

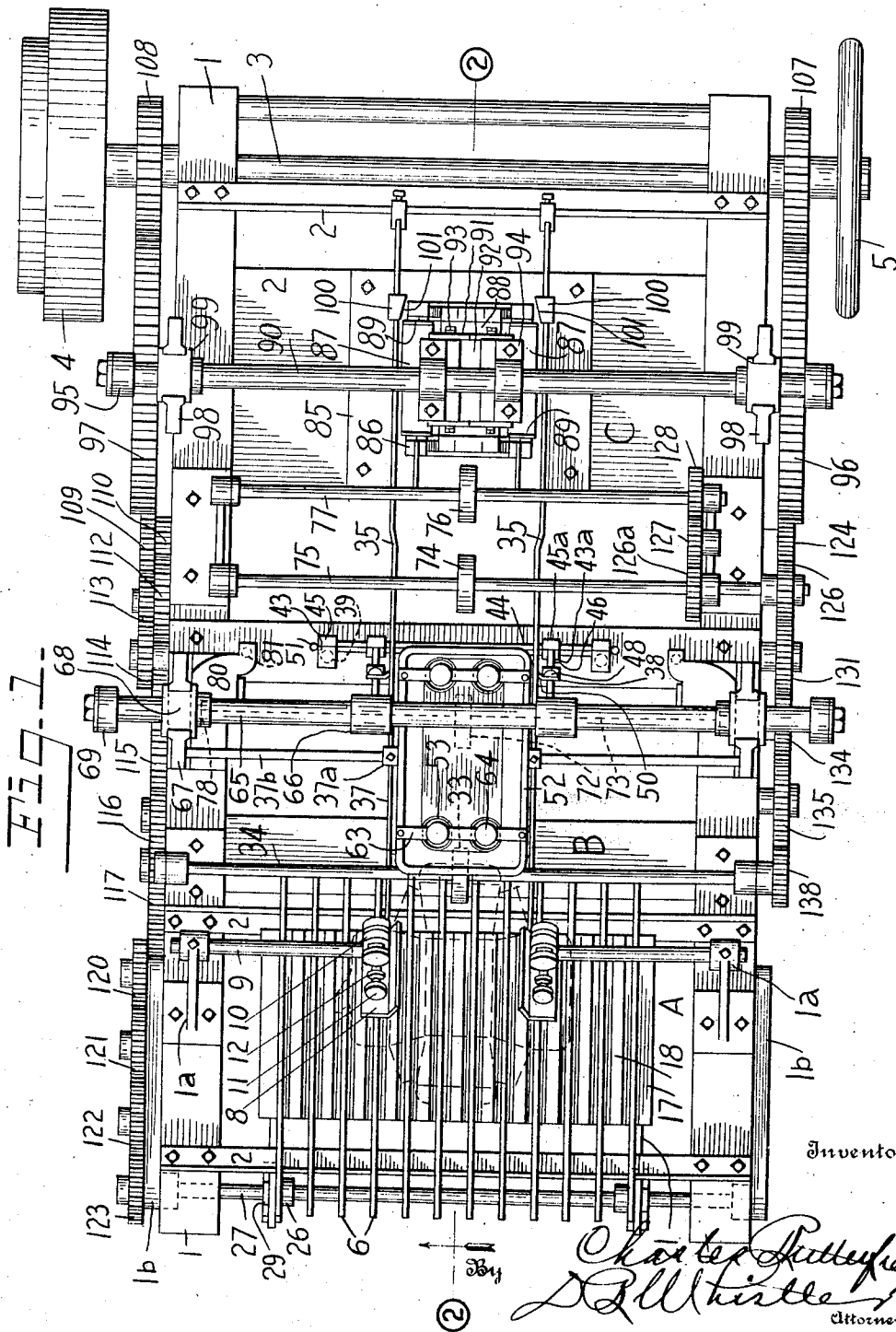
April 21, 1925.

