

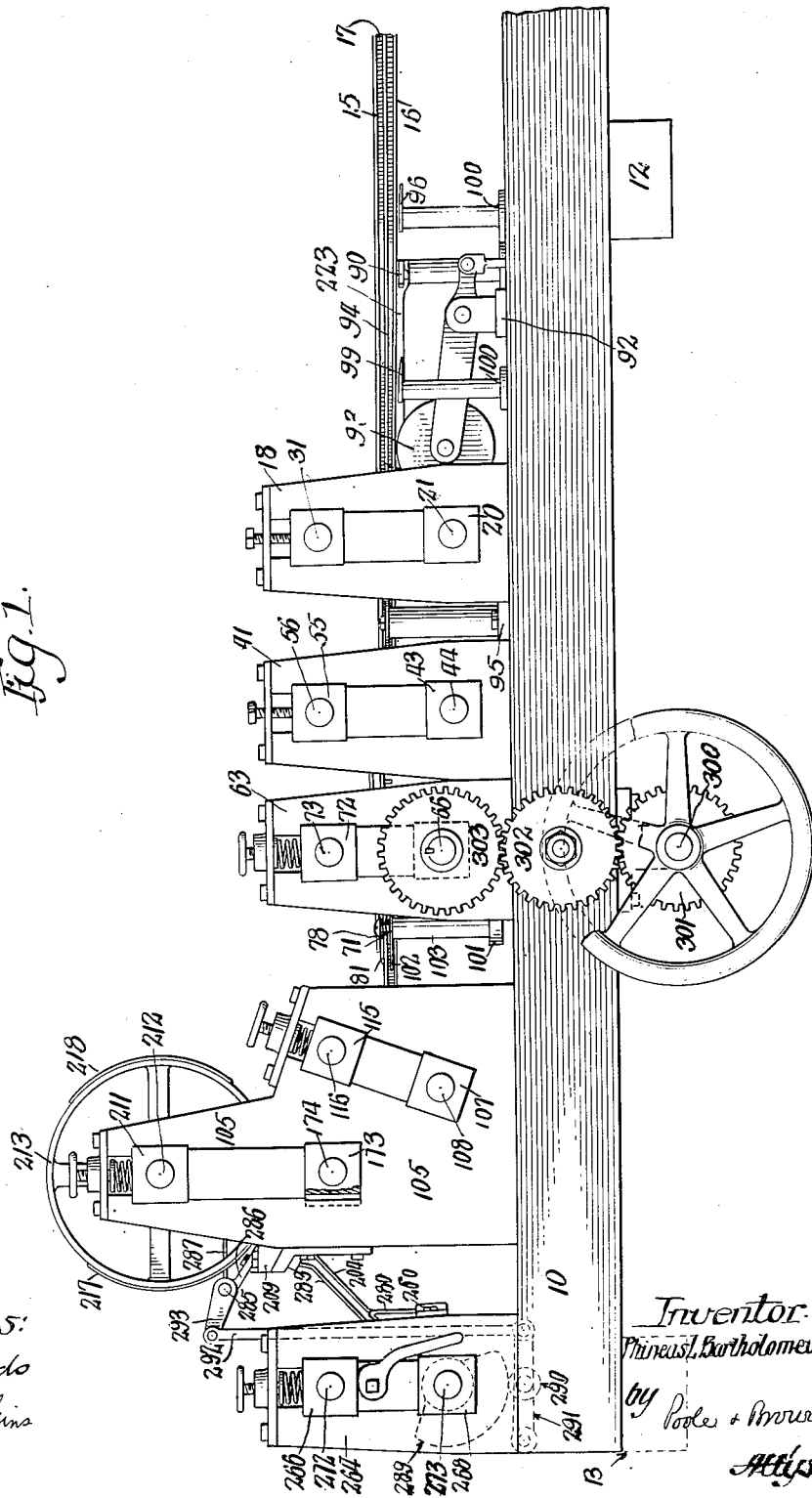
P. L. BARTHOLOMEW.
PAPER BAG MANUFACTURING MACHINE.
APPLICATION FILED FEB. 14, 1907.

Patented July 27, 1909.

10 SHEETS—SHEET 1.

929,273.

Fig. 1.



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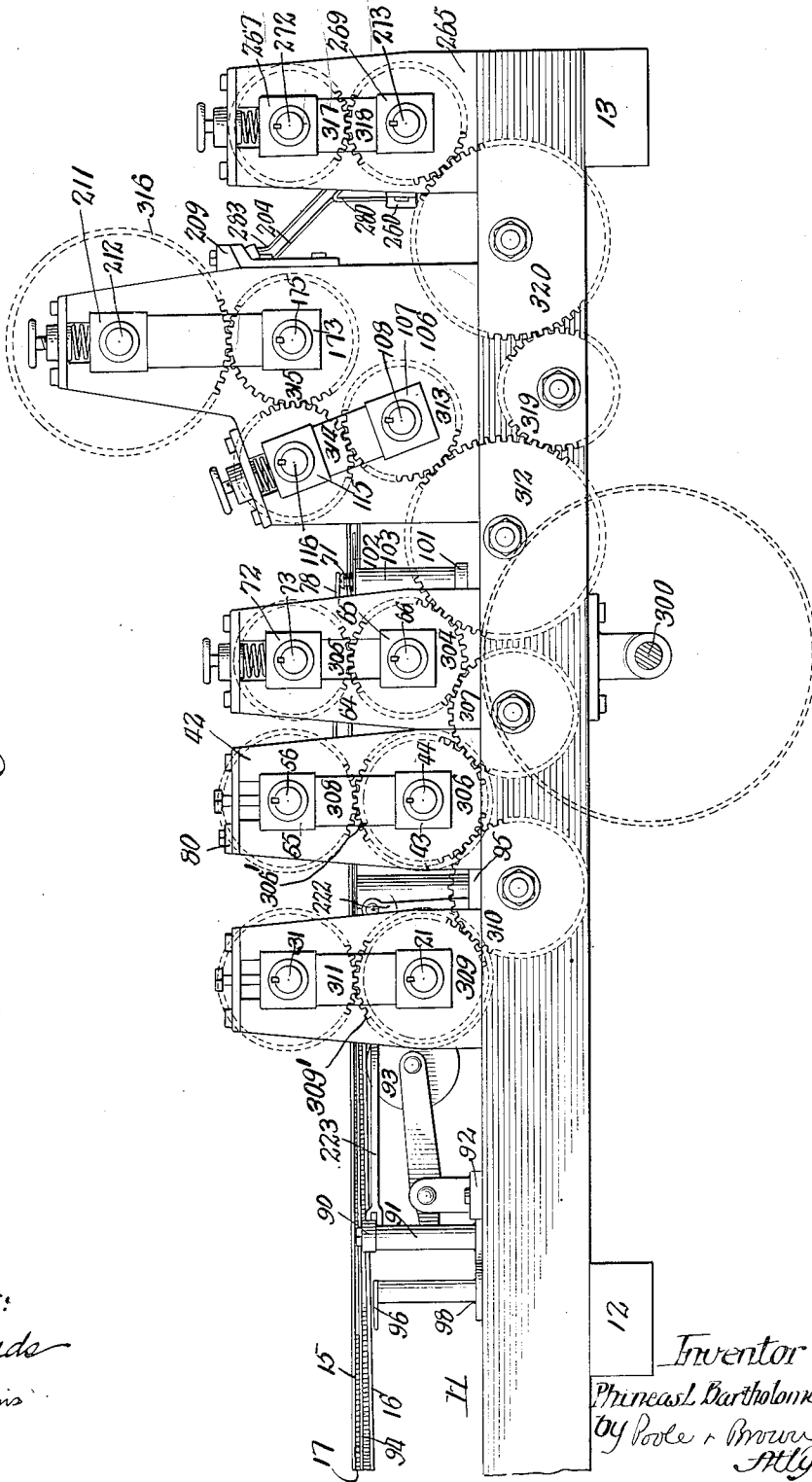
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Fig. 2.



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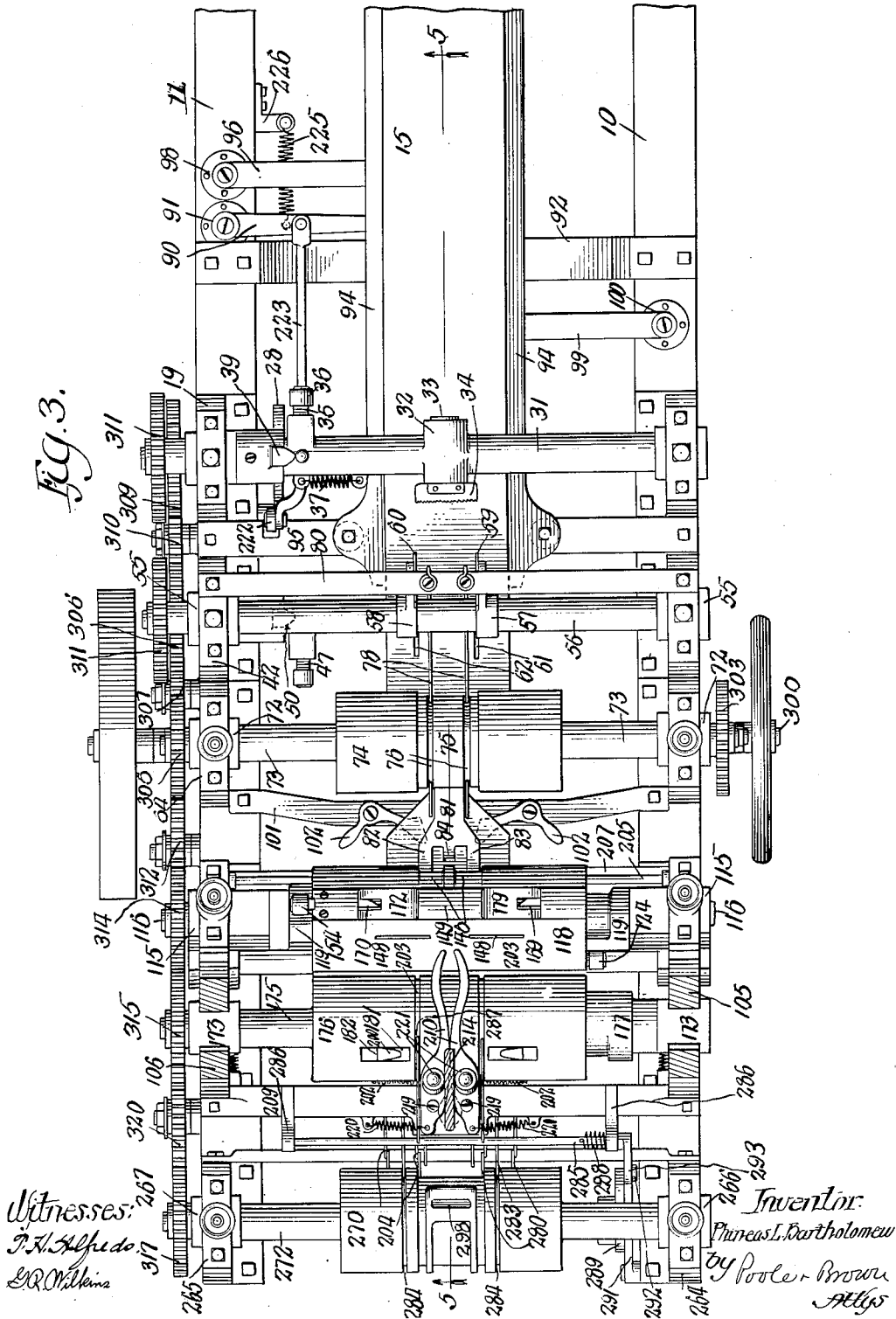
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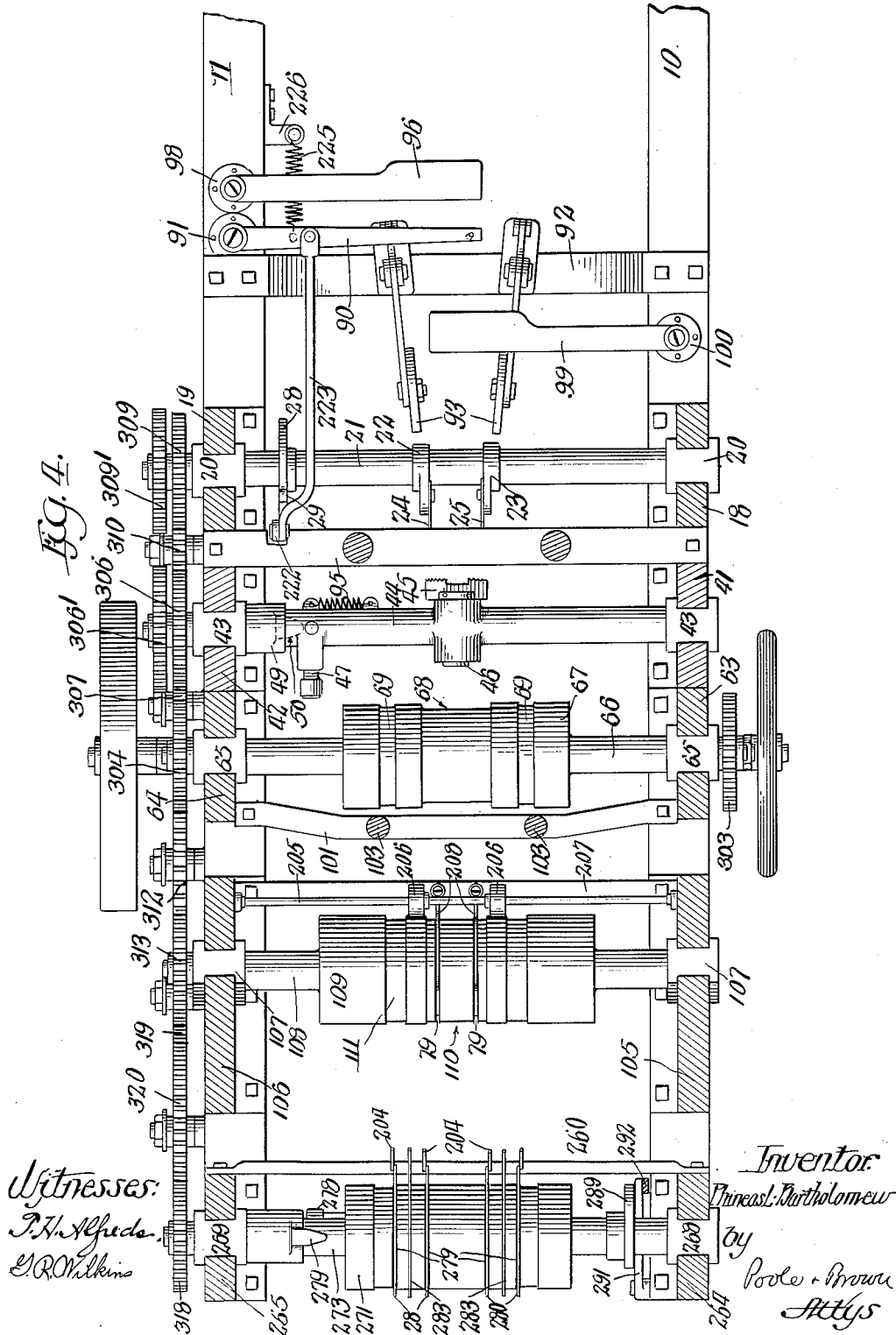
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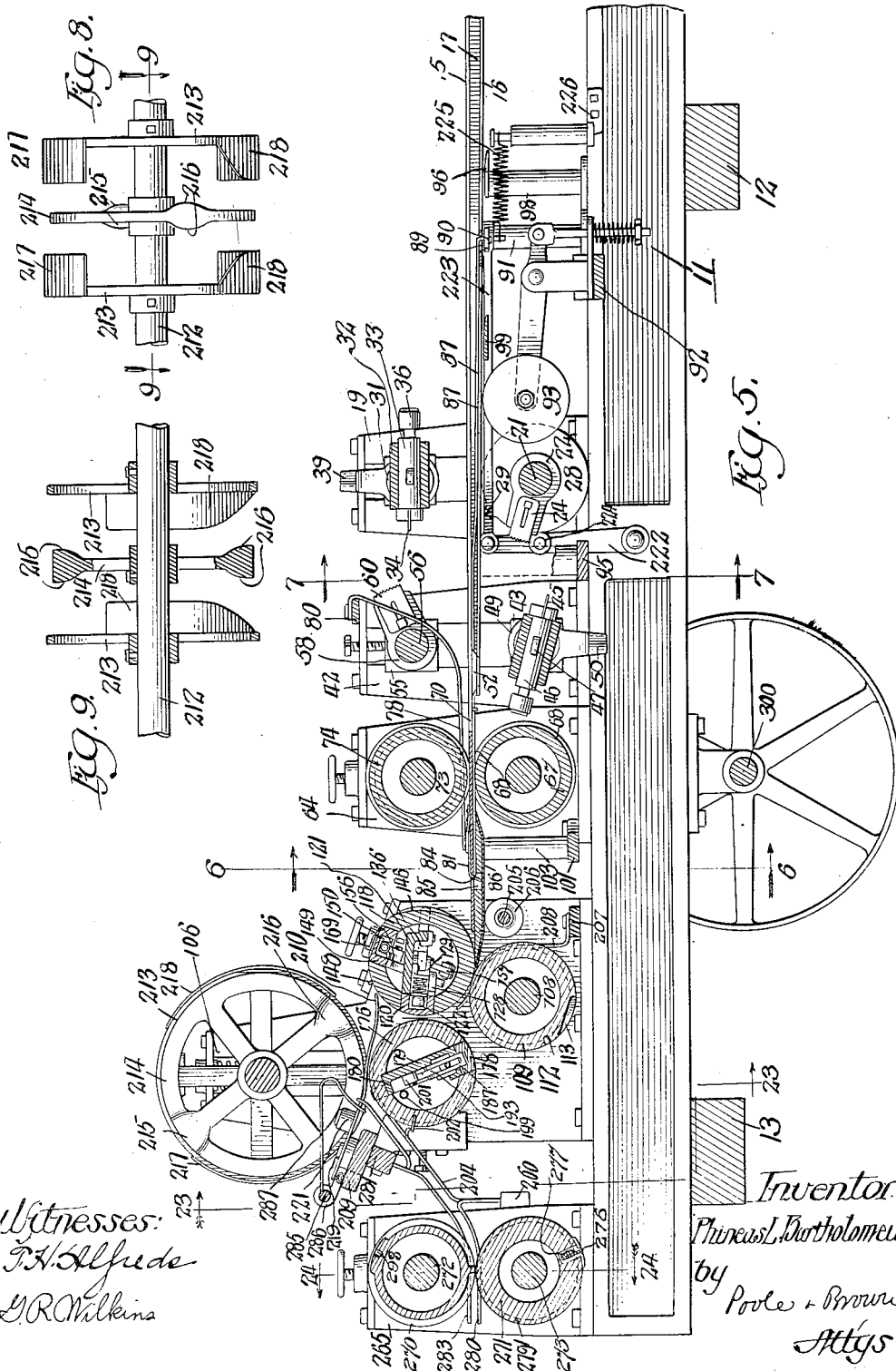


