No. 694,635. Patented Mar. 4, 1902.

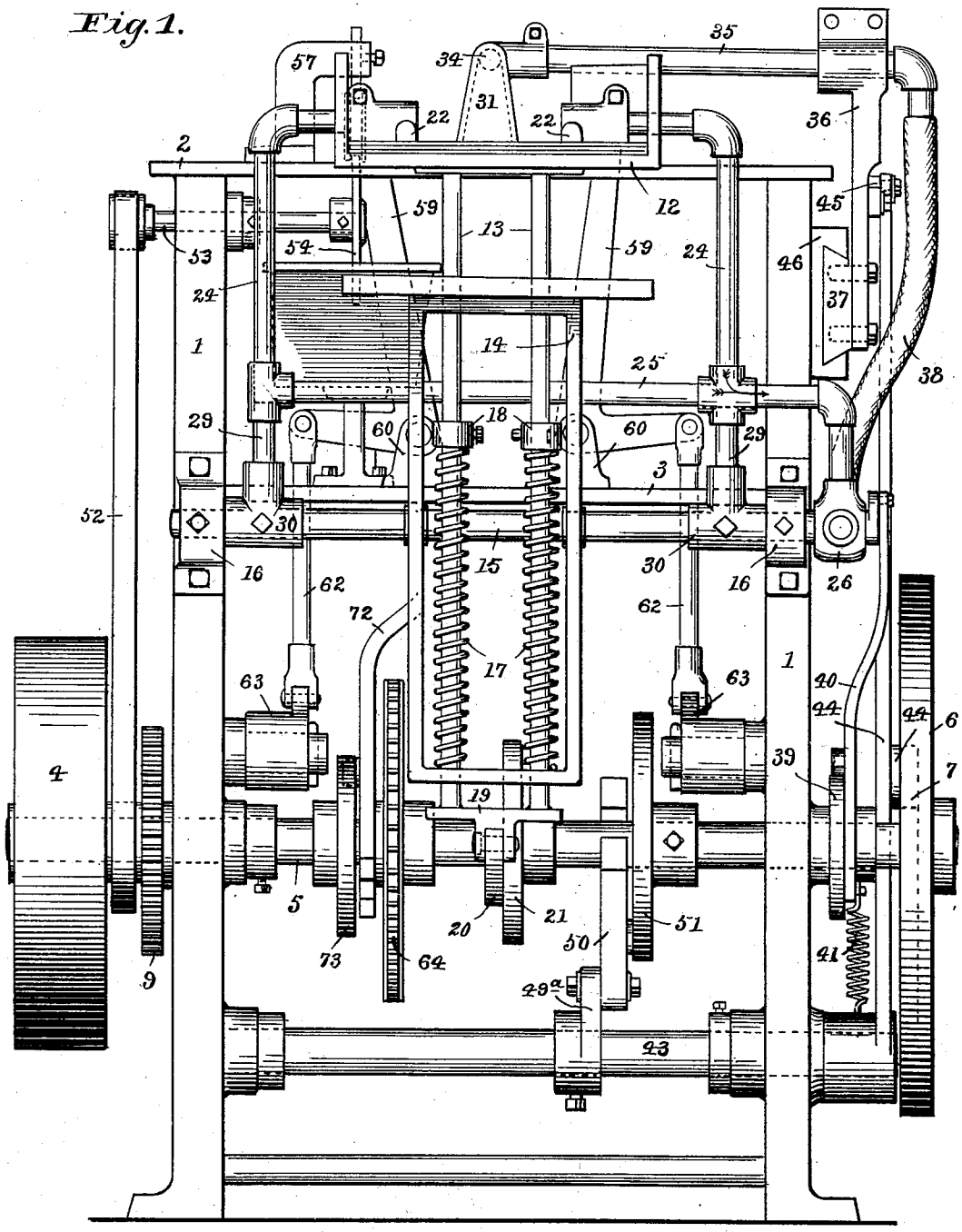
G. M. GRISWOLD.