1,534,569

C. BUTTERFIELD  
PAPER BOX MAKING MACHINE

Filed Aug. 8, 1923

6 Sheets-Sheet 1



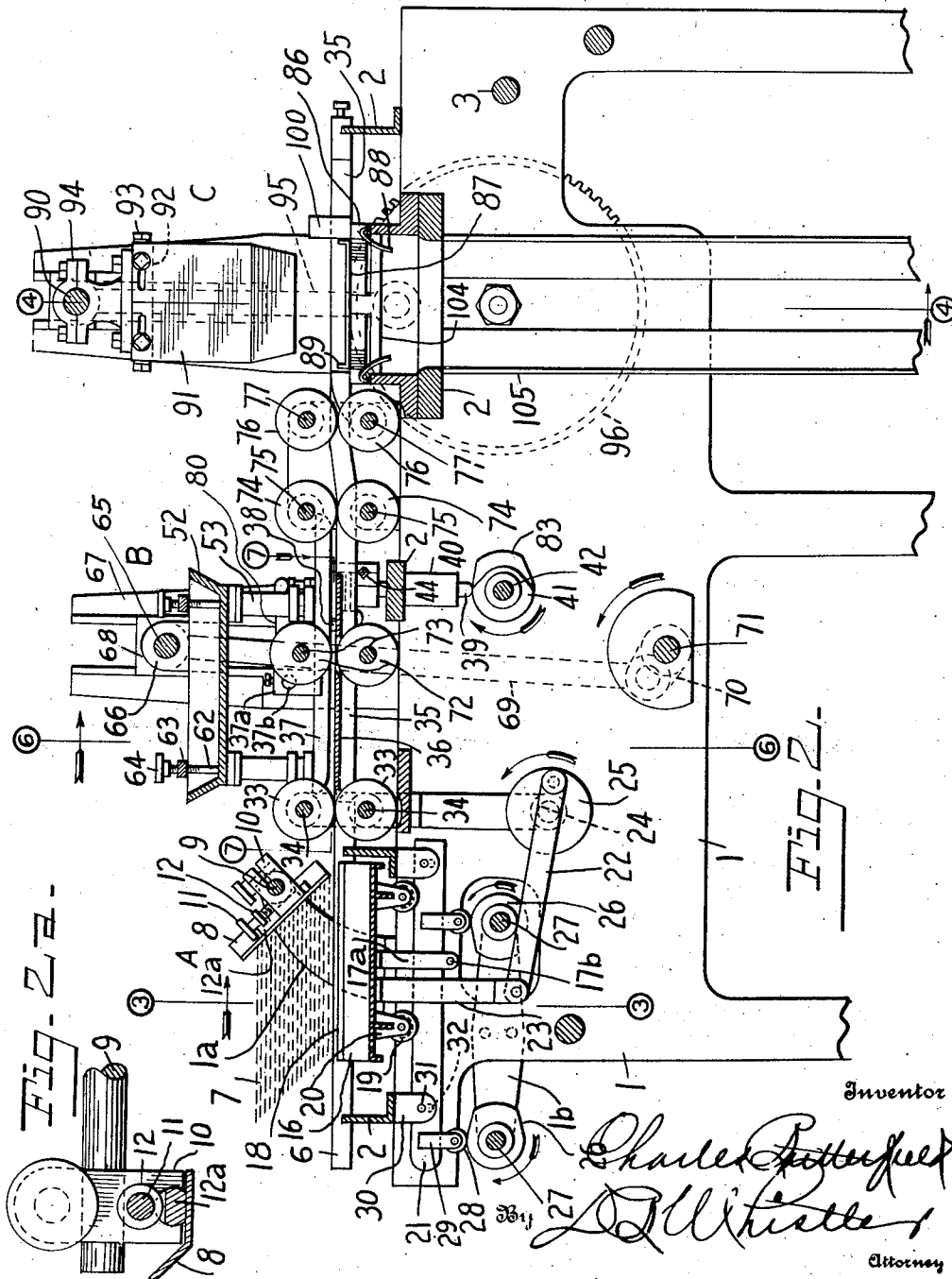
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6 Sheets-Sheet 2



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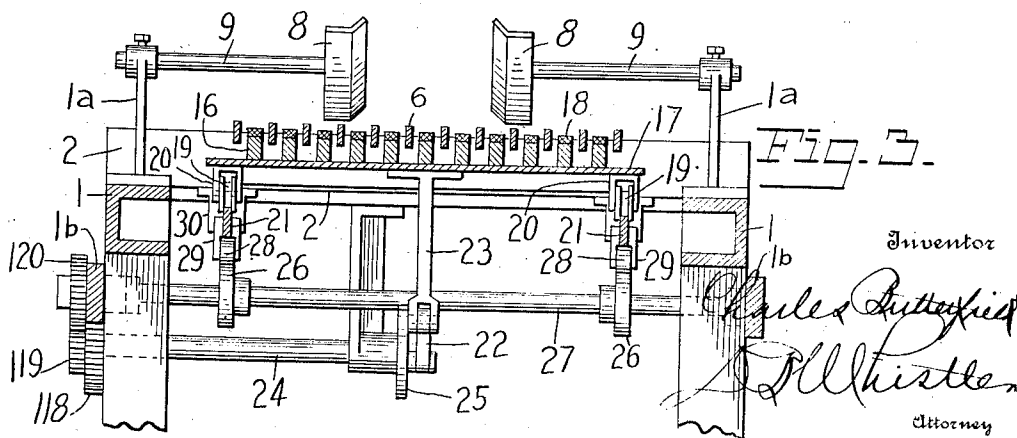
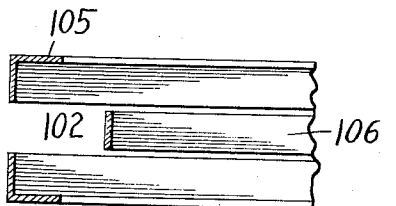
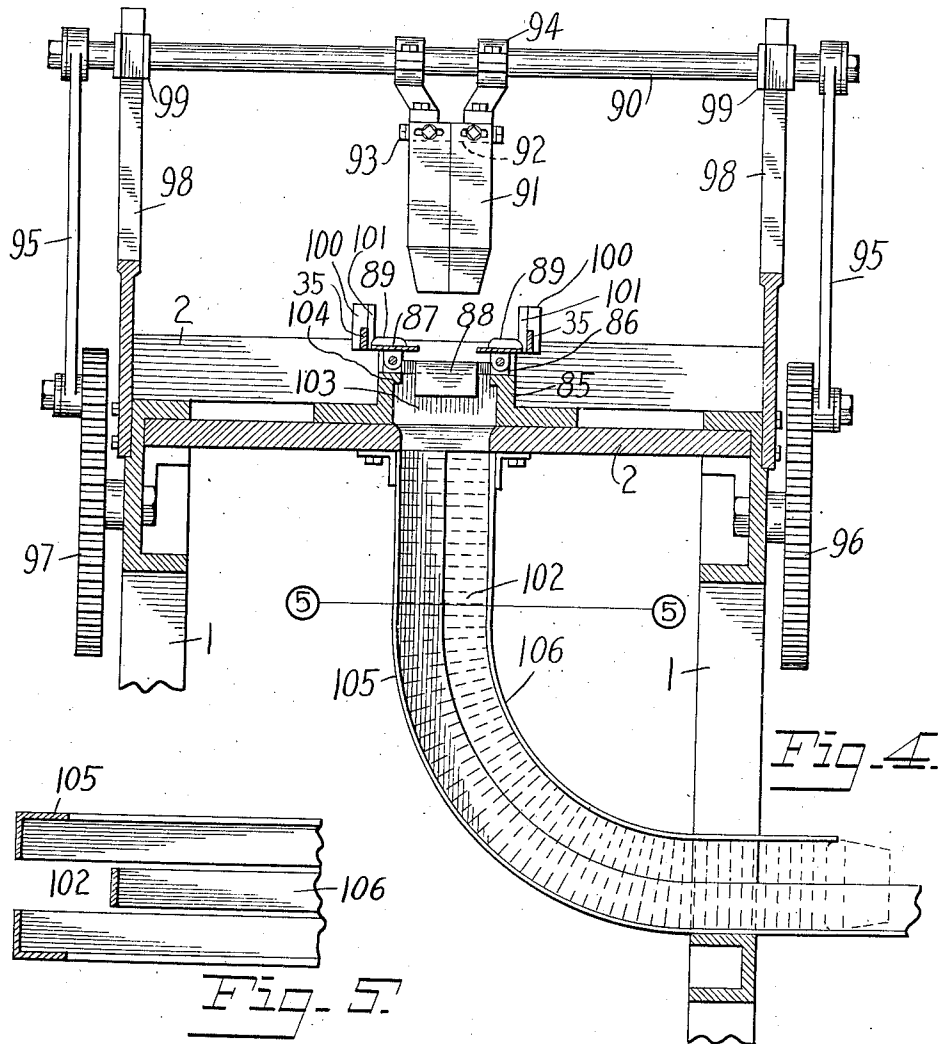
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6 Sheets-Sheet 3