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Fig. 6.

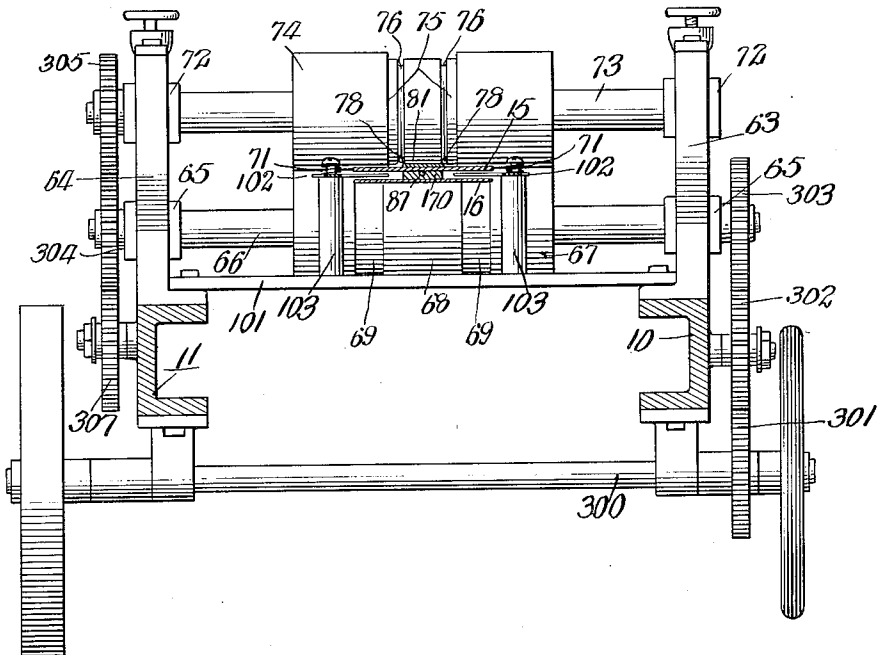
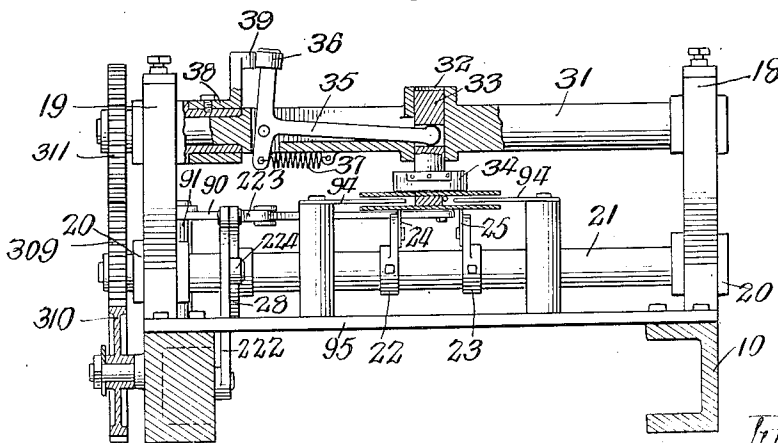


Fig. 7.



Witnesses:
J. H. Alfreds
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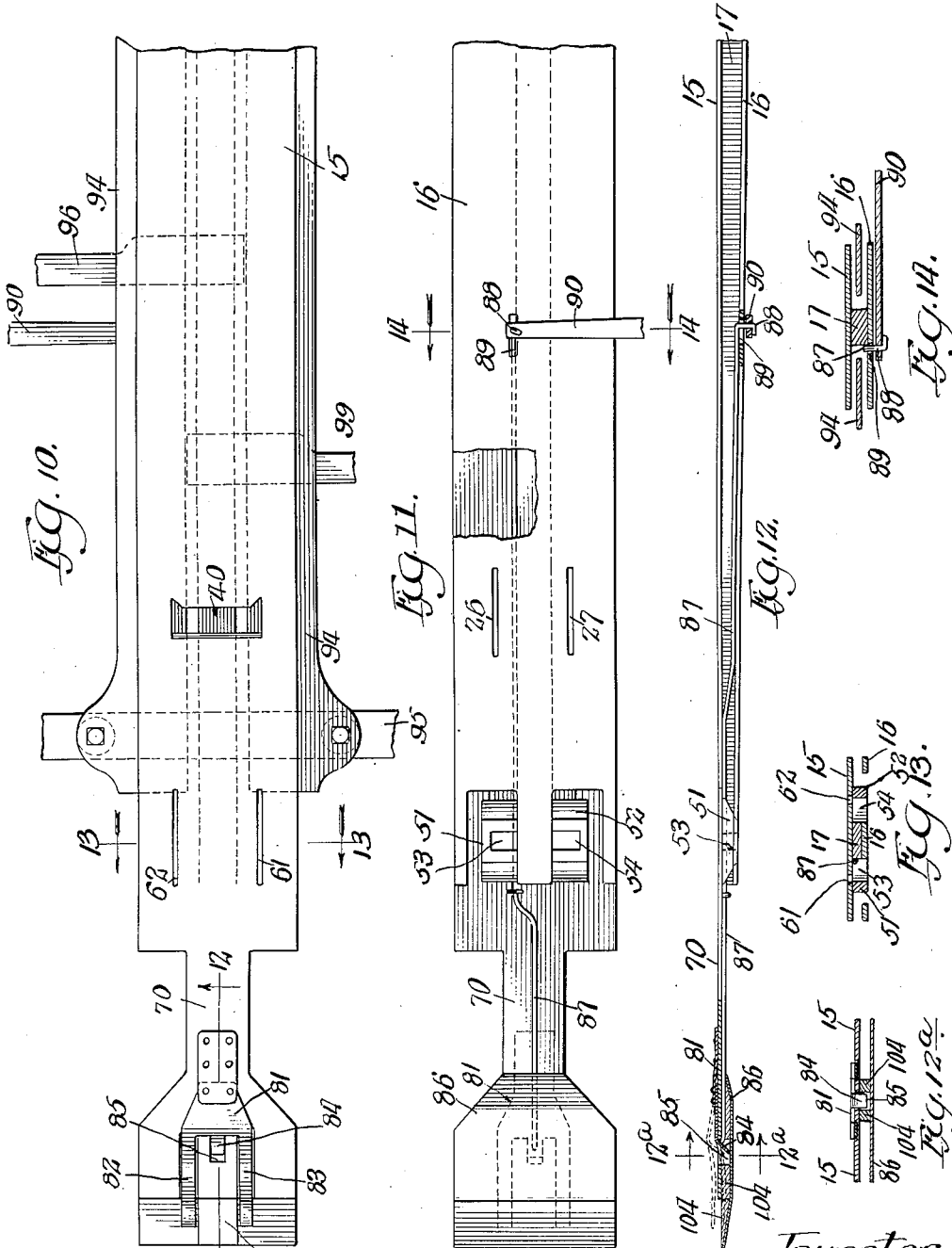
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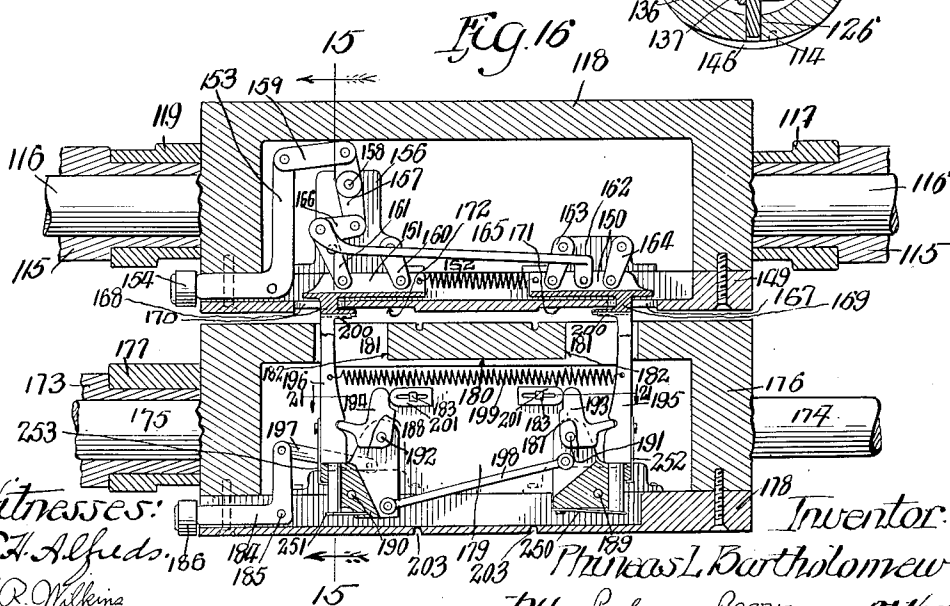
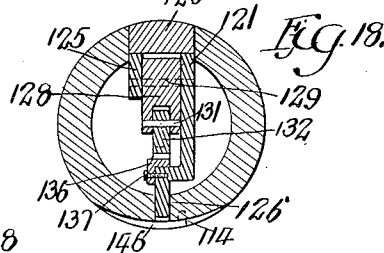
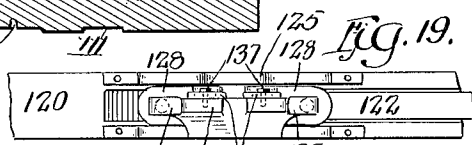
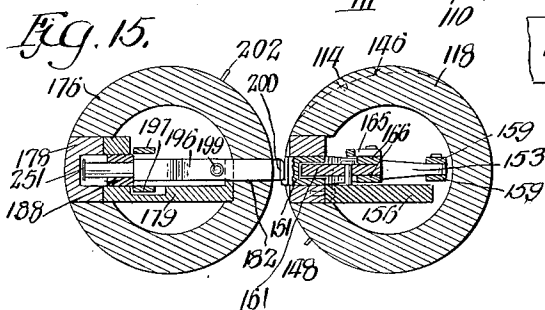
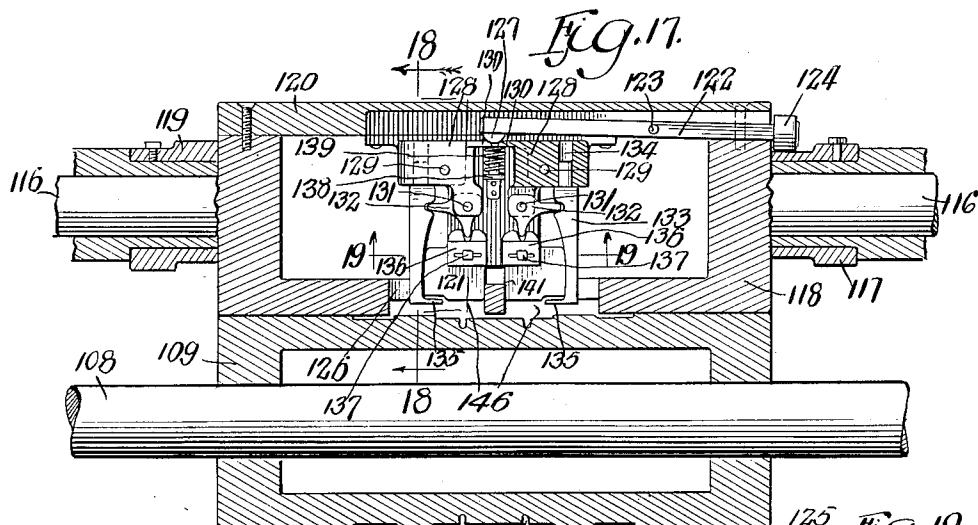


