of the arrow *d* of Fig. 1 upon the shaft 25 the distance required to allow the tucker-plate 47 to clear the cylinder as it revolves on the shaft 38 from its extreme downward position, as shown in Figs. 4 and 5, in the direction of the cylinder, passing through the positions of Figs. 5. 7, and 9. The distances of the successive positions of that cylinder in its vibratory motion from its first position are indicated in those figures by the letters *a*, *b*, and *c*. The cylinder, by the continued action of the cams 43 and 44, then returns, Figs. 10 and 11, to its first or normal position, Figs. 12 and 13, the tucker-plate having made nearly a half-revolution, as clearly shown in Fig. 13. The combined rotary and vibratory motion of the cylinder produces the successive positions of Figs. 5, 7, 9, 11, and 13. The cylinder is provided with mutilations 46ª, or broken-away portions, which permit the tucker-plate to oscillate back to its starting or normal position.

The cylinder is provided with front clips 49, fastened to shaft 50, and their free ends are provided with cam-arms 51, engaging the cam 52, which is a part of the upward-extending arm 40. The timing of the cam 52 in relation to the rotation of the cylinder is such that the front clip 49 is caused to close against the pressure of the spring 53 as the leading end of the tube advances and holds the lower ply of the tube thereto, as shown in Figs. 4 to 13, inclusive, to carry the same onward and to release the same again when the diamond form is completed. The cylinder is also provided with two pairs of bevel-edged side clips—that is, with each front clip is coacting one pair of bevel-edged side clips 54, as best shown in Figs. 14, 15, and 16, pivotally mounted on shafts 55 in bosses 56 beneath the folding-surface of the cylinder. Those side clips have pinion-sectors 59 fastened thereto, meshing into racks 59ª, provided with a projection adapted to engage the cam-groove of the cam 57. To allow for wear and still maintain the grip on the tube, I have provided the clips with springs 58, which hold the clips firmly in the downward position. The cam 52, operating the front clips 49, the cam 57, which causes to operate the side clips, and the cam 43, which causes the cylinder to oscillate, are so shaped in relation to the rotation of the cylinder and the advancing bottom-forming end of the tucked-paper tube that as the front clip grips the lower ply to the cylinder and the side clips 54 enter the tucks and hold the lower ply to the cylinder the latter is oscillating away from the tucker-plate 47 with its coacting side nippers 60, which enter the tucks, and with the tucker-plate grip and turn back this upper fold, as shown in Figs. 4 to 13, inclusive, and unfold the tube, and as the cylinder is continuously rotating on shaft 38 and vibrating back to its normal position the blank is refolded and carried on around.

The tucker-plate 47 is mounted in trunnions 62 and 63 in the stationary uprights 21 and 22 and is oscillated by means of the pin-

ion-sector 64, rigidly connected to the trunnion 63 and meshing into the sector 65, pivotally mounted on the shaft 66, which is attached to the inner side of and adjacent to the upright 22. On the outside of the upright 22 and fastened to the shaft 66 is the upward-projecting arm 65ª, and the same is provided with the projection 67, engaging the cam-groove in the cam 68. The tucker-plate is provided with two oppositely-disposed bevel-edged side nippers 60, pivotally mounted by the pivots 69 in the slides 70, which receive a lateral oscillatory motion by means of the grooves 71, in which the projections 72 of the arms 73 are adapted to engage. Those arms are pivotally mounted on pivots 74 upon projecting lugs 75 of the uprights 21 and 22, and their lower ends engage cam-grooves 77 of the rotating cams 78, which are fastened on the shaft 25 and rotate therewith. Springs 79 tend to press the nippers away from the tucker-plate and are bedded in grooves of said nippers and corresponding opposite grooves in the slides 70. The nippers are closed and pressed to the tucker-plate by means of cones 83, operated by another set of arms 80, also pivotally mounted on lugs 75, having projections 84 upon their lower ends which engage the cam-grooves 81 of the cams 78, and the upper ends of those arms 80 engage in the grooves 82 of those conical slides 83 with the projecting arm of that side nipper resting on the cone on those slides. Therefore as the projections 84, engaging the cam-grooves 81, are in their extreme limit of outward movement the nippers will be pressed to the tucker-plate, as previously stated, and rest upon the conical slides, as clearly shown in Fig. 17. The center line of the trunnions 62 and 63 coincides with a line which passes through the two points of intersection formed by the edges of the tube and the forty-five-degree edges of the nippers. The distance from the center line of the trunnions to the folding edge of the tucker-plate is substantially equal to the depth of the tucks and serves to define the primary transverse folding-line across the tubular blank as the same is carried onward by the cylinder. The timing of the cam-grooves 77 and 81, which respectively oscillate laterally and open and close and carry the side nippers laterally, the cam 68, by means of which the tucker-plate 47 is oscillated, the cam 52, operating the front clip 49, the cam 57, operating the bevel-edged side clips 54, and the cams 43 and 44, which give the cylinder its oscillatory motion, are all in such relation to the rotation of the cylinder that as the bottom-forming end of the tube enters the folding mechanism it is gripped by the front clip, the nippers enter the tucks and hold the upper fold to the tucker-plate, the cylinder oscillates away from the stationarily-trunnioned tucker-plate, which is continuously rotating, the tucks of the tube are distended and unfolded into the well-known inside triangular folds, and the primary transverse folding-line across the tube formed by the tucker-plate, as is clearly shown in the drawings in Figs. 4 to 13, inclusive, and the tubular blank of Figs. 4 and 5 is converted into the diamond form of Figs. 12 and 13.