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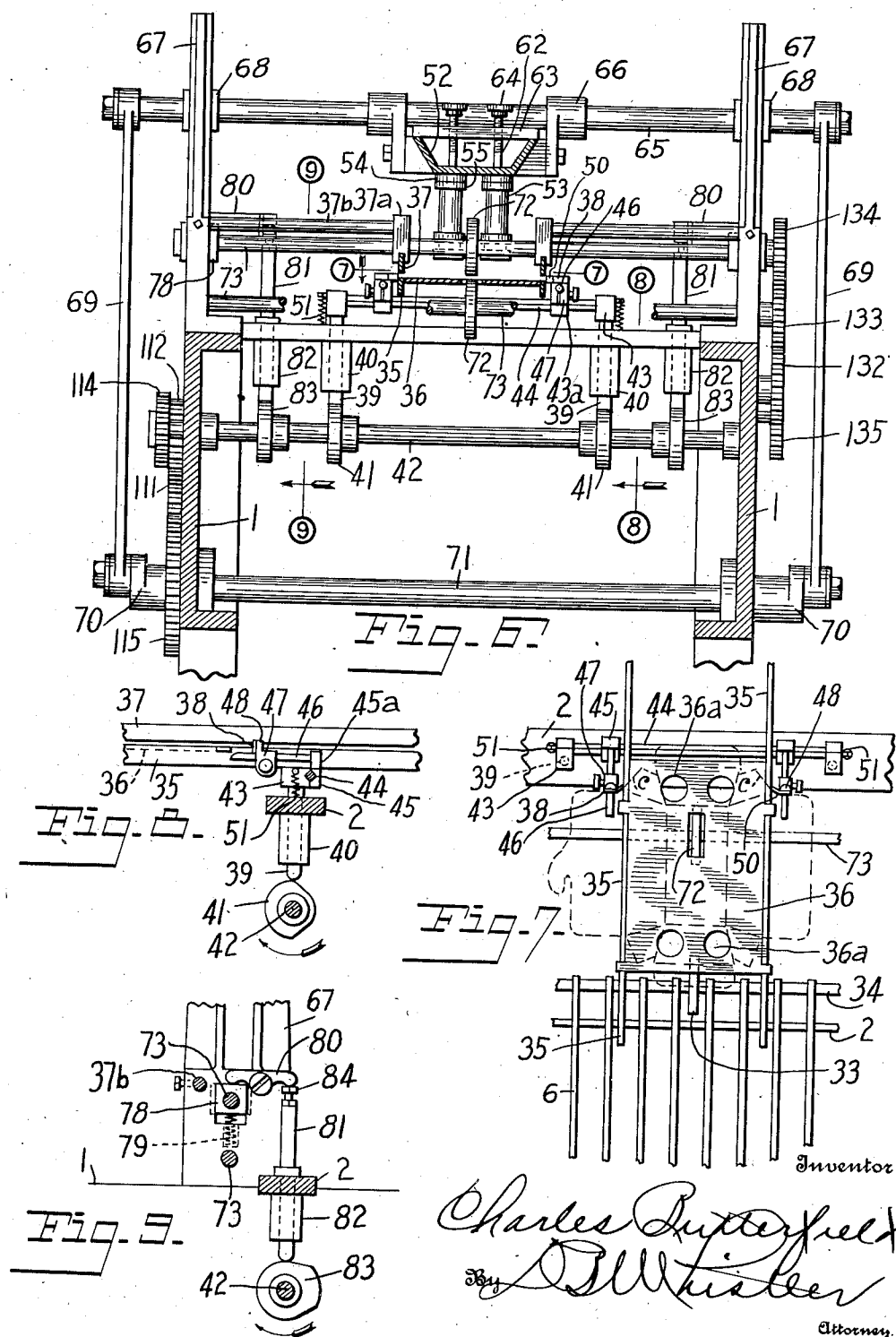
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C. BUTTERFIELD  
PAPER BOX MAKING MACHINE