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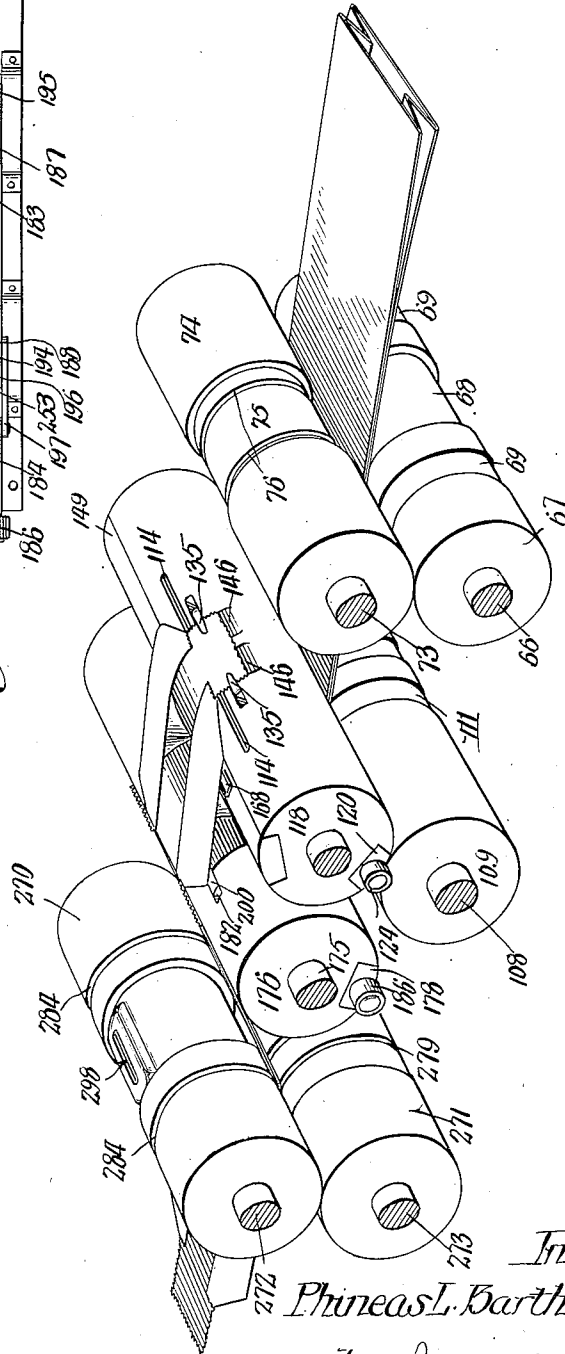
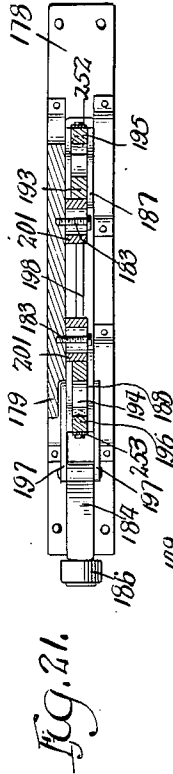
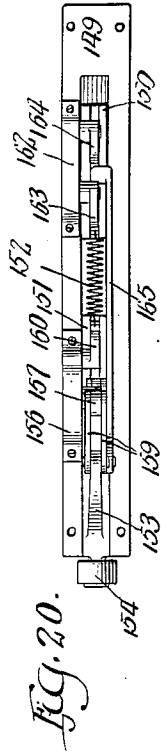
²⁵⁰₃ ¹⁸⁹Phineas L. Bartholomew
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10 SHEETS—SHEET 9.



Witnesses:
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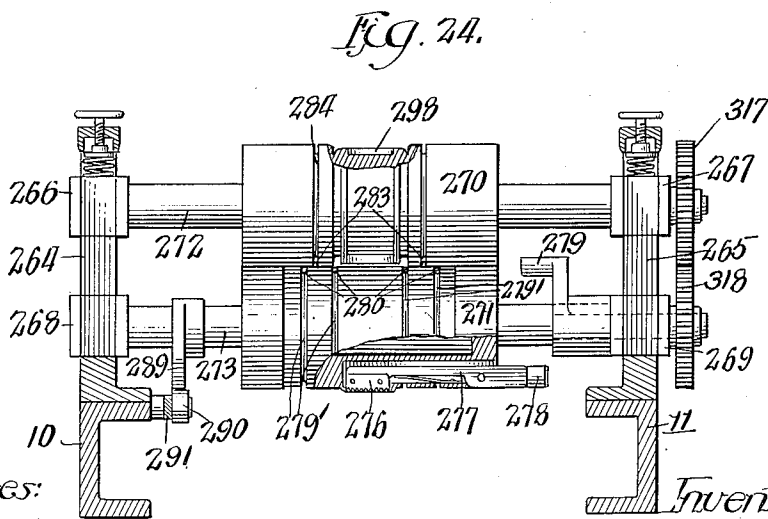
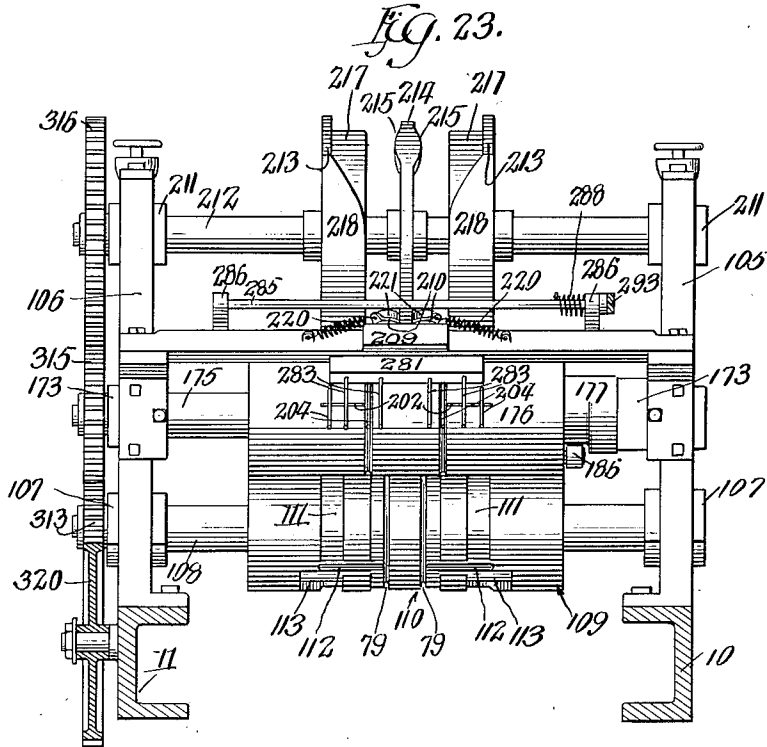
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Patented July 27, 1909.

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UNITED STATES PATENT OFFICE.

PHINEAS L. BARTHOLOMEW, OF AURORA, ILLINOIS.

PAPER-BAG-MANUFACTURING MACHINE.

No. 929,273.

Specification of Letters Patent.

Patented July 27, 1909.

Application filed February 14, 1907. Serial No. 357,355.

To all whom it may concern:

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

My invention relates to that class of paper bag manufacturing machines which are designed to cut, fold and paste the bottom of the bag into the customary diamond shape, and my invention applies more particularly to those particular parts of the machine which are designed for cutting, gripping and folding the paper tube.

My principal object is to improve generally the parts of the machine concerned in cutting, folding and gripping the bellows folded tube from which the individual bags are made, but my particular object is to improve the cutting bar designed to produce the initial cut in the bellows folded paper tube; to improve the means of feeding the bellows folded tube into the cutting, folding and gripping parts of the machine; to improve the means of gripping and retaining the projecting severed portions on the upper layer of the bellows folded tube; to improve the means of gripping the side margins of the upper section of the bellows folded tube and to retain a firm grip thereon for the required length of time; to improve especially the means of gripping the side margins of the lower section of the bellows folded tube and to retain a firm grip thereon for the required length of time; to improve the breaking or creasing means heretofore employed, and to improve the means employed for spreading the sides of the paper tube when the diamond fold is being produced.

My invention consists of certain details of construction hereinafter set forth, pointed out in my claims and illustrated in the accompanying drawings in which,—

Figure 1 is a view in side elevation of that portion of my machine which constitutes the cutting, gripping and folding means. Fig. 2 is a side elevation of the reverse side of the same. Fig. 3 is a plan view of the same. Fig. 4 is a plan view with the tongue and that portion of the machine above the tongue removed. Fig. 5 is a longitudinal sectional view of the same taken on the line 5—5 of Fig. 3. Fig. 6 is a cross-section of the machine taken on line 6—6 of Fig. 5. Fig. 7 is

a cross-section of the machine taken on line 7—7 of Fig. 5. Fig. 8 is a detail side view of the irons and the shaft on which the same are mounted. Fig. 9 is a longitudinal section of the same, taken on the line 9—9 of Fig. 8. Fig. 10 is a detail plan view of a portion of the tongue-plate and associated parts. Fig. 11 is a bottom view of the same, a part of the central portion thereof being broken away. Fig. 12 is a side view of the same with the end portion thereof in longitudinal section, taken on line 12—12 of Fig. 10. Fig. 12^a is a transverse section of the parts shown in Fig. 12, taken on line 12^a—12^a of Fig. 12. Fig. 13 is a transverse sectional view, taken on line 13—13 of Fig. 10. Fig. 14 is a cross-section taken on line 14—14 of Fig. 11. Fig. 15 is a transverse vertical section of the gripping and folding rollers, taken on the line 15—15 of Fig. 16. Fig. 16 is a longitudinal section taken axially through both gripping and folding cylinders, with the parts in the position shown in Fig. 15. Fig. 17 is a longitudinal section taken longitudinally through both of the said cylinders when in changed position. Fig. 18 is a cross-section taken on line 18—18 of Fig. 17. Fig. 19 is a detail view of the gripping device shown in Fig. 17. Fig. 20 is a detail view of the gripping devices mounted on the bar 149. Fig. 21 is a detail view of the gripping device mounted on the plate 178 with parts in section taken on line 21—21 of Fig. 16. Fig. 22 is a perspective view of the gripping and folding cylinders with a bag being formed therein. Fig. 23 is a cross-section of the machine, taken on line 23—23 of Fig. 5. Fig. 24 is a cross-section taken on line 24—24 of Fig. 5.

Referring to the accompanying drawings, 10 indicates one of the horizontal rails of the lower part of the frame of the machine, and 11 indicates the companion and parallel rail. On these two rails forming the longitudinal sides of the frame are mounted the various parts of the machine which constitute the cutting and folding parts, and it is to these parts alone that my invention relates.

When reference is herein made to the forward or rear portion of the machine, the rear portion is intended to mean the receiving end of the machine and the forward portion is intended to mean the delivery end of the machine.

At right angles to the rails 10 and 11, near the receiving end of the machine is a cross-bar 12. 13 indicates a like cross-bar near

the delivery end of the machine. The two rails aforesaid and the said cross-bars form the frame of the machine.

Arranged longitudinally and in a central position relative to the rails 10 and 11 is located a tongue or feed bar adapted to receive the bellows folded paper tube and to feed same into the machine. The said tongue or feed bar extends forwardly to a point near the forward part of the machine and is horizontal and parallel with and above the level of the rails 10 and 11. The said tongue is composed of an upper plate 15, and a lower plate 16, which are vertically separated a considerable distance at their rear ends, the forward ends thereof being in very close proximity to each other. A longitudinally arranged wedge shaped bar 17 is interposed between and connects said plates, said bar extending from the rear portion of the tongue to a point near the forward end of the same and being centrally located laterally of the plates so as to provide longitudinal grooves between the margins of said plates at the sides of the tongue.

Mounted on the rail 10 a short distance from the receiving end of the machine, and extending upwardly therefrom, is a standard 18, and on the rail 11 is a companion standard 19. Said standards 18 and 19 afford supports for journal boxes 20, 20, in which are supported the ends of a transverse, longitudinal shaft 21, located below the plane of the tongue. Said shaft has on its central portion two like disks 22 and 23. Severally attached to said disks are longitudinally arranged cutting knives 24 and 25. Said knives are arranged to enter recesses 26 and 27 in the lower portion of the tongue plate 16 as the shaft 21 revolves. The said disks are adjustable on the said shaft and are so mounted thereon that the knives 24 and 25 operate at the same time. The said knives 24 and 25 are arranged to each make a longitudinal cut in the lower fold of the bellows folded paper tube, the two cuts being parallel with each other and of equal length and laterally opposite each other. Secured to one end of the shaft 21 is a cam disk 28 provided with a lug 29 on the periphery of its flange, for purposes hereinafter set forth. Said disk is also adjustable on the shaft 21. Above and in the same vertical plane with the shaft 21 is a transverse horizontal shaft 31 which has bearing at its ends in journal boxes which are mounted in the standards 18 and 19. Said shaft 31 is provided on its central portion with a transverse guide passage 32 through which extends a transversely arranged cylindric knife bar 33 adapted to slide endwise in said guide passage. Said knife bar 33 has secured to one of its ends a knife 34, said knife being arranged transversely with relation to the machine, or in parallel relation to the shaft 31. The said

knife is in width equal to about one-half of the width of the bellows folded paper tube, and is adapted to make the initial cut in the said paper tube, which cut extends at right angles to the tube and between the side margins thereof. The said knife bar 33 is actuated through the medium of a T-shaped lever 35 mounted within a longitudinal slot in the shaft 31, said slot extending from the central portion of the shaft to a point near one end thereof. The body or shank of the T-shaped lever 35 is parallel with the shaft and engaged at its end with the knife bar 33, in such manner as to give endwise movement to the same. The said lever 35 is pivotally secured to the said shaft 31 at the junction of its transverse arms with its body or shank, said arms extending transversely of the shaft. One arm of said lever has an antifric-tion roller 36 mounted at its end. The other arm of said lever is connected with one end of a coiled spring 37, the other end of which is secured to a lug on the shaft 31, located at a point between the end of the shaft and the center thereof. Said spring 37 acts to swing the T-shaped lever 35 in a direction to draw the knife 34 on the bar 33 inwardly or toward the shaft. 38 indicates a cam supporting collar which surrounds and is rigidly secured to the journal box 20 located on the side of the machine near the T-shaped lever 35, which journal box has an inwardly extending cylindric part adapted to receive said collar. Said collar 38 is provided with an upwardly extending arm provided with an inwardly projecting cam lug 39 adapted to act upon the antifric-tion roller 36 as the shaft 31 revolves so as to move the lever 35 in a direction to shift the knife bar in a direction to carry the knife outwardly. The cam 38 is so adjusted as to cause the knife bar bearing the knife to be forced outwardly at the time the knife is in a perpendicular position with relation to and immediately above the upper section of the bellows shaped paper tube, thereby making the initial cut, as hereinbefore described.

40 indicates a transverse recess in the upper plate 15 of the tongue, which recess permits the toothed knife 34 to penetrate and cut the paper tube.

41 and 42 indicate standards mounted on the rails 10 and 11 at a point nearer the delivery end of the machine than are the standards 18 and 19, said standards 41 and 42 being alike and supporting journal boxes 43, having mounted therein a transverse horizontal shaft 44 located below the level of the tongue. Said shaft 44 is similar to the shaft 31 with the exception that it is provided with a transversely extending knife 45 which has two separated cutting edges, one at each end thereof instead of having a continuous cutting edge as has the knife 34. The knife 45 is designed to make two trans-

verse cuts in the under portion or section of the bellows shaped paper tube; said cuts being located at opposite sides of the longitudinal center line of the tube. The shaft 44 is provided with a transverse guide passage in which is mounted an endwise sliding, transversely arranged, cylindric knife bar 46 bearing the knife 45. A T-shaped lever 47 is mounted in a longitudinal groove in the shaft 44 for operating the said lever, these parts being like those described hereinbefore as being mounted to the shaft 31.