The paste is applied by sector 85, fastened to shaft 86, carrying connected thereto the gear 87, meshing with the large intermediate gear 34. The gear 87 also drives the train of gears 88 and 89 on shafts 90 and 91, which have fastened thereto the intermediate paste-sector 92 and paste-roll 93, the latter revolving in the paste-box 94, and from which the paste is delivered to the bag. The gears 87, 88, and 89 are so geared in relation to the cylinder-gear that the face of the paste-sector 85 comes in contact with the surface of the cylinder twice to each revolution of the cylinder, and in this manner the paste is deposited on each bag as it passes along.

The folding of the rear and front flaps is accomplished as follows: The paste-sector 85 has attached thereto the two creaser-blades 95 and 96 at a distance apart, measured upon the circumference of the paster, equal to twice the depth of the tucks, which correspond with the transverse creaser-grooves 97 and 98 in the cylinder. On a projecting lug 99 of the upright 22 is pivotally mounted the arm 100, the upper extension of which has a projection 101 engaging a cam 102, fixed upon the shaft 90, which, as before stated, is driven by the gear 88, and that arm has its lower extension terminating in the sector 103, meshing into the sector-pinion 104, which is fastened upon the shaft 105. This shaft has also fastened upon it the plicators 106, provided with the projections 107, and as the cam 102, which operates these plicators, revolves they are oscillated from a position below the paste-sector 85 toward the guide 108. Just before the oscillation takes place the front creaser-blade 95 forces the blank into the corresponding groove 97 of the cylinder and raises the front flap, and the creaser-blade 96 engages groove 98 and slightly raises the rear flap from the face of the cylinder, the plicators swing from the rearward end of the bag-blank, and as the cylinder is at this point just vibrating away from the tucker-plate and toward the guide 108 it acts to push and turn the flap over into its final position on the bottom of the bag under the guide 108, where it is held in position. As the blank continues to be propelled onward, the folder-finger 109 catches into the crease of the front flap and delivers the bag to the delivery-rolls 119 and 120. The folder-finger is mounted and operated as follows: The folder-finger 109 is securely fastened to the shaft 110, which is journaled in the uprights 21 and 22 and carries on the outer side of the upright 22 the arm 111, having pivotally connected thereto the connecting-rod 112, the lower end of which is pivotally connected to the cam-arm 113 by the pin 115. The cam-arm 113 is pivoted on the stud 114, held rigidly on the inner side of the up-

right 22. The cam-arm 113 has about midway between the stud 114 and the connecting-pin 115 the rightward-projecting stud 116, engaging the cam-groove 117 of the cam 118, and that cam is so timed in accordance with the rotation of the cylinder and the front clip-cam 52, that operates the front clip 49, that the front end of the bag is released just previous to that position shown in Fig. 1. The bag-blank being held over the curved surface of the cylinder has the tendency to spring away from the cylinder, and when the front clip is opened and the front flap released the same will be thrown forward, and when the blank arrives at the position shown in Fig. 1 the end of the folder-finger 109 will engage the crease in the blank formed by the creaser-blade 95 and the groove 97 in the cylinder and deliver the blank into the delivery-rolls.