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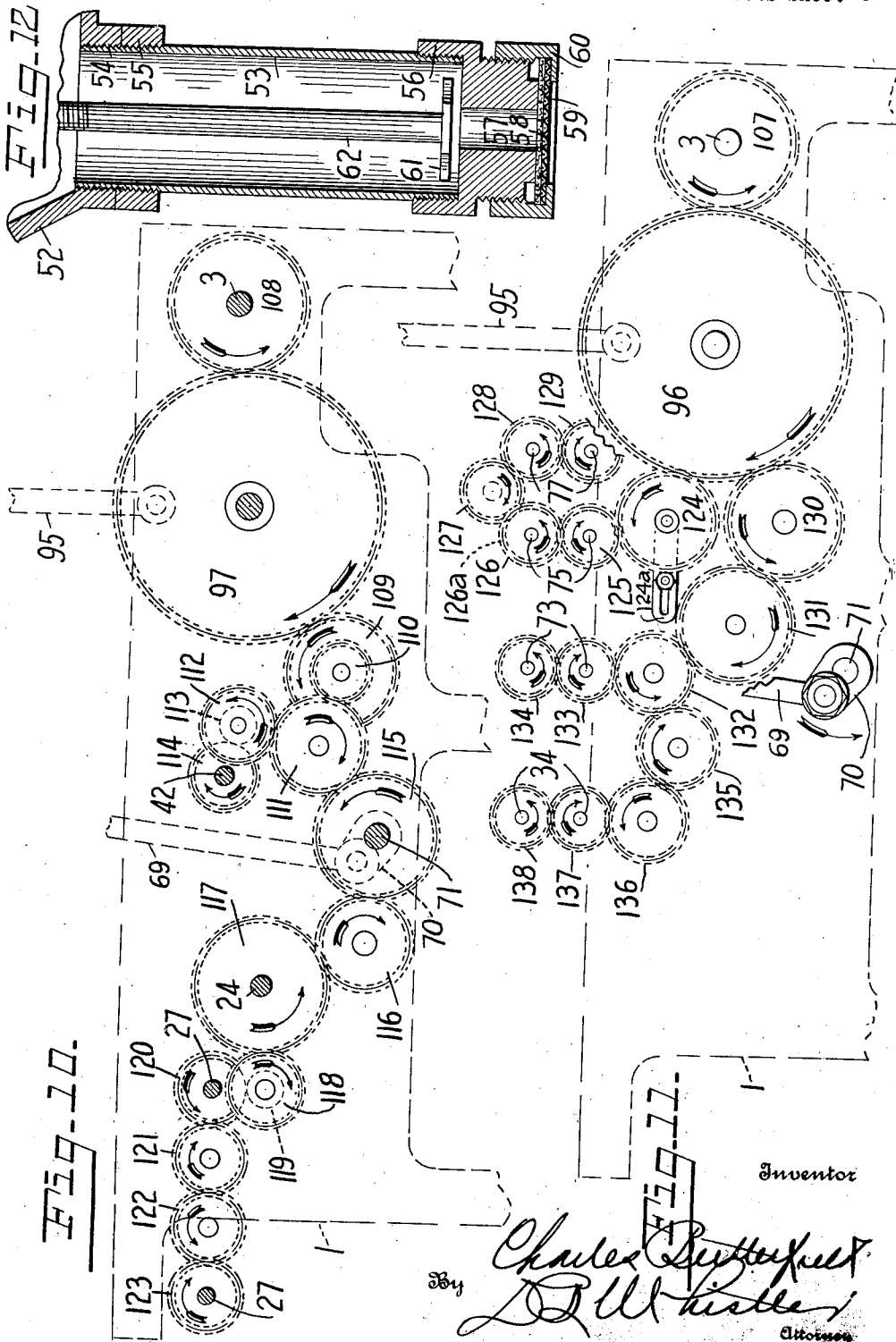
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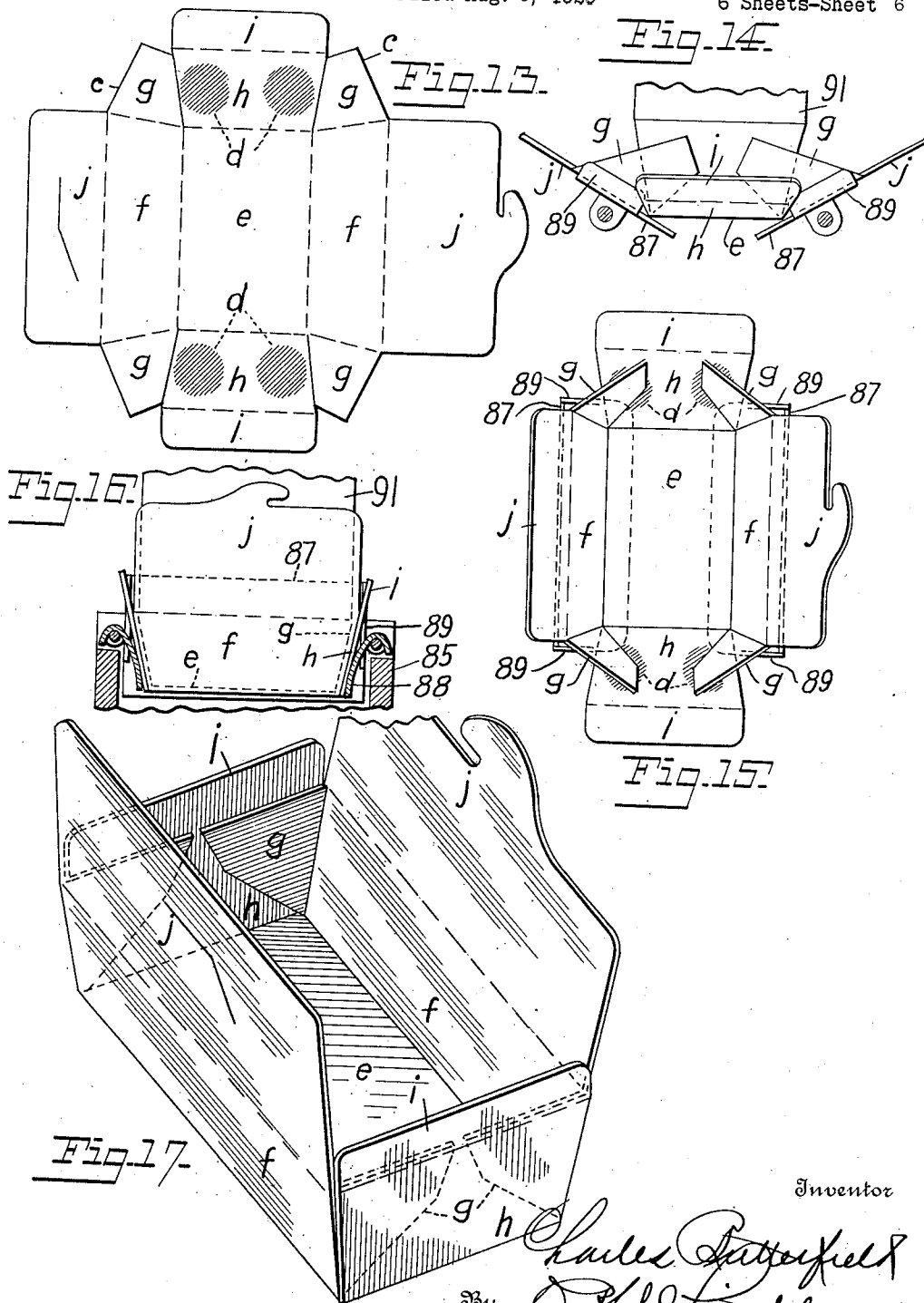
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PAPER BOX MAKING MACHINE