49 indicates a cam supporting collar which surrounds and is rigidly secured to an inwardly projecting extension of the journal box 43. Said collar is provided with a downwardly extending arm having at its outer end an inwardly extending cam lug 50 designed to operate the T-shaped lever as the shaft 44 revolves, thus causing the bar bearing the toothed knife to be actuated in the same manner as hereinbefore described in connection with the knife carried by the shaft 31. The lower plate 16 of the tongue terminates at a point slightly in advance of the place where the knife 45 acts upon the under portion of the bellows folded paper tube. The forward end of said under plate 16 is provided with two notches arranged side by side and forming a central tongue which is of the same width as the central space between the two separated cutting edges of the knife 45. The notches in the end of said lower plate 16 extend inwardly to the rear of the point where the knife 45 acts on the under portion of the bellows folded paper tube. Two like plates 51 and 52 are secured to the lower face of the upper tongue plate 15, one on each side of the central bar 17, and of the central tongue on the end of the plate 16. The said plates 51 and 52 are of such thickness that the lower surfaces thereof are flush with the bottom surface of the said tongue, as clearly seen in Figs. 11, 12 and 13. Said plates 51 and 52 are provided with recesses 53 and 54 located at the points where the cutting edges of the knife 45 act on the bellows folded paper tube as the shaft 44 revolves, said recesses being adapted to receive said cutting edges, the lower surfaces of said plates 51 and 52 serving to support the paper adjacent to the knife in the cutting operation. The said plates 51 and 52 are beveled or inclined on their under surfaces adjacent to their ends, and the inclined surfaces at the rear ends thereof form guide surfaces by which the bellows folds of the tube, when they reach said plates, are deflected downwardly and pass beneath said plates. It is obvious that, by this construction, the under portion of the bellows folded tube and the bellows folds between the upper and lower portions of the tube, are brought together, so that the cutting edges of the knife 45 are adapted to cut not only the lower por-

tions of the bellows shaped paper tube, but also the inner margins of said bellows folds.

Mounted above and in the same vertical plane with the shaft 44, in the standards 41 and 42, are journal boxes 55, 55 having mounted therein a transverse, horizontal shaft 56 provided at its central portion with two rigidly attached collars 57 and 58, each having a radial, knife carrying arm, and to said arms are attached knives 59 and 60, said knives being arranged longitudinally and adapted to make two longitudinal, parallel cuts in the paper tube. Longitudinal recesses 61 and 62, respectively, are formed in the upper plate 15 of the tongue to receive said knives when the shaft 56 revolves. The two collars 57 and 58 are adjustable on the shaft and are so adjusted that their respective knives act on the upper portion of the bellows folded tube at the same time, and to produce therein two cuts side by side and one on each side of the longitudinal center line of the tube and at an equal distance therefrom, for purposes hereinafter set forth.

63 and 64 indicate two like standards, mounted on the rails 10 and 11, respectively, a short distance in advance of the standards 41 and 42. Said standards 63 and 64 support journal boxes 65, 65 having mounted therein a transverse, horizontal shaft 66 located below the level of the tongue and to which is secured a cylinder 67. Said cylinder has its peripheral surface at the top thereof in a horizontal plane passing between the top and bottom surfaces of the upper tongue plate 15. Said tongue plate 15 is provided with opposite notches in its side edges (Figs. 10 and 11) forming a narrower central portion 70 adjacent to the cylinder 67. The central annular portion of said cylinder 67 is reduced in diameter to form a shallow groove 63, through which the longitudinally extending, narrower, central portion 70 of the tongue passes without coming in contact with, or bearing upon, the said cylinder. The cylinder 67 is also provided with two annular grooves 69, 69 located at either side of the central groove 68 in line with the longitudinal side margins of the upper tongue plate 15.

Mounted in the standards 63 and 64 above, and in the same vertical plane with, the shaft 66 are journal boxes 72, 72 having mounted therein a transverse, horizontal shaft 73 located above the level of the tongue plate 15. On said shaft 73 is mounted a cylinder 74 similar in size and conformation to cylinder 67, the said cylinder 74 being provided in its central portion with a shallow, circumferential groove 75 corresponding in width with the groove 68 in the cylinder 67. The two cylinders 67 and 74 are companion cylinders and are adapted to grip the bellows folded tube between them and to thereby assist the feed of the said tube through the machine. The annular grooves

75 and 68 form a space between the two cylinders to permit the passage of the narrower part 70 of the upper plate 15 of the tongue, and the larger annular parts of the cylinders at the sides of said central grooves bear upon the tube inside of its side margins. The lateral grooves 69, 69 in the cylinder 67 are in line longitudinally with the sides of the tongue and also in line with the side margins of the tube, the said grooves serving to keep the folded outer edges of the bellows folds from becoming crushed and broken as they pass between the said cylinders. Located within the central groove 75 of said cylinder 74 are two parallel, narrow, circumferential grooves 76, 76 adapted to receive longitudinally arranged, parallel guide wires 78, 78, located above the top plate 15 of the tongue and extending beneath said cylinder 74. The guide wires 78, 78 are secured at their rear ends to a cross-bar 80 mounted on the top of the standards 41 and 52, and in a position at the rear of the shaft 56. The said guide wires extend downwardly from said cross bar to the rear of the shaft 56 and curve forwardly beneath said shaft, said wires extending beneath and forwardly of the cylinder 74 to points in advance of said cylinder. The object of said guide wires is to guide the upper fold of the bellows folded tube between the feed cylinders 67 and 74.

The forward end portion of the upper tongue plate 15 is located forward of the cylinders 67 and 74 and, as more fully illustrated in Fig. 5, its rear margins or shoulders are oblique or inclined, while its forward edge is adjacent to the gripping and folding cylinders. Affixed to the wider forward end of the tongue plate 15 is a leaf spring 81 having two forwardly projecting, parallel, laterally separated prongs 82 and 83 which extend to a point beyond the forward extremity of the said tongue plate. Between their ends said prongs are curved downwardly, as shown in Fig. 10, and their curved parts, when the prongs are depressed, are adapted to extend into longitudinally arranged recesses provided for them in the upper surface of the tongue plate 15. Between the said prongs 82 and 83 is a forwardly and downwardly projecting central prong 84 which is deflected downwardly into an opening 85 in said tongue plate and terminates below the lower surface of the said tongue plate.

86 indicates a supplemental, horizontal plate located below and parallel with the wider forward end portion of the tongue plate 15, and conforming to the side and rear margins of the same. Said plate 86 extends beyond the forward extremity of the said plate 15 and beveled or inclined forwardly and upwardly on the lower surface of its part which extends beyond said tongue plate (Fig. 12). The beveled extremity of said-

plate 86 is adapted to feed the tube into and between the gripping and feeding cylinders, as hereinafter set forth. Said supplemental plate 86 is connected with the tongue plate 15 by means of a longitudinal, central plate or connecting member 104 (Fig. 12^a) beyond which the side margins of the tongue plate and the lower plate 86 extend laterally so that longitudinal grooves are formed between the side margins of the wider forward end of the tongue plate 15 and the supplemental plate 86, said grooves being designed to receive the inwardly projecting folds of the bellows folded paper tube, as the same is being fed to the gripping and folding cylinders.

Extending longitudinally between the upper plate 15 and the lower plate 16 of the tongue, from the orifice 85 to a point near the rear of the tongue, is a rod 87, said rod lying within the space formed between the said upper and lower plates, as hereinbefore described. The forward end of said rod is bent upwardly within the orifice 85 so as to engage the under surface of the central tongue 84. The said rod is mounted loosely so as to be adapted for forward and backward endwise movement, and the rear end of said rod is bent downwardly to provide an arm 88 which extends downwardly through a longitudinal slot 89 (Figs. 11 and 12) in the lower tongue plate 16, said slot being adapted to permit a limited forward and backward movement of the rod. Said arm 88 engages one end of a horizontally swinging lever 90 which extends transversely of the machine frame and is mounted on an upright pivot stud 91, secured to the rail 11 so as to swing in a horizontal plane. Devices are provided for actuating said lever 90, as will be hereinafter described.

92 indicates a cross bar extending between and attached at its ends to, the rails 10 and 11, at right angles to the latter, said cross bar affording support for two pressing wheels 93, 93 which are held by spring pressure in upwardly pressing contact with the bottom surface of the lower tongue plate 16. Said wheels 93, 93 are arranged obliquely to the longitudinal center line of the machine and operate to cause the freshly pasted overlapping longitudinal edges of the tube to be held from spreading apart.

94, 94 indicate longitudinally arranged, horizontal guide plates which extend into the grooves between the side margins of the upper and lower tongue plates 15 and 16, as seen in Fig. 14. Said guide plates extend from the rear of the tongue plates to points near the cylinders 67 and 74 and are adapted to enter the bellows folds of the paper tube, as the same is fed into the machine, and to draw the said bellows folds closely into said groove between the top and bottom tongue plates. Each guide plate 94 is secured at its forward extremity to a bar 95 extending transversely

between the rails 10 and 11 and secured at its ends thereto, and at its rear end is secured in a like manner to another bar similarly attached to the machine frame, but which is not shown.

96 indicates a horizontal guide plate extending transversely of the machine frame and attached to the top of a fixed standard 98 on the rail 11. The inner end of said guide plate 96 extends to a point beyond the middle of the lower plate 16 of the tongue, the upper surface of said guide plate bearing against the said lower plate 16 at the rear of the longitudinal slot 89, and the said slot 89 is located in the lower plate 16 at a point at one side of the longitudinal center of said plate.

99 indicates a guide-plate similar to the guide-plate 96 which is secured at its outer end to a standard 100 secured to the rail 10. The inner end of said guide-plate extends to a point beyond the middle of the lower plate 16 of the tongue, said guide bearing upwardly against the lower surface of said plate 16 at a point forward of the slot 89 in the said lower plate 16.

101 indicates a cross bar extending between and attached to the rails 10 and 11, said cross bar being located just above the level of said rails and forward of the cylinder 67. Attached to said cross bar and rising therefrom are two standards 103, 103, located near the ends of said cylinder 67. Mounted on the upper ends of said standards are two guide arms 102, 102 located and adapted to swing in a horizontal plane and at the level of the top of said cylinder 67. The said guide arms 102, 102 extend from the standards 103, 103 transversely of the machine toward the center longitudinal line thereof. Said guide arms are provided at their outer or pivoted ends with operating levers or handles which extend forwardly therefrom, giving the arms, as a whole, the shape of bell-crank levers, and are adapted to be grasped by the hand in swinging or moving the guide arms for the purpose of laterally adjusting their inner or free ends. Said guide arms are, moreover, so pivoted to the standards 102 and 103 as to be held from movement by friction, while being capable of being swung or moved by the application of considerable force or pressure thereto. Coiled friction springs 71, 71 (Fig. 1) are shown as applied between said guide arms and the heads of the screws by which they are pivotally connected with the standards 102, 102, said springs holding the arms in frictional engagement with the upper ends of the standards for the purpose stated. The free ends of the said guide arms are located in the lateral grooves between the side edges of the wider forward end of the tongue plate 15 (Fig. 3) and the side margins of the plate 86, which is secured to the lower surface of

said wider end of the tongue plate, as hereinbefore described. The said free ends of the guide arms 102, 102 enter within the bellows folds of the paper tube, which bellows folds pass through said grooves between the plates 15 and 86, and serve to confine or hold said bellows folds in said grooves. The end edges of said arms are inclined or beveled on inwardly and forwardly converging lines, as clearly seen in Fig. 3.

As the paper designed to form the bags enters the cutting, gripping and folding devices of the machine, it has already been folded to form a bellows shaped tube, as hereinbefore stated. The said bellows folded tube is threaded upon the tongue plate as hereinbefore described, and one of the side edges of the said tube is provided with paste and is adapted to overlap and to be secured to the other side edge thereof. In threading the paper tube upon the tongue plate, the longitudinal folding plates 94, 94 enter the bellows folds of the tube and retain the same in the grooves formed between the side edges of the tongue plates 15 and 16. The side margin of the tube at the side of the machine at which the guide plate 96 is located is threaded between the said guide plate 96 and the lower tongue plate 16 and extends between the lever 90 and the said lower tongue plate. The opposite side margin of the paper tube passes beneath the end of the lever 90 which engages the arm 88 of the rod 87 and between the guide plate 99 and the lower tongue plate 16. The two side margins of the tube are held in overlapping relation beneath the tongue plate 16 and will be pressed together as they pass between the guide 99 and the lower tongue plate so as to complete the joining of the two side margins by means of the adhesive substance applied thereto. The lower portion of the said tube next passes between the pressing wheels 93, 93 and the lower tongue plate and as these wheels are mounted in the ordinary manner, in forwardly converging relation, they tend to bring the two side margins together or to keep them from spreading apart so that the freshly pasted parts will not separate. The paper tube is threaded upon the entire length of the tongue plate 15 before the machine is set into operation.

When the machine is operating, the initial cut is made in the paper tube by the transverse knife 34, the said knife making the cut extending nearly across the upper part or layer of the tube or nearly to each side edge thereof. Said knife does not penetrate below the lower surface of the upper tongue plate 15 so that only the upper layer of the tube will be cut by the stroke of the knife. The bellows folds of the tube, which travel in the lateral grooves of the tongue, will not be cut. The downward stroke of the knife 34 is produced by the roller 36 coming in contact

with, and being forced inwardly by, the cam projection 39 on the collar 38. Other cuts in the paper tube are produced by the action of the knives 24 and 25, carried by the disks 22 and 23 on the shaft 21, said knives being arranged transversely of the said shaft and producing two parallel longitudinal cuts in the tube. As this shaft is located below the tongue, it is obvious that the cuts produced will be in the lower fold or portion of the tube, and the parts are so adjusted and timed that the two longitudinal cuts will be in line longitudinally, one with each end of the transverse cut produced by the knife 34 in the upper fold of the tube.

The two knives 24 and 25 are so mounted and adjusted on the disks 22 and 23 that they will not penetrate the lower tongue plate 16 beyond the upper surface thereof, thus restricting the longitudinal cuts produced by the said knives to the lower section or portion of the tube. Other cuts are produced in the upper layer or part of the tube by the longitudinal knives 59 and 60 secured to the disks 57 and 58, respectively, on the shaft 56, which disks are so located on the said shaft that each of said knives will produce a longitudinal cut in line with one end of the transverse cut produced by the knife 34. The shaft 56 is so located and the disks 57 and 58 are so adjusted, and the gearing which drives the several shafts is so timed, as to cause the said knives 59 and 60 to make two longitudinal cuts extending rearwardly from the ends of the transverse cut made by the knife 34, thus producing a U-shaped cut having two right angles and forming a forwardly extending tongue in the upper part of the said tube. The transverse knife 45, having two separated cutting edges and mounted on the shaft 44, is so located thereon, and the gearing driving said shaft is so timed that said knife will make two transverse cuts in the lower layer of the tube, in position to meet at their outer ends the forward ends of the two longitudinal cuts made by the knives 24 and 25 mounted on the shaft 21. The longitudinal knives 24 and 25, together with the separated cutting edges of the knife 45, are therefore adapted to make in the lower layer of the paper tube two angular cuts which define the two corners of a forwardly extending tongue to be formed on said lower layer. The said transverse knife 45 is, moreover, so located on its shaft and so timed with respect to the movement of the knives 59 and 60, that the two transverse cuts made by said knife 45 will be in line transversely with the centers of the two longitudinal cuts made by said knives 59 and 60. The knife 45 is so adjusted that in its upward stroke it extends into the openings 53 and 54 formed in the plates 51 and 52 which are attached to the lower surface of the upper tongue plate 15, as hereinbefore

described (Figs. 11, 12 and 13). The bellows folds of the paper tube pass beneath said plates 51 and 52 and, by reason of the notches in the end of the longitudinal plate 16, the lower layer of the tube is no longer separated from the said bellows folds by the lower tongue plate, but the inner margins of the bellows folds and said lower layer are brought together as they pass beneath said plates 51 and 52. By the action of the knife 45, therefore, two transverse cuts will be produced not only in the lower section or fold of the paper tube, but also through the inner margin of each bellows fold. As the inner folded margins of the bellows folds extend inwardly into the paths of the cutting edges of the knife 45, they are cut transversely by said knife in a manner to form one long cut in each of the bellows folds when the same are opened or stretched apart. Upon the completion of the cuts described, a bag section will have been partially severed from the paper tube, and will be connected with the same only at the center of the lower layer of the tube, between the transverse cuts made by the knife 45 and at the side edges of the tube. With the cuts produced in the manner described, the paper tube is fed to the gripping and folding cylinder of the machine, as will be hereinafter explained.