PAPER BOX BLANK FEEDING AND FOLDING MECHANISM.

(Application filed June 25, 1901.)

(No Model.) 6 Sheets—Sheet 1.

Fig. 1.



Witnesses

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Fig. 2.

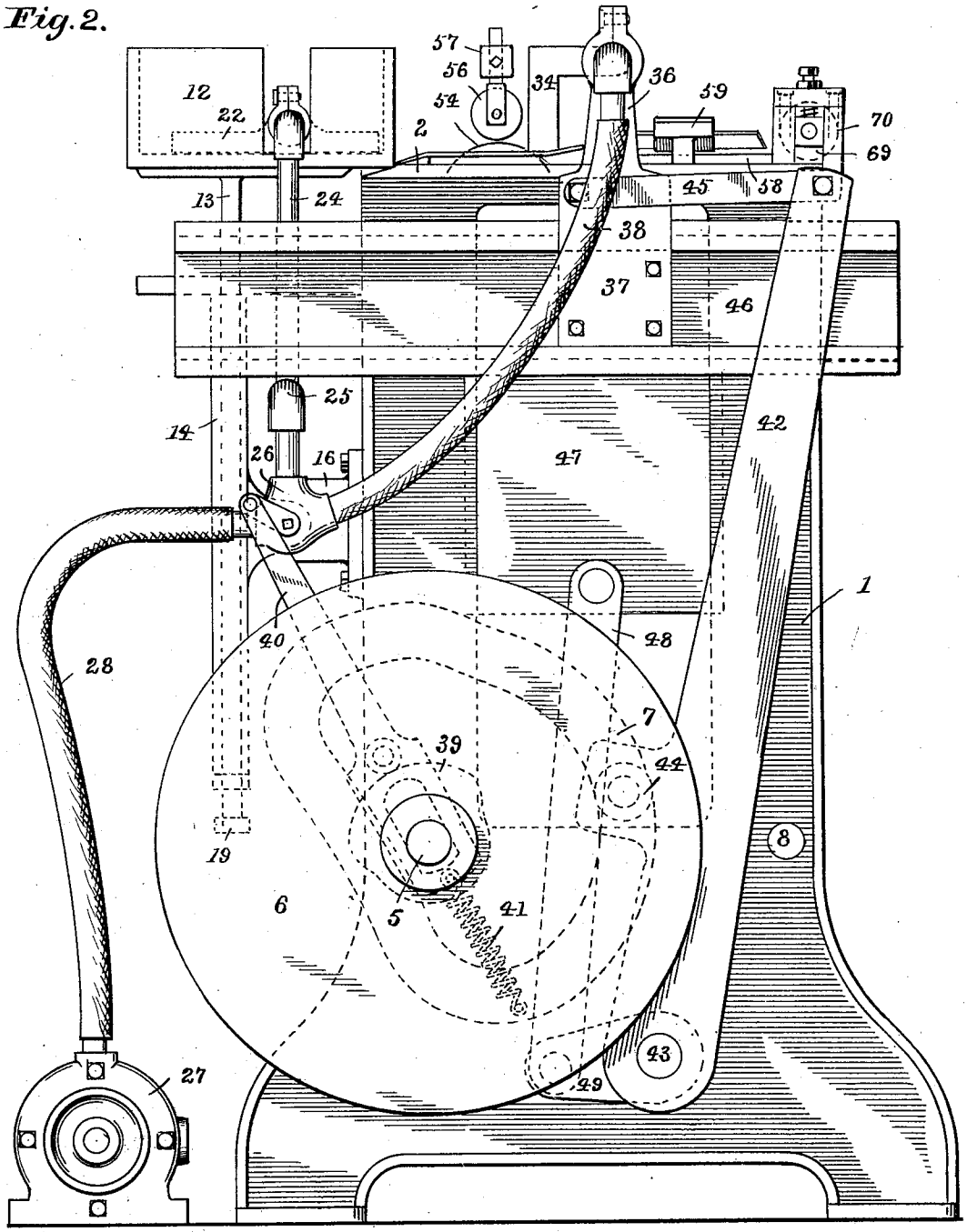

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Fig. 3.