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6 Sheets-Sheet 6



Inventor

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Patented Apr. 21, 1925.

1,534,569

# UNITED STATES PATENT OFFICE.

CHARLES BUTTERFIELD, OF MIDDLETOWN, OHIO, ASSIGNOR TO THE INTERSTATE FOLDING BOX COMPANY, OF MIDDLETOWN, OHIO.

## PAPER-BOX-MAKING MACHINE.

Application filed August 8, 1923. Serial No. 656,397.

*To all whom it may concern:*

Be it known that I, CHARLES BUTTERFIELD, a citizen of the United States, residing at Middletown, in the county of Butler and State of Ohio, have invented certain new and useful Improvements in Paper-Box-Making Machines and the like, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to improvements in paper box making machines.

The invention relates especially to paper box making machines of the type in which the boxes are formed from blanks which are cut and scored for folding before the same are supplied to the machine, and upon which the successive operations of feeding the paper blanks to the machine, forming and gluing of the boxes, and delivery from the machine of the finished product are accomplished by automatic operations.

The object of the invention is to provide a machine of the character of simple construction, which will produce a superior product, and which will be capable of large production.

While the machine is shown in the accompanying drawings in a preferred form for the production of paper boxes of the design illustrated, it will be seen that the principle of the invention is readily adaptable by rearranging various parts of the mechanism to producing paper boxes of variable sizes and designs.

In the drawings:

Fig. 1, is a plan view of the machine;

Fig. 2, is a longitudinal sectional view of the machine taken on line 2—2 of Fig. 1;

Fig. 2<sup>a</sup>, is a detail sectional view of the paper guides;

Fig. 3, is a cross-sectional view of the machine taken on line 3—3 of Fig. 2;

Fig. 4, is a cross-sectional view of the machine taken on line 4—4 of Fig. 2;

Fig. 5, is a detail cross-sectional view taken on the line 5—5 of Fig. 4;

Fig. 6, is a cross-sectional view taken on the line 6—6 of Fig. 2;

Fig. 7, is a sectional plan view taken on line 7—7 of Fig. 2;

Fig. 8, is a detail view in longitudinal section on line 8—8 of Fig. 6;

Fig. 9, is a detail view in longitudinal section on line 9—9 of Fig. 6;

Fig. 10, is a diagram of the driving mechanism on the left side of the machine;

Fig. 11, is a diagram of the driving mechanism on the right side of the machine;

Fig. 12, is a vertical sectional view through one of the glue supply tubes;

Fig. 13, is a view of the paper blank showing the position of the glue as applied thereto;

Fig. 14, is a detail end view illustrating the first step of folding the box blank;

Fig. 15, is a plan view of the blank as illustrated in Fig. 14;

Fig. 16 is a sectional view illustrating the completion of the folding operation, and

Fig. 17, is a view of the completed box as delivered from the machine.

As here shown the paper box making machine comprises three groups of coordinated mechanisms consisting of the feeding mechanism —A, for the paper blanks from which the boxes are made, the gluing mechanism —B for supplying glue, or any suitable adhesive, to portions of the blank which are glued together, and the forming mechanism —C which forms the box.

The machine as a whole is supported on a suitable frame comprising opposite side frame members —1 and cross frame members —2, in which is supported a main drive shaft —3, which has secured to one end thereof a power belt pulley —4 and to its opposite end a wheel —5 by means of which the machine may be turned by hand.