The upper front delivery-roll 119 is fixed upon the shaft 121, which carries the gear 122, driven by the gear 123 upon the shaft 124, which carries the lower front delivery-roll 120. The gear 123 is in turn driven by gear 125 upon the shaft 126, to which is rigidly mounted the gear 127, which is in mesh with and therefore driven from the large intermediate gear 34. The gear 125 meshes into the gear 128 upon the shaft 45, which has also secured thereto the lower rear delivery-roll 129. The gear 128 drives the gear 130 upon the shaft 131, upon which is also mounted the upper roll 132.

The operation of the machine is as follows: The tucked-paper tube is taken from the rolls 30 and 33, having been previously severed into bag-blank lengths, the revolution of these rolls being in such relation to the revolution of the cylinder that two revolutions of those rolls are made to one of that cylinder and that the bag-blank lengths are thereby fed to the bottom-forming mechanisms as required. The bottom-forming end of the tube is guided into the bottom-forming mechanism in such a manner that the same enters between the tucker-plate 47, provided with the bevel-edged side nippers 60 on one side and on the other side by the cylinder 46, which is provided with the front clip 49 and the two oppositely-disposed side clips 54. The tube, as it arrives at about the position shown in Figs. 4 and 5, is clasped by the front clip 49, the same being carried by the cylinder, and by virtue of the cam 52 the side clips 54 are caused to close by means of the cam 57, thus holding the lower fold of the tube to the cylinder. The side nippers 60 are caused to close against the tucker-plate by means of the cam-grooves 77 and 81, and as the cylinder is simultaneously rotating and oscillating away from the stationarily-trunnioned tucker-plate the primary transverse folding-line is formed across the tubular blank and the well-known inside triangular folds formed, converting the tubular blank of Figs. 4 and 5 into the diamond form of Figs. 12 and 13. The bag is carried on by the revolving cylinder to the paste-sector 85, which applies the paste received from the intermediate paste-sector 92, which takes it from the paste-roll 89. The creaser-blades 95 and 96 then engage successively the creaser-grooves 97 and 98, thus raising, respectively, the front and rear flaps slightly from the surface of the cylinder. The plicators 106, with their projecting arms 107, then swing from the rearward end of the bag and push and turn the flap over upon the bottom of the bag, where it is held until the guide 108 is reached, which holds it down in that position. The folder-finger 109 then engages in the crease of the front flap, the front clip having opened and released the lower ply, and carries the bag on into the bite of the delivery-rolls 119 and 120 and then through the rolls 129 and 132.

This machine is distinguished from all prior machines for making square-bottomed paper bags in that it carries both plies of the paper tube at the primary transverse folding-line, which is defined by the lower edge of the tucker-plate, forward under the secondary transverse folding-line, across the upper ply of the paper tube, (see Figs. 7, 9, and 11,) which is afterward defined by the creaser-blade and the creaser-groove in the cylinder, instead of carrying the secondary transverse folding-line backward over the primary transverse folding-line. In this new mode of operation the cylinder continuously revolves and simultaneously vibrates from its normal position away from the tucker-plate while it is coöperating with that tucker-plate to make the primary transverse fold and the inwardly-inclined triangular folds during the first half of that making, Figs. 7 to 9, and vibrates outward to its normal position while it is thus coöperating during the last half of that making, Figs. 9 to 13, whereas in every prior machine the folding-bed does not thus oscillate while those folds are being made, but simply holds the lower ply of the paper tube against all oscillation while the upper ply is being turned over backward upon itself. It results from this new mode of operation that all the devices which act upon the paper to make the primary tranverse fold and the inwardly-projecting triangular folds are moving forward while they are making them, whereas in the prior machines some devices which help make those folds are moving backward at that time, and this new result is promotive of speed and also of some of the other superiorities which characterize this machine.