The purpose of the lateral notches in the side edges of the upper tongue plate 15 adjacent to the cylinders 67 and 74 is to provide for the gripping of the side portions of the tube between the larger parts of said cylinders at the sides of the central grooves therein so that said cylinders will act to assist in the feeding or advance movement of the tube. The guide arms 102, 102 are so adjusted as to bring their free ends within the bellows folds of the tube; the guiding edge of each of said arms being inclined forwardly and inwardly. Said guide arms 102, 102, as stated, are located immediately at the rear of the lower supplemental plate 86 on the tongue plate 15, and the free ends of said guide arms project into the lateral grooves between the side margins of said plate 86 and of the tongue plate 15, and act to retain the bellows folds of the paper tube in said grooves as the tube is advanced or fed forward. It will be remembered that the knife 46 operates to sever the inner folded edges of each of the bellows folds and it is obvious that without said guide arms the severed folds might drop downwardly and come in contact with the rear edges of the laterally projecting parts of the plate 86 with the effect of retarding or tearing the tube. The purpose of the guide wires 78 and 78 is, as stated hereinbefore, to keep the paper tube straight and smooth as it moves toward and leaves the cylinders 67 and 74.

105 and 106 indicate standards extending upwardly from the rails 10 and 11 and ar-

ranged in line with each other transversely of the machine frame.

107, 107 indicate journal boxes supported in, and located near the base of, the standards 105 and 106. Said journal boxes afford bearings for a transverse, horizontal shaft 108 on which is secured a cylinder 109, said cylinder being located midway between the rails 10 and 11. The top of said cylinder extends to a point above the level of the upper surface of the upper tongue plate 15. The forward end of the plate 86, which is attached to the under surface of the tongue plate 15, as described, terminates near the upper surface of the said cylinder 109 and extends partially over the said cylinder. The said cylinder 109 is provided with a wide and shallow, central, annular groove 110 and in said groove with two narrow grooves 79, 79 adapted to receive guide wires 208, 208, used for a purpose hereinafter set forth. The groove 110 is made of the same width as the central grooves 68 and 75 in the cylinders 67 and 74. Said cylinder 109 is also provided, outside of the central groove 110, with two narrower, shallow, annular grooves 111, 111 made of the same width as, and in longitudinal alinement with, the grooves 69, 69 in the cylinder 67. Said grooves 111, 111 are in line with the side margins of the paper tube and are for the purpose of permitting of the passage of the paper tube between the cylinders without crushing and breaking the folded edges of the tube formed by the in-turned bellows folds thereof.

112, 112 indicate two longitudinal grooves formed in the cylindric surface of the cylinder 109, said grooves being adapted to co-act with creasers on another cylinder, as will be hereinafter explained. 113, 113 indicate shallow recesses formed in the surface of said cylinder 109 for a purpose hereinafter explained.

115, 115 indicate journal boxes mounted in the standards 105, and 106, said journal boxes for short shafts or trunnions 116, 116 on the ends of a hollow cylinder 118, said cylinder being of the same size as the cylinder 109 and located above the same, with its central axis slightly to the rear of the central axis of said cylinder 109. Secured rigidly on the journal boxes 115, 115 which are extended inwardly to receive them are cam sleeves 117 and 119 said cam sleeves being adjacent to the ends of the cylinder 118. Said cylinder 118 is provided with gripping means constructed as follows: In one side of said cylinder is formed a longitudinal slot, which extends through the ends of the cylinder. In said slot is secured a longitudinal supporting bar 120 which extends the entire length of the cylinder and completely fills said slot, the outer surface of said bar being flush with the outer surface of the cylinder. The said supporting bar is provided at its

central portion with a bracket 121 which is attached to the inner face of said bar adjacent to one side of the same and extends at right angle therefrom, said bracket being designed to provide bearings for parts of a supporting device as will be hereinafter explained. In the inner surface of the bar 120 (Fig. 17) a longitudinal groove is provided, within which is located a longitudinally arranged operating lever 122 fulcrumed by a pivot pin 123 to the bar, and adapted to swing in a plane radial to the center of the cylinder. One end of said operating lever extends beyond one end of the bar 120 and projects outside of the adjacent end of the cylinder. Mounted on the outer end of said operating lever, is an anti-friction roller 124 adapted to engage a cam projection on the cam sleeve 117. 125 (Fig. 18) indicates a second bracket mounted at the center of the bar 120, at the side edge thereof opposite the bracket 121. The bracket 121 extends diametrically across the interior of the cylinder 118, and its outer end is offset to bring it diametrically in line with the center of the bar 120, and is centrally notched to form two parts which are seated in longitudinal slots 126, 126, formed in and extending longitudinally of the wall of the cylinder, opposite the said bar 120, as seen in Figs. 17 and 18. The inner end of the lever 122 extends to the central portion of the plate 120, and has mounted on its inner end a lug 127 extending therefrom toward the center of the cylinder.

Mounted between the brackets 125 and 121, and adjacent to the bar 120 are two oscillating blocks 128, 128, said blocks being pivoted to the brackets 125 and 121 by pivots 129, 129, located at points equi-distant from the center of the said bar 120. The said blocks 128, 128, are provided adjacent to the bar 120, with arms 130, 130 which extend from the blocks inwardly or toward each other, parallel with the bar 120. The ends of said arms are both engaged by the lug 127, which rests against the same when the lever 122 is in its normal position. The said blocks 128, 128 are provided with inwardly extending, slotted lugs, in which are pivoted, by means of pivots 131, 131 two bell-crank levers 132, 132 each having a longitudinally and a transversely extending arm.

133, 133 indicate gripper arms, which extend transversely of the cylinder, and have their inner ends inserted and adapted to slide endwise in guide-passages 134, 134 formed in the blocks 128, 128, and extending transversely of the cylinder outside of the pivots 129, 129 as clearly seen at the right hand side of Fig. 17. In the inner or adjacent edges of the said gripper arms, are formed transverse notches, which are engaged by the outer ends of the longitudinally extending arms of the bell-crank levers 132, 132. The outer ends

of said gripper arms are provided with gripper fingers 135, 135, which are arranged at right angles to the gripper arms and extend inwardly or toward each other, parallel with the axis of the cylinder. Said fingers are adapted to overlap the end surface of the bracket 121, the outer ends of said arms being located at the ends of and in the same plane with the offset end portion of said bracket. The end of said bracket 121 constitutes the fixed jaws of the grippers, the movable jaws of which are formed by the gripper fingers 135, 135. The finger-bearing ends of said gripper arms are located in the outer ends of the slots 126, 126 in which the end portions of the bracket 121 are seated, said slots being long enough to permit oscillatory or swinging movement of the gripper arms toward and from the side edges of the bracket.

136, 136 are two blocks which are secured by bolts 137, 137 to the face of the bracket 121, in the same plane with the bell-crank levers 132, 132. (Figs. 17 and 18). Said blocks 136, 136 are provided in their margins nearest the bar 120 with notches in which are inserted the ends of the laterally extending arms of the bell-crank levers 132, 132. Centrally secured to the side of the bracket 121 at a point transversely in line with the lug 127 is a stud 138 which is parallel with said bracket and extends toward said lug. Mounted on said stud 138 and bearing against a shoulder thereon, is a coiled spring 139 which acts on the inner ends of the arms 130, 130 of the blocks 128, in a direction to press the same outwardly, thereby normally holding the inner end of the operating lever 122 outwardly and holding the outer end of said lever 122 at the inward limit of its radial swing or movement. Outward pressure on the antifriction roller 124 swings the inner end of the operating lever 122 inwardly or toward the center of the cylinder, and the lug 127 acting on the arms 130, 130 of the blocks 128, 128, operates to swing said arms inwardly and give oscillatory movement to the said blocks in a direction to swing or carry the gripper arms outwardly or away from the outer end of the bracket 121. As the blocks are thus swung or moved, the pivots 131, 131 will be swung away from each other, but as the outer ends of the transverse arms of the bell-crank levers 132, 132 are engaged with the blocks 136, 136 the effect of this movement of the said pivots will be to swing or turn said bell-crank levers on said pivots in a direction to carry the outer ends of the longitudinally extending arms of said bell crank levers away from the bar 120, and as said arms are engaged with the gripper arms, the latter will be moved endwise in a direction to carry their gripping fingers away from the outer end of the bracket 121; the said gripper arms sliding in their guide aper-

tures in the blocks 128, 128. Outward pressure on the roller 124, therefore, has the effect of opening the gripper jaws against the action of the spring 139, which tends to keep them closed. Release of the outward pressure on said roller 124 will permit the spring 139 to throw the arms 130, 130 laterally away from the central axis of the cylinder, with the result of swinging the gripper fingers toward and over the outer end of the bracket 121, and, through the action of the bell-crank levers 132, 132, for drawing said fingers inwardly into their gripping position. The end margin of the said bracket 121 is in length equal to the width of the knife 34, thereby making it equal to the width of the severed tongue on the paper tube, so that as said tongue approaches the gripping cylinder the gripping fingers 135, 135 will grip the side edges of said tongue.

146, 146 (Figs. 5, 17 and 22) indicate depressions in the periphery of cylinder 118 located at the portion of the circumference thereof at which the two separated end portions of the bracket 121 extend through the slot 126 of the said cylinder; said end portions of the bracket being substantially flush with the bottom of the depressions. The width of each depression 146 longitudinally of the cylinder is equal to the length of the slot 126 associated therewith.

114, 114 indicate longitudinal grooves in the cylindric surface of the cylinder 118, which grooves extend outward from the depressions 146, 146 and are designed to receive knives, as will be hereinafter explained.

148, 148 indicate creasing knives mounted in the cylindric surface of the cylinder 118 and extending longitudinally thereof, said knives being located at opposite sides of the longitudinal center of the machine and operating in connection with the grooves 112, 112 in the cylinder 109 to crease the paper tube, as will be hereinafter explained.

149 indicates a supporting bar similar to the bar 120, said bar being seated in a longitudinal slot provided in the cylindric wall of said cylinder 118. Extending longitudinally of said bar 149, in the inner surface thereof, is a groove in which is located endwise movable gripper bars 150, 151 (Figs. 15 and 16), said bars being adaptable for backward and forward movement in said groove longitudinally of the bar 149 and also for movement in a direction toward and from the center of the cylinder. A coiled spring 152 connects the inner ends of said gripper bars and tends to draw the same inwardly.

153 indicates a bell crank lever which is pivoted to the supporting bar 149 in the longitudinal groove thereof and the shorter arm of which extends longitudinally of the cylinder 118 and beyond the end of the said cylinder nearest the cam 119. Mounted on the outer end of said shorter arm is an anti-

friction roller 154 designed to be engaged by the said cam. The longer arm of the said lever extends transversely of the interior of the cylinder 118, adjacent to the end wall thereof.

156 indicates a bracket attached to and extending inwardly from the inner surface of the bar 149.

157 indicates a lever which extends transversely of the cylinder and is pivoted between its ends to the bracket 156 by means of a pivot pin 158.

159 indicates a link which is pivotally connected at its ends to the end of the transverse arm of the bell crank lever 153 and to the outer end of the lever 157. The gripper bar 151 is connected with the standard 156 by means of connecting arms 160 and 161, said arms being pivoted to the said standard and to the gripper bar in a manner to provide the aforesaid forward and backward endwise movement, and also a slight inward and outward movement, of the said gripper bar, while maintaining its parallel relation with the supporting bar 149.

162 indicates a bracket secured to the inner face of the bar 149 at a point immediately inside the gripper bar 150.

163 and 164 indicate connecting arms pivoted to the gripper bar 150 and to the bracket 162, said levers being designed to afford a forward and backward endwise movement in the bar 150 as well as a slight inward and outward movement thereof, while holding it in position parallel with the bar 149. Pivoted to the said gripper bar 150, at a point between the arms 163 and 164 is a connecting rod 165 which extends longitudinally of the cylinder to a point beyond the lever 157. Said rod 165 is connected with the end of the said lever 157 nearest the bar 149 by means of a longitudinally extending link 166. The connecting arm 161 is extended inwardly or toward the center of the cylinder, past the pivot by which it is connected with the bracket 156, and the extended end of said arm 161 is pivotally connected with both the arm 161 and the link 166, preferably by means of a single pivot pin. The gripper bars 150 and 151 are shown as grooved in their inner faces, and the arms 160, 161, 162 and 163 are shown as inserted at their ends into said grooves, and pivoted to the gripper bars by pivot pins inserted through the parts of the bars at the sides of the grooves therein.

From the construction described, it will be manifest that pressure on the roller 154 in an outward radial direction, will, through the action of the levers described, have the effect of giving movement to the gripper bars endwise of the cylinder and away from each other. The connecting arms 160 and 161 are inclined in such manner that, as the gripper bar 151 is moved toward the end of

the cylinder, it will move outward or away from the axis of the cylinder, and the connecting arms 163, 164 of the gripper bar 150 are similarly arranged. When outward pressure on the antifriction roller 154 is removed, the levers will thereby be released and the gripper bars 150 and 151 will be drawn back to their normal position by means of the coiled spring 152.

167 and 168 indicate longitudinal slots in the supporting bar 149 exterior to the outer ends of the gripper bars 150 and 151.

169 and 170 indicate L-shaped gripper fingers secured to the outer faces of the gripper bars 150 and 151 respectively, and extending outwardly through the slots 167 and 168, and having end portions which are parallel with the outer surface of the bar 149 and are directed toward the longitudinal center of the cylinder. Said gripper fingers or grippers are so arranged that their end portions extend over the outer face of the bar 149, inside of the inner ends of the slots 167 and 168, and are adapted for gripping engagement therewith. When the gripper bars 150 and 151 are operated by outward pressure in the roller 154 the said gripper fingers will move away from each other, and will also move radially outward, or away from the bar 149, but when the gripper bars again return to their normal positions, the fingers will be moved into gripping engagement with the outer surface of the bar 149. The outer surface of the said bar 149 is provided with two wide notches or depressions, 171 and 172, said depressions being located at the points at which the gripper fingers 169 and 170 engage the outer surface of the said bar. The inner ends of the slots 167 and 168 are in line with the side margins of the paper tube for purposes hereinafter set forth.