In the feeding mechanism a series of horizontally disposed bars —6, arranged longitudinally of the machine, and supported by cross frame members 2—2, constitute a support for the paper blanks 7, which are arranged in an inclined stack as illustrated in Fig. 2, of the drawings. The angle at which the paper blanks are stacked on the machine can be regulated as desired by means of opposite guides —8, which are secured to a shaft —9, supported in opposite side frame brackets —1<sup>a</sup>, by means of clamp brackets —10, being adjustable on the shafts, transversely of the machine to position the same relative to the width of the paper blanks, and angularly in a vertical plane to determine the degree of inclination of the stack of paper blanks. Guides —8 are further adjustable longitudinally in their angular plane by means of adjusting screws —11, threaded into brackets —10 and

having annular shoulders —12, coacting with slides —12<sup>a</sup>, secured to the guides —8 and slidably mounted in the brackets —10, whereby the guides can be adjusted relative to bars —6 to effect delivery of but one blank from the bottom of the stock in one operation of the feeding mechanism.

The paper blanks are delivered singly from the under side of the supply stack by means of a reciprocating carriage comprising a series of parallel bars —16 supported on a carriage base —17, and equally spaced thereon to operate between the stationary supporting bars —6, each bar —16 having its upper surface covered with a strip —18 of yieldable material, as rubber, to provide for effective frictional engagement with the paper blanks. The carriage is supported on rollers —19 mounted in depending brackets —20 secured to the carriage base —17 and operable upon ways —21. The carriage —17 is held on the ways —21 by projections —17<sup>a</sup> having pins —17<sup>b</sup> which lie under the ways. The reciprocating movement of the carriage upon ways —21 is effected by means of a depending bracket —23 and to a drive shaft —24 by means of a pitman head —25. The carriage also has a vertical reciprocal movement relative to the bars —6 which is imparted thereto by means of cams —26, the cams being secured to opposite cam shafts —27 supported in bearing brackets 1<sup>b</sup> secured to the opposite side frames —1, the cams being arranged to engage rollers —28 which are connected by depending brackets —29 to the carriage ways —21 which in turn are supported from cross frame members —2 by depending brackets —30, the ways being connected to the brackets by means of lugs —31 extending into slots —32 which permits of the upward movement imparted to the ways —21 and the feeding carriage by action of cams —26.

At the beginning of the idle stroke of the feeding operation the mechanism will be substantially in the relation shown in Figs. —2 and —3, the feeding carriage being in its lowermost position with bars —16 out of contact with the paper blanks. On the back stroke of pitman —22, the feeding carriage will be moved to the extreme opposite position from that shown in Fig. 2, and upon beginning of the forward stroke of the pitman, cams —26, having made a half turn, will act through their engagements with rollers —28 to raise the feeding carriage, thus bringing the rubber-covered bars —16 into engagement with the lowermost paper blank, the blank being advanced from the supply stack, through frictional contact with bars —16, into engagement with pick-up rollers —33, which are secured to shafts —34 supported in side-frames —1.

Rollers —33, advance the paper blanks over opposite guides —35 to the gluing

mechanism, the blanks passing between a platen —36 and opposite upper guides —37 into engagement with opposite stops —38 which act to align the forward end of the blanks and to stop the same in position to receive the glue. The upper guides are supported by blocks —37<sup>a</sup> and rods —37<sup>b</sup> extending from frames 67. As best shown in detail Fig. 8, stops —38 each consists of a plunger —39 supported in a depending housing —40 on a cross frame member —2, and adapted to be actuated by a cam —41 secured to a shaft —42 extending transversely of the machine and supported in bearings in the side frame members of the machine. The upper end of plunger —39 is provided with an enlarged head —43 which is notched on one side to receive the end of a squared shaft —44 which connects the opposite stops one with the other and is secured to the plunger heads —43 by means of side plates —45, which are fastened on the heads —43 in any suitable manner, as by screws. Also mounted on the rod or shaft —44 are blocks —43<sup>a</sup> secured thereto by plates 45<sup>a</sup>. Secured in each plate —45<sup>a</sup>, is a forwardly extending arm —46 which has a stop lug —47 having a projection —48 adapted to be moved upon the upward thrust of the plunger into the path of the paper blanks as the same are advanced to the gluing mechanism. Each stop is provided with an inwardly inclined guide —50, secured to the projections —48 as best shown in Fig. 7, which is in position when the stops are raised to engage an angular edge —c of the paper, thus acting to align the forward ends of the blanks longitudinally. In the position shown in Fig. 8, the stops are in raised position. In the idle movement of cams —41 the stops drop to their disengaged position by gravity and under tension of springs —51 which are connected to plunger heads —43 and cross frame member —2.

The mechanism for applying glue to the paper blanks consists of a container —52 adapted to receive a suitable supply of glue, and having four downwardly extended tubes —53 which are open at their upper ends to the container and are each adapted to make a deposit of glue on each paper blank. An enlarged longitudinal section view of one of the tubes —53 is shown in Fig. 12. Their construction consists of the tube —53 which is threaded into the container as shown at —54 and is held in fixed relation thereto by means of an adjusting lock nut —55. The lower end of the tube is provided with an end cap —56, having a port —57 through which the glue is delivered, the discharge end of the port being covered with a fabric pad —58, as felt, and the pad with a wire screen —59, which serve to spread the glue evenly upon the surface of the blank as it is applied there-

to,—the extent of surface covered being determined by an apertured cap —60 threaded into end caps —56 which serves to hold pad —58 and screen —59 in position over port —57. Beneath each tube —53, the platen is provided with an opening —36<sup>a</sup> which permits the blank to form its own cushion when receiving the application of glue. Coacting with port —57 is a valve comprising a valve seat —61, adapted to restrict the discharge of glue through port —57, a valve stem —62 to which the valve seat is attached, extending upwardly through the glue container and supported in a cross strip —63 secured to the top of the container; the upper end of the valve stem being provided with a finger piece 64, by means of which the valve can be manipulated to insure free passage of the glue through tube —53 and port 57.