In the machine herein illustrated the line of paper that will eventually form one edge of the rectangular bottom coincides with the axis of the trunnions of the tucker-plate 47, which are held perfectly stationary except as to the rotation about the orbit of the tucker-plate during and while both plies of the paper tube are tucked under by the tucker-plate and while the edge of that tucker-plate

forms the primary transverse folding-line. The cylinder 46 vibrates away from that tucker-plate a sufficient amount to permit the tucker-plate to pass, (see Fig. 9,) thereby unfolding the tube. As the tucker-plate continues its uninterrupted oscillation (see Figs. 11 and 13) the cylinder recedes, thereby refolding the unfolded tube into a paper-bag blank.

Another feature wherein this machine distinguishes itself from all prior machines is the turning of the rear flap, in that the same is partly raised by the creaser 96, forcing the blank into the creaser-groove, thereby raising the same partly from that cylinder, permitting the ends of the plicators 107 to get back of the same and turn the flap forward under the guide 108. At this instant the cylinder begins to vibrate from its normal position toward that guide to the dash-and-dot position X of Fig. 1, and the flap is brought down upon the bottom of the bag, and then the front flap is turned by the folder to be delivered into the delivery-rolls.

In the machine herein illustrated I have the rotating and vibrating cylinder arranged for two bags—that is, two paper-bag blanks are guided into the bottom-forming mechanism to each revolution of the cylinder; but it is obvious that the details of construction and the general arrangement may be varied to use a one or three bag cylinder without departing from the spirit of my invention herein disclosed.

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

1. The combination of a continuously-rotating cylinder, mechanism to vibrate that cylinder, and bag-bottom-forming mechanism consisting of a tucker-plate having a folding edge, stationary supporting-frames for said plate, and means for oscillating the tucker-plate; the cylinder being adapted to move away from the tucker-plate during the first half of its rotary and vibratory movement and the tucker-plate to oscillate to unfold a paper tube and to refold the tube upon the return movement of the cylinder and backward movement of the tucker-plate, all substantially as described.

2. The combination of a continuously-rotating cylinder, mechanism to vibrate that cylinder, devices to hold the lower ply of a tucked-paper tube upon the face of that cylinder; a tucker-plate mounted in the stationary frames and provided with a folding edge, means for vibrating that tucker-plate, devices to hold the upper ply of a tucked-paper tube against the face of the tucker-plate between the line of its trunnions and the line of its defining edge; all coöperating during the rotary and vibratory movement of the cylinder away from the tucker-plate during the first half of the oscillation of the tucker-plate to unfold a tucked-paper tube and to refold the same into a paper-bag blank during the rotary and vibratory movement of the cylinder toward the tucker-plate and during the last half of the oscillation of the tucker-plate, substantially as described.

3. The combination of a rotating cylinder, mechanism to vibrate that cylinder, the mutilations in the circumference of the cylinder, devices to hold the lower ply of a tucked-paper tube upon the face of that cylinder; a tucker-plate mounted in the stationary frames and provided with a folding edge, means for vibrating that tucker-plate, devices to hold the upper ply of a tucked-paper tube against the face of the tucker-plate between the line of its trunnions and the line of its defining edge, all coöperating during the rotary and vibratory movement of the cylinder away from the tucker-plate during the first half of the oscillation of the tucker-plate to unfold a tucked-paper tube and to refold the same into a paper-bag blank during the rotary and during vibratory movement of the cylinder toward the tucker-plate and the last half of the oscillation of the tucker-plate, substantially as described.

4. In a paper-bag machine, the combination of a continuously-rotating cylinder, mechanism to vibrate that cylinder by a cam; side clips having the capacity of moving toward and from each other to hold the lower ply of a tucked-paper tube upon the face of the cylinder; the tucker-plate mounted in the stationary frames and provided with a folding edge, means for vibrating that tucker-plate, side nippers having the capacity of moving toward and from each other, to hold the upper ply of the tucked-paper tube to the face of the tucker-plate between the line of its trunnions and the line of its defining edge, all coöperating during the rotary and vibratory movement of the cylinder away from the tucker-plate during the first half of the oscillation of the tucker-plate to unfold a tucked-paper tube and to refold the same into a paper-bag blank during the rotary and vibratory movement of the cylinder toward the tucker-plate and during the last half of the oscillation of the tucker-plate, substantially as described.