173 indicate journal boxes in which are mounted transverse, horizontal trunnions 174 and 175 which are rigidly attached to the ends of a hollow cylinder 176; said cylinder being of the same diameter and length as the cylinder 118. The three cylinders, 109, 118 and 176 act conjointly to perform certain functions, as will hereinafter appear. The said cylinder 176 has its longitudinal axis in the same horizontal plane with that of the cylinder 118, and is located forward of, and above the cylinder 109. The cylinders 118 and 109 have their cylindric surfaces in contact, as do also the cylinders 118 and 176 but the cylinders 109 and 176 are separated by a considerable space.

177 (Figs. 3 and 16) indicates a cam sleeve which is secured upon the inwardly extending end of the journal box 173, on the side of the machine nearest the rail 11, for purposes hereinafter set forth.

178 indicates a supporting bar, which is secured in a longitudinal slot in the cylindric wall of the cylinder 176, the outer surface of

said bar being flush with the outer surface of the said cylinder. In the inner face of said bar 178 is a longitudinal groove, as seen in Figs. 15 and 16. 179 indicates a bracket secured to the inner face of said bar, adjacent to one of its side edges and centrally between its ends. Said bracket has the form of an elongated flat plate which extends lengthwise of the bar 178, and laterally therefrom to the opposite side wall of the cylinder. On its longitudinal edge remote from the bar 178, the bracket 179 fits against the inner surface of the cylinder and is provided with a laterally extending flange 180 (Fig. 15) on the ends of which are formed two outwardly extending lugs 181, 181, which lugs extend through slots 182, 182 formed in the wall of the cylinder 176, with their outer ends flush with the cylindric outer surface of said cylinder. The outer end faces of the said lugs are located at such distances from the ends of the cylinders as to be in line with the side edges of the paper tube, as the same passes through the rollers and constitute stationary members of gripping devices adapted to engage said edges.

184 indicates a bell-crank lever fulcrumed by a pivot 185 to the bar 178 near the end of the same and in the longitudinal groove thereof. One arm of said lever 184 extends longitudinally of the bar toward the end of the cylinder adjacent to the rail 11 and projects outside of the end face of the said cylinder 176 at its end nearest the rail 11. Said bell crank lever 184 has a second arm which extends from the pivot 185 transversely of the cylinders toward the central axis thereof. 186 indicates an anti-friction roller mounted on the projecting end of said longitudinal arm of the lever, said roller being adapted for engagement with the cam sleeve 177, as will be hereinafter explained.

187 and 188 indicate rocking bearing-blocks which are connected by transverse pivots 189 and 190 respectively, with the bracket 179 at one side of the latter. The said bearing blocks 187 and 188 are provided with arms which extend transversely of the cylinder and to the ends of said arms are connected by pivots 191 and 192, two bell crank levers 193 and 194, the pivots 191 and 192 being parallel with the pivots 189 and 190 of said bearing blocks.

195 and 196 indicate gripper arms which extend transversely of the cylinder and are mounted in and supported by the bearing blocks 187 and 188, the inner ends of said gripper arms being provided with cylindric parts which fit and slide in guide apertures formed in the said bearing blocks exterior to the pivots 189 and 190 thereof. The said gripper arms are thus adapted to partake of the oscillatory movement of said bearing blocks, while being capable of endwise movement in a direction transverse of the cylinder.

197 indicates a longitudinally arranged link which is pivoted at one end to the transverse arm of the bell-crank lever 184 and at its opposite end to the bearing block 188, inside of the pivot 190 of the latter.

198 indicates an obliquely disposed connecting rod, pivoted at one end to the bearing-block 188, outside of its pivot 190, and at its opposite end to the bearing block 187, inside of the pivot 189 of the latter.

199 indicates a longitudinally extending, contractile, coiled spring, which is connected at its ends with the gripper arms 195 and 196, and which tends to draw the swinging ends of said gripper arms toward each other. The outer ends of said gripper arms 195 and 196 extend through the slots 182, 182, longitudinally exterior to the lugs 181, 181, on the bracket 179. The said outer ends of the gripper arms are provided with gripper fingers 200, 200, extending from said arms inwardly or toward each other, at right angles to the arms and overhanging the outer surfaces of said lugs 181, 181. Said gripper fingers constitute the movable members of gripping devices, which act with the lugs 181, 181, to grip and hold the side edges of the paper tube.

Attached to the side faces of the bracket 179 by means of bolts 201, 201 are stop-blocks 183, 183, which are shown as provided with slots through which pass the bolts 201, in order to provide for adjustment of said blocks in a direction longitudinally of the cylinder. The bell-crank levers 193 and 194 are provided with arms which extend from the pivots 191 and 192 thereof, transversely of the cylinder, and which rest or bear laterally against the outer ends of said stop-blocks. The said bell-crank levers 193 and 194 also have arms which extend from the pivots 191 and 192, in a direction endwise of the cylinder, toward the ends of the cylinder, and are engaged at their extremities with notches formed in the inner edges of the gripper arms 195, 196.

250, 251 indicate leaf springs which are attached to the bearing blocks 187 and 188, in such manner as to bear on the ends of the gripper arms 195, 196, which latter slide in said bearing blocks as hereinbefore described, and extend through the edges of said blocks nearest the supporting bar 178. Said leaf-springs tend to hold the gripper arms in position with their gripper fingers away from the lugs 181, 181, and thereby maintain the grippers in the open position thereof. The endwise movement of said gripper arms, under the action of said springs 250 and 251, is limited by means of stop-plates 252, 253, which are attached to the outer edges of said gripper arms and have inwardly bent ends adapted to engage shoulders on the bearing blocks; said stop-plates and shoulders being so located as to limit

the opening movement of the gripping arms when the gripping fingers are separated from the lugs 181, 181 a distance sufficient to admit the entrance of the edges of the paper-tube beneath the fingers.

The spring 199, by drawing inwardly the swinging ends of the gripper arms, correspondingly swing or rock the bearing blocks 187 and 188, so as to carry toward each other the pivots 191, 192 of the bell crank levers 193, 194, with the result that the transverse arms of said bell-crank levers are pressed against the stop blocks 201, 201, and the said bell-crank levers are swung in a direction to carry their longitudinal arms toward the supporting bar 178, thereby pressing the gripper arms endwise in a direction to bring the gripping fingers toward the lugs 181, 181 against the action of the leaf-springs 250, 251, which latter serve to keep the bell-crank lever always pressed against the said stop blocks 201, 201, and tend to move the gripper fingers away from said lugs 181, 181. The said spring 199, therefore, acts to hold the gripper fingers normally in gripping position, and to retain the roller 186 on the lever 184 in its inward position. When said roller is pressed outwardly or away from the center of the cylinder the block 188 is rocked so as to carry the gripper arm 196 away from the lug 181, and a corresponding rocking movement in reverse direction, is imparted to the rod 198 from the block 188 to the block 187, and the gripper arm 195. As the pivots 191 and 192 of the bell-crank levers 187 and 188 are carried away from each other by the rocking movement of said blocks the gripping arms are pressed outwardly by the springs 250 and 251, which latter retain the transverse arms of the said bell-crank levers 187 and 188 in contact with said stop blocks by their pressure on the longitudinal arms of said bell crank levers exerted through the gripper arms.

It is obvious from the construction described that an outward radial pressure, on the antifriction roller 186 will cause the finger-bearing ends of the gripper arms 195 and 196 to move outwardly and away from one another in the slots in the cylinder wall, and it is also obvious that when the outward pressure is removed from the antifriction roller the coiled spring 199 will draw inwardly the said gripping arms so as to bring the gripping fingers into clamping engagement with the lugs 181, 181.

202, 202 indicate knives secured in the surface of the cylinder 176 longitudinally thereof, each of said knives having its outer end in line with one side margin of the paper tube as it passes between the cylinders; the distance between the inner or adjacent ends of said knives being the same as the length of the knife 34. Said knives 202, 202 enter the grooves or recesses 114, 114, formed in

the cylinder 118, as hereinbefore described in effecting the cutting of the tube. The function of the said knives 202, 202 is to completely sever the tube with the exception of the central part of the lower layer or fold of the tube, which corresponds in width with that portion of the upper layer or fold which is severed by the knife 34.

203, 203 indicate narrow, circumferential grooves in the cylinder 176, said grooves being designed to receive guide wires 204 which are attached to a cross-bar 260 located near the delivery end of the machine.

205 indicates a shaft mounted transversely of the machine and having bearings at its ends on the standards 105, 105. Said shaft is provided near its central portion with two idler rollers 206, said rollers being located beneath and adapted to press upwardly against the forward end of the tongue plate, so as to support the tongue and keep the lower part or fold of the tube pressed against the same.

207 indicates a transverse, longitudinal bar which is attached to and extends between the rails 10 and 11. Said bar 207 has attached to its central portion the two guide wires 208, 208 hereinbefore mentioned in connection with the cylinder 109. Said guide wires extend upwardly from the bar and rest in the grooves 110, 110 in the cylinder 109, and pass between the cylinders 109 and 118 to a point adjacent to the cylinder 176; the outer ends of said guide wires curving upwardly to conform to the curvature of the cylinder 118, and being adapted to direct the paper tube upwardly between the said cylinders 118 and 176.

Secured to the forward edges of the standards 105 and 106 is a transverse, horizontal bar 209, said bar being parallel with the cylinder 176 and located forward of and slightly above the same. On the central portion of said bar are pivotally mounted two spring-actuated spreaders 210, 210. Said bar 209 is inclined downwardly and rearwardly from its forward edge, and the spreaders extend from said bar rearwardly over the cylinder 176 to points near the surface of the cylinder 118. Said spreaders are connected at their forward ends with the bar 209 by pivots 219, 219, permitting the rear ends of said spreaders to swing laterally of the machine toward and from each other.

220, 220 are contractile, coiled springs which extend longitudinally of the bar 209 and are connected at their opposite ends with the spreaders, forward of the pivots 219, 219 thereof, and with said bar outside of the spreaders. Said springs tend to hold the rear ends of the spreaders adjacent to each other. Mounted in the upper ends of the standards 105 and 106, in journal boxes 211, 211, is a transverse, horizontal shaft 212, said shaft having its central axis vertically

in line with and above that of the cylinder 176. Centrally secured to said shaft are three disks 213, 213 and 214. The disk 214 is located at the center of said shaft and the
 5 disks 213, 213 at either side thereof. The central disk 214 has on its opposite side faces adjacent to its periphery, two pairs of cam lugs, one pair consisting of lugs 215, 215, arranged opposite each other, and the
 10 other pair consisting of lugs 216, 216 also arranged opposite each other, the pair of lugs being located on diametrically opposite sides of said disk. Each of said lugs is convexly curved on its outer face, as shown in
 15 Fig. 8. The spreaders 210, 210 are provided with upwardly extending studs 221, 221 which are located in the paths of the cam lugs 215 and 216. Said cam lugs pass between the studs 221, 221 on the spreaders
 20 and thereby operate to spread apart the rear ends of the same against the action of the springs 220, 220 which tend to throw them toward each other.

The disks 213, 213 are each located at a
 25 point equi-distant from the center of the shaft 212, and are located each in line longitudinally with one of the side margins of the paper tube, as the same passes over the cylinder 176. Each of the said disks is provided with two curved plates 217, 218, having the form of cylindric segments, and each of which is attached at one side margin to the periphery of the disk and extends inwardly therefrom or toward the central disk 214.
 30 Said plates extend each through about one-fourth of the circumference of the disk on which it is mounted, and the two plates on each disk are arranged diametrically opposite each other on the disk. Said plates constitute ironers and in the turning of the disks move closely adjacent to the top surface of the cylinder 176. Said ironers act on the folded margins of the bellows folds of the tube, after the diamond folds have been
 45 made by the action of the gripping rollers and spreaders, so as to press the same against the body of the tube and complete the diamond fold as the tube passes from the cylinder 176 toward the delivery end of the machine. Said ironers operate intermittently and when traversing the upper parts of their circular paths are remote from the cylinder 176 and in position to avoid interference with the end margins of the bellows folds as the
 55 latter are opened and turned or folded inwardly by the action of the cylinders and the grippers thereon.

222 is a lever which is pivotally mounted on the inner face of the frame bar 11, (Figs. 3, 5 and 7) below the cross-bar 95, and extends upwardly from its pivot, so as to swing in the same vertical plane with the cam disk 28 on the shaft 21, hereinbefore described. Said lever is connected at its upper end with
 65 the forward end of a horizontal connecting

rod 223, the rear end of which is pivotally connected with the horizontal swinging lever 90 between the ends of the latter; the inner end of said lever 90 being connected with the downwardly projecting arm 88 of the rod 87,
 70 as hereinbefore described. The lever 222 is provided with a laterally extending stud 224 (Figs. 5 and 7) located in contact with the periphery of the cam disk 28, and which is acted on by the cam projection 29 to give
 75 swinging movement to said lever, in the rotative movement of said cam disk. A contractile, coiled spring 225 (Figs. 3 to 5) acts on the lever 90 to swing the same rearwardly and to hold the stud 224 against the cam
 80 disk 28.

226 indicates a bracket arm which is secured to the rail 11 at a point between the receiving end of the machine and the lever 90, which rises to the level of said lever 90
 85 and to which the coiled spring 225 is secured at its rear end. The lever 222 is forced forwardly or toward the delivery end of the machine against the action of said spring 225 by the cam lug 29 on the cam disk, at each
 90 revolution of the shaft 21. When the cam lug 29 engages the stud 224 on said lever 222 the inner end of the lever 90 will be carried forward, thus causing the inclined forward end of the rod 87 to be moved against the
 95 downwardly inclined lug 84 on the leaf spring 81, thus forcing the pronged ends 82 and 83 of the said leaf spring upwardly to points above the level of the plate 16. When the cam lug 29 passes from the said stud 224 the
 100 coiled spring 225 will draw the said rod back into its normal position, thus permitting the pronged ends 82 and 83 of the leaf spring to resume their normal or lower positions.

270 and 271 indicate upper and lower pasting and severing cylinders, which are located at the discharge end of the machine and which receive the paper tube after the same passes from the cylinder 176 and act to finally sever the bag sections from the paper tube and apply thereto paste for securing together the folded parts. Said cylinders 270 and 271 (Figs. 5 and 24) are mounted on horizontal, transverse shafts 272 and 273 which are supported at their ends in standards 264, 265 on the rails 10 and 11 of the machine frame. The upper shaft 272 is mounted in journal boxes 266, 267 and the lower shaft in journal boxes 268, 269 which are supported in the standards 264, 265.
 115 The lower cylinder 271 is provided with a centrally arranged knife 276 by which a final transverse, central cut is made in the lower fold of the tube, to sever the bag section from the same after the completion of the
 125 diamond fold. Said knife 276 is located in a recess in said cylinder and is movable radially of the cylinder so that it may remain in inoperative position and may be advanced at the desired time to effect the severing of
 130

the bag from the tube. The knife 276 is attached to the inner end of a longitudinally arranged lever 277 which is located in a longitudinal recess in the cylinder 271 and is pivoted to the said cylinder in a manner to swing in a radial plane. Said lever 277 has its outer end extended beyond the end of the cylinder, and on said outer end of the lever is mounted a roller 278 which is adapted for contact with a fixed actuating cam 279 mounted in the journal box 269 of the shaft 273. The cam 277 acts on the lever 275 to throw the knife 274 outward at the proper time. As the knife is thrown outward to sever the tube, it enters a recess 298 formed in the periphery of the cylinder 270.