The glue container as a whole is supported on a shaft —65 by means of brackets —66, the shaft being adjusted to opposite vertical ways —67 by guide sleeves —66, and connected at its opposite ends to pitmans —69 which are connected at their opposite ends to crank sleeves —70 secured to a drive shaft —71, thus a vertical reciprocal movement will be imparted to the glue container and a deposit of glue will be made on a paper blank upon each stroke of the pitmans, the position of the glue on the blanks being illustrated at *d-d* in Fig. 13, of the drawings.

A series of feed rollers comprising three sets as here shown 72—72, 74—74, and 76—76, mounted on shafts 73—73, 75—75 and 77—77, respectively act upon the paper blanks after glue has been applied thereto to advance the same to the box forming mechanism —C. Rollers 72—72 are out of engagement one with the other, as best shown in Figs. 2 and —6, of the drawings during the interval the glue is being applied to the blanks, and are then moved into feeding relation one with the other to advance the blank. To this end upper shaft —73 which carries upper roller —72 is mounted at its opposite ends in floating bearing blocks —78 in opposite frame members —1, the shaft being supported in its raised position by compression springs —79, acting against the bearing blocks as shown in Fig. 9, and moved to its lowered position against the tension of springs —79 by pressure exerted upon bearing blocks —78 by pivoted levers —80 actuated by plungers —81 supported in housings —82 secured to a cross frame member —2, the plungers being actuated by cams —83 supported on shaft —42. Plungers —81 are provided at their upper ends with adjusting screws —84 for adjusting the relation of the plunger with lever —80.

The box forming mechanism consists of a die member comprising an apertured rectangular-shaped base —85 supported upon cross frame member —2, and having upwardly extended lugs —86 at the four corners thereof which serve as pivot bearing supports for opposite spring tension forming guides —87 and —88—88 which are arranged at right angles one with another adjacent the upper edge of the die aperture. The coacting member of the die consists of a vertically reciprocating ram or plunger supported on a shaft —90 and comprising a plurality of vertically arranged members —91 assembled as a unit on a head member —92 by screws —93, the plunger being secured to shaft —90 by mounting brackets —94. The vertical reciprocal movement is transmitted to the plunger by opposite pitmans —95 which are connected at one end to shaft —90 and at their opposite ends to gears —96 and —97, shaft —90 being adapted to slide in vertical ways —98 by means of guide sleeves —99, the ways being secured to the opposite side frames —1.

The successive steps of forming the boxes are illustrated in Figs. 13 to —17. The outline of the paper blank, full open and flat, is shown in Fig. 13, the glue deposits thereon being indicated at *d-d*. Each blank as it is advanced by feed rollers —16 is brought to position over the forming die by opposite stops —100 supported on guides —35, which have their inner faces inclined as indicated at —101, to engage the angular edges —*c* of the blanks to align the blanks as the same are brought to position over the forming die. Figs. —14 and —15 are end and plan views respectively illustrating the initial movement of the forming action. As here shown the forming plunger has moved into engagement with the paper blank, having pressed the central portion —*e* of the blank downwardly against spring tension plates —87 which have been moved by action of the plunger to the angular position shown. In this relation the central portion of the blank is in a horizontal plane across the end of the plunger, side portions —*f* —*j* are turned upwardly to the angle of plates —87, opposite upwardly projecting flanges —89 of plates —87 acting to turn the corner reinforcing flaps —*g* inwardly in advance of portions —*h* —*i* which are turned upwardly by the later action thereon of spring pressure plates —88. Fig. 16 illustrates the position of the parts as the box is brought to completion in the forming die. In this relation gluing of the corner flaps —*g* to portions —*h* is accomplished by the pressure exerted thereon between plates —88 and the tapered end of the forming plunger. Fig. 17 illustrates the complete box as delivered into a delivery chute —102 through which the boxes are discharged from the machine nested one within another as illustrated in Fig. 4. From the position illustrated in Fig. 16 the completed boxes are moved, by

further downward movement of the plunger, into an enlarged space —103 of the forming die in which the boxes expand sufficiently, as they are freed from the pressure thereon of plates —87 and —88, to cause their upper edges to engage shoulders —104 of the die and thus to be stripped from the end of the plunger at the beginning of its upward movement.

10 The delivery chute is formed of two angular pieces of metal —105 and a flat flexible piece —106 arranged relatively one to another and curved as shown in Figs. —4 and —5 to direct delivery of the boxes to the side of the machine, the flexible piece —106 acting to retard the movement of the boxes through the chute by frictional contact therewith thus causing complete nesting of the boxes one within another as they are delivered from the forming die and providing time for the glue to set before the boxes are delivered from the machine.

The power transmission mechanism for the machine is illustrated in diagrammatic views in Figs. 10 and —11, —Fig. 10 being a side elevation of the left side and Fig. 11 of the right side of the machine as viewed from the front. The power shaft —3, supported in the opposite main frames —1, adjacent the rear end of the machine, has opposite drive gears —107 —108 secured there to outwardly adjacent frames —1, the drive gears being directly connected with opposite gears —96 —97 which operate the forming plunger through pitman connections —95. On the left side of the machine the transmission from gear —97 is through intermediate gears —109 —110 —111 —112 —113 and gear —114 to shaft —42 to which 40 cams —41 and —83 are attached. Gear —111 also meshes with a gear —115 secured to the pitman crank shaft —71 by means of which the gluing device is reciprocated. From gear —115 the movement is through 45 idle gear —116 and drive gear —117 to crank shaft —24 through which the feed carriage —17 is operated. From gear —117 movement is also transmitted through intermediate gear —118 and gear —119 to inner cam shaft —27 and from gear —119 through intermediate gears —120 —121 —122 and gear 50 —123 to outer cam shaft —27, the shafts —27 each supporting one of the sets of cams —26 by means of which vertical reciprocal movement is imparted to the feeding carriage —17.