5. In a paper-bag machine, the combination of a continuously-rotating cylinder, mechanism for vibrating that cylinder by a cam, and provided with the mutilations and also with devices to hold the lower part of the tubular blank; the tucker-plate trunnioned in the uprights and provided with side nippers, operating means to cause the tucker-plate to vibrate, and means to close the nippers on the tucker-plate, all parts combined and operating to distend and unfold the tucked-paper tube and form the inside triangular folds while the cylinder is vibrated away from the tucker-plate, and simultaneously the tucker-plate defining the primary transverse folding-line across the blank; the whole operating to

convert the blank into the diamond form, while the blank is carried onward by the cylinder substantially as described.

6. In a paper-bag machine, the combination of a continuously-rotating cylinder, provided with the front clip and the two oppositely-disposed side clips, arranged to swing down upon the lower part of the tubular blank, and hold the same to that cylinder, mechanism to vibrate that cylinder, the tucker-plate trunnioned in the uprights and provided with the side nippers, operating means to vibrate the tucker-plate, operating means to cause the side nippers to swing down upon the tucker-plate and hold the upper part of the tubular blank, all parts combined and operating to distend and unfold the tubular blank to form the inside triangular folds while the edge of the tucker-plate travels with the combined movement of the rotating and vibrating cylinder in order to define the primary transverse folding-line, substantially as described.

7. The combination of a rotating cylinder, arms in which that cylinder is mounted, cams for vibrating those arms and that cylinder, and the tube-gripping device on that cylinder; the tucker-plate, tube-gripping devices on the tucker-plate, all arranged and operating so that when the tucker-plate swings toward the cylinder, that cylinder vibrates away from the tucker-plate and then returns with the same, substantially as described.

8. The combination of a rotating cylinder, arms in which that cylinder is mounted, cams for vibrating those arms and that cylinder, tube-gripping devices on that cylinder; the tucker-plate, tube-gripping devices on the tucker-plate, all arranged and operating so that when the tucker-plate vibrates, the combined motion of the rotating and vibrating cylinder will yield to the folding edge of that tucker-plate, substantially as described.

9. The combination of a continuously rotating and vibrating cylinder, devices to hold one side of a paper tube to that cylinder; a tucker-plate mounted on trunnions and having a folding edge adapted to define the transverse folding-line across the other side of that blank, slides adapted to reciprocate on the trunnions, nippers pivotally mounted to the slides, the conical slides adapted for lateral reciprocation to force the nippers to the tucker-plate, substantially as described.

10. The combination of a continuously rotating and vibrating cylinder, devices to hold one side of a paper tube to that cylinder, a tucker-plate mounted on trunnions and having a folding edge adapted to define the transverse folding-line across the other side of that blank, operating means for oscillating that tucker-plate, slides adapted to reciprocate on the trunnions, nippers pivotally mounted to the slides, the conical slides adapted for lateral reciprocation, to force the nippers to the tucker-plate, substantially as described.

11. The combination of a continuously rotating and vibrating cylinder, devices to hold one side of a paper tube to that cylinder, a tucker-plate mounted on trunnions and having a folding edge adapted to define the transverse folding-line across the other side of that blank, operating means for oscillating that tucker-plate, slides mounted on the trunnions and cams for oscillating the same laterally, nippers pivotally mounted to the slides, conical slides operating those nippers and cams for oscillating those conical slides laterally to open and close those nippers, substantially as described.

12. The combination of a continuously-rotating cylinder, means for vibrating that cylinder, transverse creaser-grooves in that cylinder, creaser-blades coöperating with those grooves, the plicators for partly turning the rear flap and the vibrating cylinder to hold that flap against the guide, substantially as described.

13. The combination of a continuously-rotating cylinder, arms upon which that cylinder is mounted, and means for vibrating the same, the transverse creaser-groove in the cylinder, the creaser-blade coöperating with that groove to raise the flap from the cylinder, the plicator to partly turn that flap under the guide and to complete that flap folding by the oscillation of that cylinder toward that guide, substantially as described.

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