The lower cylinder 271 is provided at each of its ends, outside of the knife 276, with two narrow, annular grooves 279¹, 279¹, and attached to the cross-bar 260 are two pairs of guide-rods 280, 280 forming downward and forward continuations of the guide-rods 204, 204, hereinbefore described. The bag-sections, with the diamond folds completed but still connected with each other, pass from the cylinder 176 forwardly and downwardly over the guide-rods 204, 204 and 280, 280 to and between the cylinders 270 and 271. Beneath the cross-bar 209, which supports the spreaders 210, 210, is another cross-bar 281 to which are attached two guide-rods 282, 282 that extend upwardly and rearwardly above the path of the bag-sections to points over the cylinder 176, and attached to said cross-bar 281 are other guide-rods 283, 283 which extend downwardly and forwardly from said crossbar, beneath the cylinder 270, which latter is provided with two annular grooves 284, 284 in which the forward ends of said rods rest.

285 is a transversely arranged, horizontal rock-shaft which is journaled at its ends in brackets 286, 286 attached to the cross-bar 209. Attached to said rock-shaft are two guide-rods 287, 287 which extend from the rock-shaft rearwardly between the disks 213, 213 and 214 over the cylinder 176. The rear extremities of said guide-rods are bent downwardly and forwardly and are curved to correspond with the curvature of the cylinder 176. By the rocking movement of said shaft 285 the curved ends of said guide-rods are brought adjacent to or lifted away from the said cylinder. The purpose of said guide rods is to direct downwardly and forwardly the forward edges of the parts of the diamond folds which project laterally from the sides of the central tongue by which each bag section is connected with the one forward of it, as the forward part of the diamond fold passes from between the cylinder 176 and the ironers 217 or 218 and advances toward the cylinders 270 and 271. To effect this result, the curved ends of said guide-rods 287, 287 are held in position adjacent to and parallel

with said cylinder 176 during the time that the diamond fold is being formed and is passing from the said cylinder, but are lifted and held away from the cylinder at other times, in order to prevent the same coming in contact with the knives 202, 202 on said cylinder. For giving rocking movement to the rock-shaft 285, as necessary for actuating said guide-rods 287, 287, devices are provided as follows: A coiled spring 288 surrounding said rock-shaft and attached at one end to the same and at its other end to the bearing bracket 286, tends to hold the said guide-rods in depressed position or adjacent to the cylinder 176. On the shaft 273 of the cylinder 271 is a second cam 289 (Figs. 1 and 24) adapted to act on a roller 290 which is mounted on a horizontally arranged lever 291 which is pivoted at its forward end to the frame member 10 and extends beneath said cam. The rear end of said lever is connected by an upright connecting rod 292 with a crank-arm 293 which is rigidly attached to and extends rearwardly from one end of the said rock-shaft. The cam 289 is formed with a concentric bearing surface extending through an arc of somewhat more than one-third of a circle. As the cylinder 271 turns at the same rate of speed as the cylinder 176, it follows that the cam 289 will make one rotation to each rotation of the said cylinder 176, and the said guide rods 287, 287 will be held in the elevated position thereof during somewhat more than a third of each revolution of the cylinder 176.

Driving means for the several shafts and cylinders described, are provided as follows: 300 indicates a transverse, horizontal shaft, mounted in bearings on the frame-members 10 and 11, below the same and vertically beneath the shaft 66; and to which power for driving the mechanism is applied. On said shaft is a gear wheel 301, (Fig. 1) meshing with an idler gear-wheel 302, which in turn meshes with a gear wheel 303 on the said shaft 66. On the opposite side of the machine, (Fig. 2), said shaft 66 is provided outside of its bearing, with a gear wheel 304 which meshes with a gear wheel 305 of the same diameter on the shaft 73. A gear-wheel 306 on the shaft 44 is driven from the gear-wheel 304, by an idler 307. The shaft 56 is driven from the gear wheel 306 by a gear wheel 308, affixed to said shaft 56 and meshing with a gear wheel 306¹ also affixed to the shaft 44. The shaft 21 is provided with a gear wheel 309, which meshes with an idler wheel 310 driven from the gear wheel 306. A gear wheel 311 on the shaft 31, meshes with a gear wheel 309¹ affixed on the shaft 21.

Mounted on the frame member 11 at the front of, and meshing with, the gear wheel 304, on the shaft 66, is a large idler-wheel 312. The shaft 108 is provided with a gear wheel 313 meshing with said idler-wheel 312,

and also with a gear wheel 314 on the shaft 116. The shaft 175 is provided with a gear wheel 315 meshing with said wheel 314, and also with a gear wheel 316 on the shaft 212.

- 5 The shafts 272, 273 are provided with intermeshing gear wheels 317, 318, and the latter gear wheel is driven from the idler 312 by means of two intermediate idlers 319, 320.

As the forward end of one of the partially severed bag sections of the bellows shaped paper tube passes forward over the widened, forward end of the tongue-plate 15 and approaches the cylinders 109 and 118, the gripping fingers 135, 135 on the cylinder 118 will grip or engage the side edges of the severed tongue on the advance edge of the upper portion of the bag section at the moment said tongue reaches or comes in contact with the lower part of said cylinder 118. The cam disk 28 on the shaft 21 is arranged to operate the rod 87 at the time the tongue on the bag section reaches a point above the spring arms 82 and 83 so that said spring arms will be elevated in a manner to lift said tongue and hold it against the cylinder 118 until the said fingers 135, 135 engage or grasp said tongue. The said tongue is therefore grasped by and clamped to the cylinder 118, while the portion of the partially severed tube on which the tongue is formed is passing over and is guided by the widened forward end of the tongue-plate 15. The cylinder 109 operates in connection with the cylinder 118 as a feed cylinder, the portions of said cylinder 109 between the central groove 110 and the lateral grooves 111, 111 thereof acting in connection with the opposed cylindric surface of the cylinder 118 to grip and carry forward the paper tube. The guide wires 208, 208 perform the function, as hereinbefore stated, of guiding the paper tube, after it passes between the said cylinders 109 and 118, forwardly and upwardly between the cylinders 118 and 176. After the tongue on the forward end of the bag section has been gripped by the grippers 135, 135, the bag section advances between the cylinders 109 and 118, until the gripping fingers 169, 170 on said cylinder 118 come in position adjacent to the cylinder 109 when they are operated to grasp the side margins of the upper plies of the bellows folds of the paper tube. The parts are so arranged that the recesses 113, 113 in said cylinder 109 come opposite the said gripping fingers 169 and 170 at the time said gripping fingers are in position to grasp the two plies of the bag sections. The part of the bag section which is gripped by the said gripping fingers 169 and 170 at this time has just passed from the forward end of the tongue-plate 15 and inasmuch as the guide-arms 102, 102 will at this time be entered between the upper and lower plies of the bellows folds of the tube, said bellows folds will be separated or held at such dis-

tance apart by said guide-arms as to insure that the said gripping fingers 169 and 170 will engage the upper plies of the bellows folds only.

The annular grooves 111, 111 in the feed cylinder 109 will prevent the side margins of the upper and lower plies of the bellows folds being pressed together between the cylinders 109 and 118, while the presence of the recesses 113, 113 in said cylinder 109 gives ample space for the operation of said gripper fingers and in which the bellows folds may remain spread apart at the time said gripper fingers come into engagement with the upper and lower plies of said bellows folds. After the tongue and upper plies of the bellows folds of the bag sections have been gripped to the cylinder 118, the further turning of said cylinder 118 and the cylinder 176 will bring the gripping fingers 169 and 170 on said cylinder 118 opposite and adjacent to the gripping fingers 200, 200 on said cylinder 176, the parts then being in the position shown in Figs. 15 and 16. At this time said gripping fingers 200, 200 will stand in the open position thereof and the parts are so arranged that the outer ends of said fingers 200, 200 will come in contact with or bear against the outer ends of said gripper fingers 169 and 170, as clearly seen in Fig. 16. Said gripping fingers 169 and 170 are provided each at one side thereof with flanges which overlap or extend outwardly past the side margins of the fingers 200, 200, as clearly seen in Fig. 15, and said flanges hold separated, or apart from each other, the two plies of the bellows folds, so that when the ends of the fingers 200, 200 are advanced to grip the lower plies they will with certainty enter between the upper and lower plies. As before stated, the said gripper fingers 200, 200 stand in the open position thereof at the time they come in contact with the closed gripping fingers 169 and 170, as shown in Figs. 15 and 16, and in the further turning of the cylinders 118 and 176, after the parts have reached the position shown in Figs. 15 and 16, said gripping fingers 200, 200 will be thrown into their closed or gripping position, and thereby grasp the lower plies of the bellows folds of the bag section at points exactly opposite the points at which the upper plies thereof are grasped by the gripper fingers 169 and 170. As the two cylinders continue to revolve after both plies of the bellows folds have been gripped at their side margins, as described, the creasers 148, 148 on the cylinder 118, acting in connection with the longitudinal grooves 112, 112 in the cylinder 109, form a transverse crease in the paper tube at a short distance rearwardly from the point at which the same is engaged at its side margins by said gripping fingers; said transverse crease being designed to assist in the folding. After the tongue on the bag section has been gripped

by the fingers 135, 135, and before the gripping of the two plies of the bellows folds to the cylinders 118 and 176, the knives 202, 202 on the cylinder 176, cooperating with the grooves 114, 114 in the cylinder 118, penetrate and sever the side portions of the paper tube. The cuts thus made extend outwardly from the longitudinal cuts in the upper portion of the tube, which define the side edges of the tongue, and are in line transversely with the transverse cuts made by the knife 45 in the lower portion of the tube, and they complete the severance of the tube with the exception of a central strip in the said lower plies thereof. The lower plies of the bag section being gripped by the grippers on the cylinder 176 and the upper plies of the tube being gripped by the grippers on the cylinder 118, it is obvious that as these cylinders revolve from the position shown in Fig. 15, so as to carry the pairs of side grippers on the two cylinders away from each other, the end of the bag section will be opened and spread and the diamond fold will be formed, as shown in Fig. 22. It will be remembered that a transverse crease has already been provided in the bag section at the rear of the point where the same is gripped by the side grippers, and this assists in the folding. When the end of the bag section is open or brought into the position shown in Fig. 21, the disk 214 operates on the spreaders 210, 210 causing the same to move outwardly within the extended or opened bellows folded side portions of the tubular bag section, thereby pressing outwardly on the same inside of and parallel with their end margins, and making the lateral folds of the diamond fold, as shown in said Fig. 22. As soon as the diamond fold has been completed the gripper fingers 135, 135 are operated to release the tongue on the upper portion of the bag section, at the same time the said grippers 169, 170 are operated to release the upper plies of the bellows folds. The parts of the diamond fold thus being released from the cylinder 118, while the other portions thereof are still gripped to the cylinder 176 by the gripping fingers 200, 200, the portion of the paper tube having the diamond fold thereon is carried forwardly over said roller 176 toward the delivery end of the machine.

As the diamond fold advances over the cylinder 176 from the position shown in Fig. 21, a pair of the rotative ironers 217, 217 or 218, 218, come in position to press the folded parts against said cylinder, so as to complete the creasing of all of the folded margins of the diamond fold. The bag section on which the diamond fold has just been formed is carried forwardly from the cylinder 176 over the guide-rods 204, 204 toward the cylinders 270, 271, by the engagement of the latter cylinders with the preceding bag section with which it remains connected at the

central part of its lower portion. As the forward end of the diamond fold passes from the cylinder 176 to the guide-rods 204, 204, the side grippers 200, 200 on the cylinder 176 are operated to release the sides of the diamond fold from said cylinder. When the forward end of the bag section on which the diamond fold has been formed reaches the cylinders 270, 271, the knife 276 on the cylinder 271 effects the final severance of the bag section from the tube. The operation of said cylinders 270, 271 in supplying adhesive material to the parts or flaps of the diamond fold and the lapping and sealing of said parts is all accomplished practically in the same manner as heretofore and need not be herein described.

I claim as my invention:—

1. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube, of means for forming a tongue in the paper tube at one side of said tongue-plate and for forming two longitudinal cuts in the paper tube at the other side of said tongue-plate, means for transversely severing the bellows folds of the tube, and means for forming a diamond fold embracing two oppositely rotating cylinders both provided with gripping means adapted to engage the plies of the bellows folds of the tube, one of said cylinders being located adjacent to the forward end of the tongue-plate, and a feed cylinder also located adjacent to the forward end of the tongue-plate and co-acting with said last named cylinder to advance the tube to and between the two oppositely rotating cylinders.

2. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube, of means for forming a tongue in the paper tube at one side of said tongue-plate, and for forming two longitudinal cuts in the paper tube at the other side of said tongue plate, means for transversely severing the bellows folds of the tube, two oppositely rotating cylinders one of which is located adjacent to the forward end of the tongue-plate, said cylinders being provided each with a pair of grippers adapted to engage the two opposite plies of the bellows folds of the tube, and means for actuating said grippers operating to actuate the grippers on the cylinder adjacent to the tongue-plate to grip two plies of the bellows folds of the tube before the grippers on the other cylinder are actuated to grip the other two plies of said bellows folds, the grippers on the said cylinders being adapted for contact with each other when the grippers on the cylinder adjacent to the tongue-plate have been closed to grip the bellows folds and the grippers on the other cylinder are still open.

3. In a paper bag machine, the combination with a tongue-plate adapted to support

a bellows folded paper tube, of means for forming a tongue in the paper tube at one side of said tongue-plate and for forming two longitudinal cuts in the tube at the other side of said tongue-plate, means for transversely severing the bellows folds of the tube, a rotating cylinder located adjacent to the forward end of the tongue-plate and provided with grippers adapted for engagement with the side edges of two of the plies of the bellows folds of the tube as the latter passes from the forward end of the tongue-plate, and a second rotating cylinder provided with grippers adapted to grasp the other two plies of the bellows folds of the tube after the latter has been engaged by the said grippers on the first named cylinder, the said grippers on the two cylinders being adapted for contact with each other after the grippers on the first named cylinder have been closed and while the grippers on the second named cylinder are still open, and the grippers on the first named cylinder being provided with outwardly extending flanges adapted to hold apart the plies of the bellows folds while the grippers on the second named cylinder enter between the same.

4. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube, of means for forming a tongue on the tube at one side of said tongue-plate and for forming two longitudinal cuts in the tube at the other side of said tongue-plate, means for transversely severing the bellows folds of the tube, means for forming a diamond fold embracing two oppositely rotating cylinders both provided with gripping means adapted to engage the plies of the bellows folds of the tube, one of said cylinders being located adjacent to the forward end of the tongue-plate, a feed-cylinder also located adjacent to the forward end of the tongue-plate and co-acting with the last named cylinder to advance the tube to and between the two oppositely rotating cylinders, and means for transversely creasing the tube, embracing creasing knives carried by the cylinder adjacent to the tongue-plate and acting against said feed-cylinder.

5. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube, of means for forming a tongue in said paper tube at one side of said tongue-plate, two oppositely rotating cylinders provided with gripping means adapted to engage the side edges of the bellows folds of the tube, and one of which is provided with gripping means adapted to engage said tongue, and means for severing the bellows folded side portions of the paper tube after the tongue thereon has been engaged by the said tongue-gripping means.

6. In a paper bag machine, the combination with a tongue-plate adapted to support

a bellows folded paper tube, of means for forming a tongue in the paper tube at one side of said tongue-plate, two oppositely operating cylinders each provided with gripping means adapted for engagement with the side edges of the bellows folds of the tube and one of which is provided with gripping means adapted to engage said tongue, one of said cylinders being provided with knives adapted to sever the bellows folds of the tube after the tongue thereon has been engaged by said tongue-gripping means.

7. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube, of means for forming a tongue on said paper tube at one side of said tongue-plate, a rotating cylinder located adjacent to the forward end of the tongue-plate and provided with gripping means adapted to engage said tongue and with a pair of grippers adapted to engage the side edges of the bellows folds at the side of the tube bearing said tongue, means operating to effect engagement of said gripping means with said tongue and the grippers with the bellows folds as the tube passes from the forward end of the tongue-plate, a second oppositely rotating cylinder provided with a pair of grippers adapted to engage the side edges of the bellows folds of the tube at the side of the same remote from the said tongue and which are adapted in the turning of the cylinder to meet the corresponding grippers of the first named cylinder, and means operating to effect engagement of the grippers on said second named cylinder with the said bellows folds at the time of the meeting of said grippers.

8. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube, of means for forming a tongue in the paper tube at one side of said tongue-plate, a rotating cylinder located adjacent to the forward end of said tongue-plate and provided with gripping means adapted to engage said tongue and the side edges of the bellows folds at the side of the tube bearing said tongue as the tube passes from the forward end of the tongue-plate, a second oppositely rotating cylinder provided with gripping means adapted to engage the side edges of the bellows folds of the tube at the side of the latter remote from the said tongue after the tube has been engaged by the gripping means on the first named cylinder, and a rotative feed cylinder in contact with said first named cylinder forward of the tongue-plate.

9. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube, of means for forming a tongue in the paper tube at one side of said tongue-plate, a rotating cylinder located adjacent to the forward end of said tongue-plate and provided with gripping

means adapted to engage said tongue and with a pair of grippers adapted to engage the side edges of two plies of the bellows folds of the tube, a second oppositely rotating cylinder provided with a pair of grippers adapted to engage the side edges of the other two plies of the bellows folds of the tube, and a rotative feed cylinder in contact with said first named cylinder forward of the said forward end of the tongue-plate, said feed cylinder being provided with a central groove to receive the forward end of the tongue-plate and with two lateral grooves in line with the side margins of the tongue-plate.

10. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded tube, of means for forming a tongue on the paper tube at one side of said tongue-plate and for forming two longitudinal cuts in the tube at the other side of said tongue-plate, two oppositely rotating cylinders, each provided with gripping means adapted to engage two plies of the bellows folds of the tube, and one of which is provided with gripping means adapted to engage said tongue, the cylinder bearing the tongue gripping means being located adjacent to the forward end of the tongue-plate, a feed roller also located adjacent to the forward end of the tongue-plate and acting with said last named cylinder to advance the tube to and between said cylinders, creasing knives carried by the cylinder bearing the tongue-gripping means, adapted to act against the said feed roller to crease the tube, and cutting knives carried by one of said oppositely rotating cylinders and acting against the other of said cylinders to sever transversely the bellows folds of the tube.

11. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube, of means for forming a tongue on said paper tube at one side of said tongue-plate and for transversely severing the bellows folds of the tube, a rotating cylinder located adjacent to the forward end of the tongue-plate and provided with gripping means adapted to engage said tongue, and with gripping means adapted to engage the side edges of two plies of the bellows folds of the tube, means for operating said gripping means adapted to effect engagement of the same with said tongue and with the bellows folds as the tube passes from the forward end of the tongue-plate and to release said tongue and the bellows folds from said cylinder upon the completion of the diamond fold, a second oppositely rotating cylinder provided with a pair of grippers adapted to engage the side edges of the other two plies of the bellows folds of the tube, and means for operating the grippers of said second cylinder adapted to effect clamping of the bellows folds to said second cylinder after the opposite bellows folds have been

clamped to the first cylinder and to release said bellows folds from said second cylinder after the release of the tongue and bellows folds from said first cylinder.

12. In a paper bag machine, the combination with means for forming a diamond fold embracing two oppositely rotating cylinders provided with gripping means, of two oscillating spreaders, springs holding said spreaders in the closed position thereof, and a rotative shaft arranged parallel with the cylinders and provided with cams adapted to act upon said spreaders to actuate same.

13. In a paper bag machine, the combination with means for forming a diamond fold embracing two oppositely rotating cylinders provided with gripping means, of two oscillating spreaders, springs holding said spreaders in their closed position, a rotative shaft arranged parallel with said cylinders, said shaft being provided with a central disk carrying cams adapted to act upon said spreaders to actuate the same and with two disks carrying ironers having the form of cylindric segments to act upon one of said cylinders.

14. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube and means for making a diamond folds, of means for advancing the paper tube along said tongue, revolving knives at one side of said tongue-plate adapted to form a central transverse cut and two parallel longitudinal cuts in the paper tube, revolving knives at the other side of said tongue-plate adapted to form two longitudinal cuts and two laterally separated transverse cuts inside of the side margins of the paper tube, said means for making the diamond fold including knives adapted to make other transverse cuts completely severing the bellows folds of the tube prior to the spreading of the said bellows folds in the formation of the diamond fold.

15. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube, of two oppositely rotating cylinders provided with gripping means and which cooperate in forming the diamond fold, means for advancing the paper tube along said tongue-plate to said cylinder, revolving cutters located at one side of said tongue-plate and adapted to form a central transverse cut and two longitudinal cuts in the paper tube, revolving knives at the opposite side of said tongue-plate adapted to form two laterally separated transverse cuts and two longitudinal cuts inside of the side margins of the said paper tube, one of said cylinders being provided with longitudinal knives adapted to make other transverse cuts completely severing the bellows folds of the tube prior to the opening or spreading of said bellows folds in the formation of the diamond fold.

16. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube, of rotative shafts located above said tongue-plate and provided with knives adapted to produce a central transverse cut and two longitudinal cuts in the upper part of the tube, said longitudinal cuts extending rearwardly from the ends of the said transverse cut, shafts located below said tongue-plate and provided with knives adapted to form two longitudinal cuts and two transverse cuts in the lower portion of the tube, said transverse cuts extending outwardly from said longitudinal cuts, and two oppositely rotating cylinders, one of which is provided with gripping means for engaging the plies of the bellows folds of the tube, and two cutting knives on one of said cylinders adapted to sever transversely the bellows folds of the tube.

17. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube, said tongue-plate having lateral grooves to receive the bellows folds of the paper tube, a spring-arm arranged longitudinally upon and secured at its rear end to the said tongue-plate near its forward end, said spring-arm being provided with two forwardly extending prongs and with a downwardly and forwardly projecting lug and said upper tongue-plate being provided with recesses to receive the prongs of the spring-arm and said lug, an endwise movable rod extending longitudinally of the tongue-plate with its forward end engaging the under surface of the lug on the spring-arm, and means for giving endwise movement to said rod.

18. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube, said tongue plate having lateral grooves to receive the bellows folds of the paper tube, a spring-arm arranged longitudinally upon and secured at its rear end to the said upper tongue-plate near its forward end, said spring-arm being provided with two forwardly extending prongs and with a downwardly and forwardly projecting lug and said tongue-plate being provided with recesses to receive the prongs of the spring-arm and said lug, an endwise movable rod extending longitudinally of the tongue-plate with its forward end engaging the under surface of the lug on the spring-arm, and means for actuating said rod comprising a horizontally swinging lever extending transversely of the machine below and adjacent to the tongue-plate and a rotating cam acting on said lever to give oscillatory movement thereto.

19. In a paper bag machine, the combination with a tongue-plate adapted to sup-

port a bellows folded paper tube, said tongue-plate having lateral grooves to receive the bellows folds of said tube, of a rotative cylinder located adjacent to the forward end of the tongue-plate and provided with gripping means adapted to engage the side edges of two plies of the bellows folds of the tube as the tube passes from the forward end of said tongue-plate, and guide bars located at the sides of the tongue-plate adjacent to its free end which enter the lateral grooves of the tongue-plate within the bellows folds and act to hold the said bellows folds apart when the side edges thereof are gripped by the gripping means.

20. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube, said plate being provided with lateral grooves to receive the bellows folds of said tube, of means for forming a tongue in said tube at one side of said tongue-plate, a rotating cylinder located adjacent to the forward end of the tongue-plate and provided with gripping means for engaging the said tongue and the side edges of two plies of the bellows folds of the tube as the tube passes from the forward end of the tongue-plate, a lifting arm mounted on the forward end of the tongue-plate, means for lifting said arm to throw the tongue against the said cylinder, and guide-arms arranged at the side of the tongue-plate and entering the lateral grooves therein inside of the bellows folds of the tube.

21. In a paper bag machine, the combination of a tongue-plate adapted to support a bellows folded paper tube, said tongue-plate being provided with lateral grooves to receive the bellows folds of said tube, cutting means for forming a tongue in the tube above said tongue-plate, a rotative cylinder located adjacent and above the forward end of said tongue-plate and provided with gripping means adapted to engage said tongue and the side margins of the two upper plies of the bellows folds of the tube, a second rotative cylinder provided with gripping means adapted to engage the two lower plies of the said bellows folds, said cylinder having its axis of rotation horizontally in line with the axis of the first named cylinder, a feed-cylinder located below and coaxing with said first named cylinder, and guide rods for directing the bag sections from said feed-cylinder to and between said cylinders.

22. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube, said tongue-plate being provided with lateral grooves to receive the bellows folds of said tube, means for forming a tongue in the tube at one side of said tongue-plate, a rotative cylinder located adjacent to the free end of said tongue-plate and provided with gripping means adapted to engage said tongue and the side

margins of two plies of the bellows folds of the tube, a pair of co-acting feed cylinders located between the cutting means and said cylinder, said tongue-plate being notched at its side margins adjacent to said cylinders, and said feed cylinders being provided with central grooves for the passage of the central part of the tongue-plate, a lifting arm mounted on the tongue-plate adjacent to its forward end, and means for actuating said lifting arm to throw the tongue against the said cylinder.

23. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube, said tongue-plate being provided with lateral grooves to receive the bellows folds of said tube, cutting means for forming a tongue in the tube at one side of said tongue-plate, of a rotative cylinder located adjacent to the free end of said tongue-plate and provided with gripping means adapted to engage said tongue and the side margins of two plies of the bellows folds of the tube, a pair of co-acting feed cylinders located between the said cutting means and said cylinder, said tongue-plate being notched at its side margins adjacent to said feed cylinders, said feed cylinders being provided with a central groove for the passage of the central part of the tongue-plate, and guide-arms located at the sides of said tongue-plate between said feed cylinders and the gripper-bearing cylinder and extending into said lateral grooves of the tongue-plate within the bellows folds of the tube.

24. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube, said tongue-plate being provided with lateral grooves to receive the bellows folds of the paper tube, of feeding means for advancing the paper tube along said tongue-plate, and means for forming two laterally separated, transverse cuts extending through the lower part of the tube and the bellows folds, comprising transverse downwardly opening recesses in the tongue-plate and transverse knives adapted to enter said recesses, the tongue-plate being notched in its lateral parts below said lateral grooves and adjacent to said recesses to permit the bellows folds and the lower part of the tube to come in contact with each other when opposite the knife receiving recesses.

25. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube and provided with lateral grooves to receive the bellows folds of the tube, of feeding means for advancing the paper tube along said tongue-plate, means for forming two transverse cuts in the lower part of the tube, comprising a rotative shaft extending transversely of the tongue-plate below the same, and two laterally separated transverse knives, said tongue-plate being provided with transverse re-

cesses adapted to receive the said transverse knives, the parts of the tongue-plate below the lateral grooves therein being notched adjacent to said transverse recesses to permit the lower part of the tube and the bellows folds to come into contact with each other when opposite said recesses.

26. In a paper bag machine, the combination with a tongue-plate adapted to support a bellows folded paper tube, and provided with lateral grooves to receive the bellows folds of the tube, of means for forming a tongue in the upper part of the tube comprising a transverse knife, and two longitudinal knives, said tongue-plate being provided in its upper surface with a transverse and two longitudinal recesses to receive said knives, and means for forming two longitudinal cuts and two transverse cuts in the lower part of the tube comprising two longitudinal knives and two laterally separated transverse knives, said tongue-plate being provided in its lower surface with two longitudinal grooves adapted to receive said longitudinal knives, and with two transverse recesses adapted to receive the transverse knives, the side margins of the tongue-plate below the lateral grooves therein being notched adjacent to said transverse recesses to enable the part of the tube below the tongue-plate and the bellows folds to come into contact with each other when acted upon by said transverse knives.

27. In a paper bag machine, a tongue-plate adapted to support a bellows folded paper tube, said tongue-plate embracing upper and lower plates joined along their central parts and forming between their side margins grooves to receive the bellows folds of the tube, said lower plate being provided at its forward end with two notches extending inwardly from the forward margin thereof, plates secured to the lower surface of the upper tongue-plate above the said notches in said lower tongue-plate, said plates being provided with transverse knife receiving recesses, and two transverse laterally separated knives adapted to cooperate with said recesses to form transverse cuts in the lower part of the tube, and in the bellows folds.

28. In a paper bag machine, the combination of a tongue-plate adapted to support a bellows folded paper tube, provided with lateral grooves to receive the bellows folds of said tube, of two opposed feed cylinders for advancing the tube along said tongue-plate arranged at opposite sides of said tongue-plate, said side margins of the tongue-plate being notched adjacent to said feed cylinders and the feed cylinders being provided with central grooves to receive the central part of said tongue-plate, and with lateral grooves in line with the side margins of the tongue-plate.

29. In a paper bag machine, the combina-

tion with a rotative cylinder, of gripping means thereon embracing a fixed gripper jaw on the cylinder, a gripper arm extending transversely of the cylinder and provided at its end at one side of the cylinder with a gripping finger, an oscillating block pivotally mounted in the cylinder, with which said gripper arm has endwise sliding connection, means giving oscillatory movement to said block, and means acting in the oscillatory movement of said block to give endwise movement of said gripper arm on said block.

30. In a paper bag machine, the combination with a rotative cylinder, of gripping means thereon embracing a fixed gripper jaw on the cylinder, a gripper arm extending transversely of the cylinder and provided at its end at one side of the cylinder with a gripping finger, an oscillating block pivotally mounted in the cylinder, with which said gripper arm has endwise sliding connection, means acting in the oscillatory movement of said block to give endwise movement of the said gripper arm therein, an operating lever arranged longitudinally of and pivoted to the cylinder with one of its ends projecting beyond the end of the cylinder, a cam acting on the projecting end of said lever in the turning of the cylinder, and means for connecting the said operating lever with the said oscillating block.

31. In a paper bag machine, the combination with a rotative cylinder, of gripping means thereon embracing a fixed gripper jaw on the cylinder, a gripper arm extending transversely of the cylinder and provided at its end at one side of the cylinder with a

gripping finger, an oscillating block pivotally mounted in the cylinder, with which said gripper arm has endwise sliding connection, a bell-crank lever pivoted to the said oscillatory block with one of its arms engaged with said gripper arm and the other with a part upon the cylinder, for giving endwise movement of said gripper arm on said block, and means for giving oscillatory movement to said block.

32. The combination with a rotative cylinder, of two gripping devices thereon, one for engaging a tongue on a bellows folded tube and the other the side margins of said tube, the gripping device for engaging said tongue being located adjacent to the center of the cylinder and comprising two gripper arms extending transversely of the cylinder and provided at their ends at one side of the cylinder with gripping fingers, said gripper arms being adapted for endwise movement transversely of the cylinder and their finger bearing ends having swinging movement in a direction endwise of the cylinder, and said gripping device for the side margins of the tube embracing two endwise and laterally movable bars arranged parallel with and adjacent to the side wall of the cylinder and provided with gripping fingers, and links connecting the said bars with the cylinder, adapted to afford both endwise and lateral movement in the bars.

PHINEAS L. BARTHOLOMEW.

Witnesses:

ETHEL SAYLOR,
ZELL G. ROE.