On the right side of the machine, as illustrated in Fig. 11, the transmission from gear —96 is through an intermediate gear 60 —124 to a gear —125 secured to lower feed roller shaft —75, and from gear —125 to gear —126 secured to upper feed roller shaft —75, from gear —126, also mounted on upper shaft —75, through intermediate gear 65 —127 to gear —128 secured to upper feed

roller shaft —77 and from gear —128 to gear —129 on lower feed roller shaft —77. Feed rollers —72 and —33 are driven in like manner from gear —96, the movement to roller —72 being through intermediate gears 70 —130 —131 —132 and gears —133 and —134 secured to upper and lower feed roller shafts —73 and to feed rollers —33 from gear —132 through intermediate gears —135 —136 to gears —137 and —138 secured respectively 75 to upper and lower feed roller shafts —34. As a mechanical expedient, to effect convenience in assembling, gear —124 is mounted on an adjustable radius arm —124<sup>a</sup>.

From the foregoing detailed description 80 and the illustrations of the drawings the construction and operation of the improved box forming machine will be readily understood.

Having described my invention, I claim: 85

1. A paper box making machine, including in combination with mechanism adapted to form the boxes from paper blanks, means for delivering the blanks to the forming mechanism including feeding mechanism 90 adapted to deliver the blanks singly from a supply of blanks stacked thereon, means interposed between said feeding and forming mechanisms for applying an adhesive to the blanks consisting of a reciprocating container for the adhesive timed in operation 95 with said feeding mechanism and having a plurality of valve controlled discharge apertures for depositing the adhesive on predetermined portions of each blank. 100

2. A paper box making machine, including in combination with mechanism adapted to form the boxes from paper blanks, a means for delivering the blanks to the forming mechanism including feeding mechanism 105 adapted to deliver the blanks singly from a supply of blanks stacked thereon, means interposed between said feeding and forming mechanisms for applying an adhesive to the blanks consisting of a plurality of valve controlled containers adapted to be actuated to make a regulated deposit of adhesive on portions of each blank. 110

3. A paper box making machine, including in combination with mechanism adapted 115 to form the boxes from paper blanks, a means for delivering the blanks to the forming mechanism including feeding mechanism adapted to deliver the blanks singly from a supply of blanks stacked thereon, means interposed between said feeding and forming mechanisms for applying an adhesive to the blanks consisting of a plurality of valve controlled containers adapted to be actuated to make a regulated deposit of adhesive on portions of each blank, and means coacting with the blank feeding mechanism for stopping 125 and aligning the blanks relative to the mechanism for applying the adhesive.

4. A paper box making machine including 130

in combination with mechanism adapted to form the boxes from paper blanks, a means for delivering the blanks to the forming mechanism including feeding mechanism adapted to deliver the blanks singly from a supply of blanks stacked thereon, means interposed between said feeding and forming mechanisms for applying an adhesive to the blanks consisting of a plurality of valve controlled containers adapted to be actuated to make a regulated deposit of adhesive on portions of each blank, and means coacting with said blank feeding mechanism and comprising separable feed rollers and stops acting therewith for positioning the blanks relative to said adhesive applying mechanism.

5. A box making machine comprising a box forming unit having power mechanism applied thereto, feeding mechanism adapted to deliver box blanks to the box forming mechanism, mechanism arranged between said feeding and forming mechanisms for applying an adhesive to the blanks to form the box joints, said mechanism being arranged in fixed relation and in longitudinal alignment one with another; and operating connections driven from the box forming unit and coordinated with the operation thereof whereby said feeding and adhesive applying mechanism are operatively timed therewith.

6. A box making machine comprising a box forming unit having power mechanism applied thereto, feeding mechanism including means for delivering box blanks singly from a stack of blanks, and intervening carrier mechanism for delivering the blanks singly to the box forming mechanism, mechanism interposed between the stack supporting mechanism and the box forming mechanism for applying an adhesive to the blanks, said mechanism being arranged in fixed relation and in longitudinal alignment one with another; and operating connections coordinated with and actuated through the box forming mechanism whereby delivery of the box blanks to the forming mechanism is timed to the forming operations thereof.

7. A box making machine comprising a

box forming unit having power mechanism applied thereto, feeding mechanism adapted to deliver box blanks singly to said forming mechanism and mechanism between said feeding and forming mechanisms for applying an adhesive to the blanks whereby to effect adhesive junctures on the boxes in the forming operation thereof, said mechanism being arranged in fixed relation and in longitudinal alignment one with another; and operating connections driven from the box forming unit for operating the blank feeding and the adhesive applying mechanisms and to interrupt intermittently the forward movement of the blanks through the machine whereby to present the same to the box forming mechanism timed with the operation thereof.

8. A box making machine comprising a box forming unit having power mechanism applied thereto, box blank feeding mechanism and adhesive applying mechanism operatively connected to the box forming unit, said connections comprising gear trains, a series of cams operatively associated with the gear trains and acting to impart intermittent operation to said blank feeding and adhesive applying mechanisms and stops arranged in the path of the box blanks through the machine acting to align the same for the respective operations thereon.

9. A box making machine comprising a box forming unit having power mechanism applied thereto, box blank feeding mechanism and adhesive applying mechanism operatively connected to the box forming unit, said connections comprising gear trains, a series of cams operatively associated with the gear trains and acting to impart intermittent operation to said blank feeding and adhesive applying mechanisms, stops and intermittently operable rollers arranged along the path of the box blanks through the machine acting to interrupt the movement of the blanks and to align the same for the respective operations thereon.

In testimony whereof, I affix my signature:

CHARLES BUTTERFIELD.