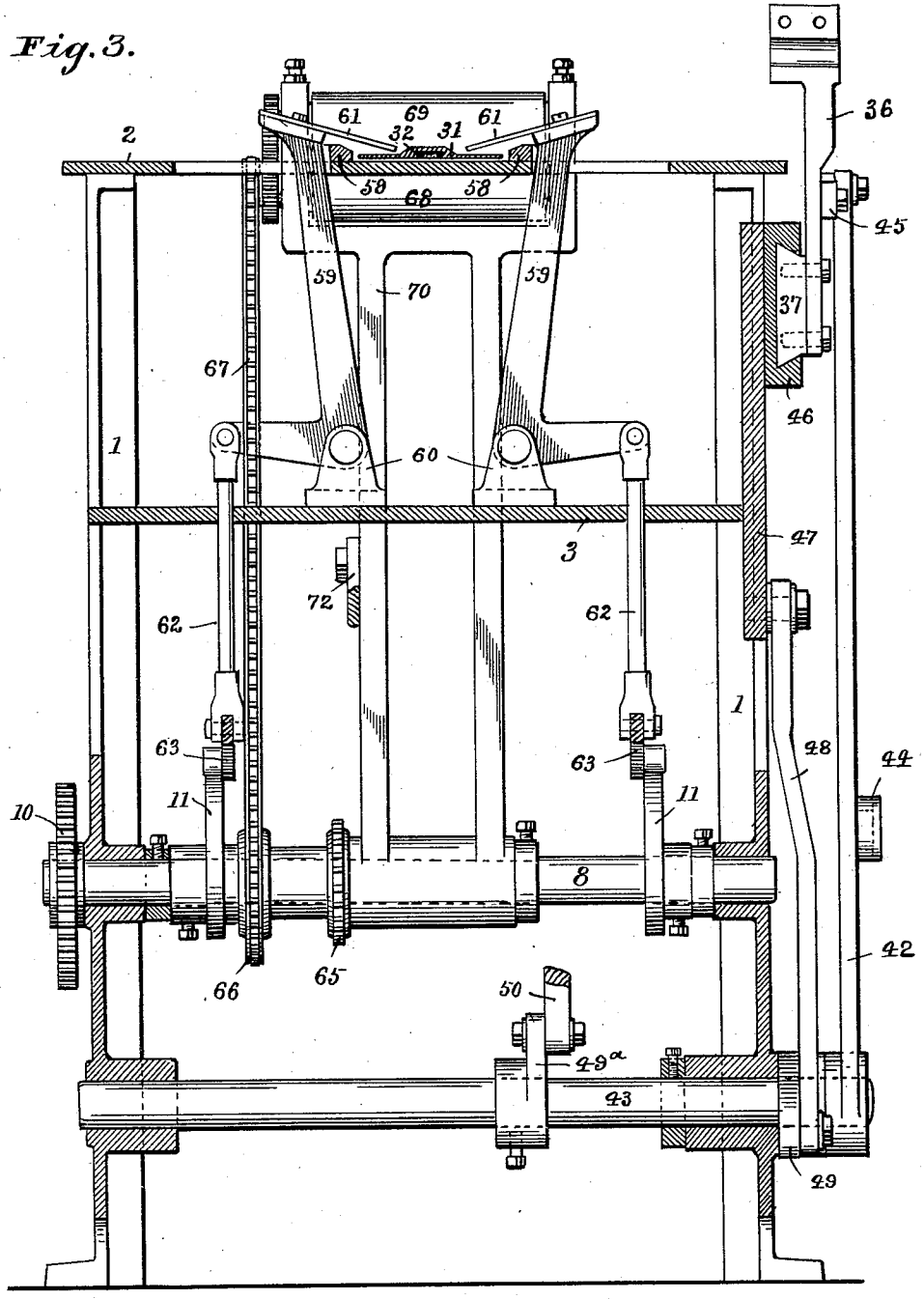

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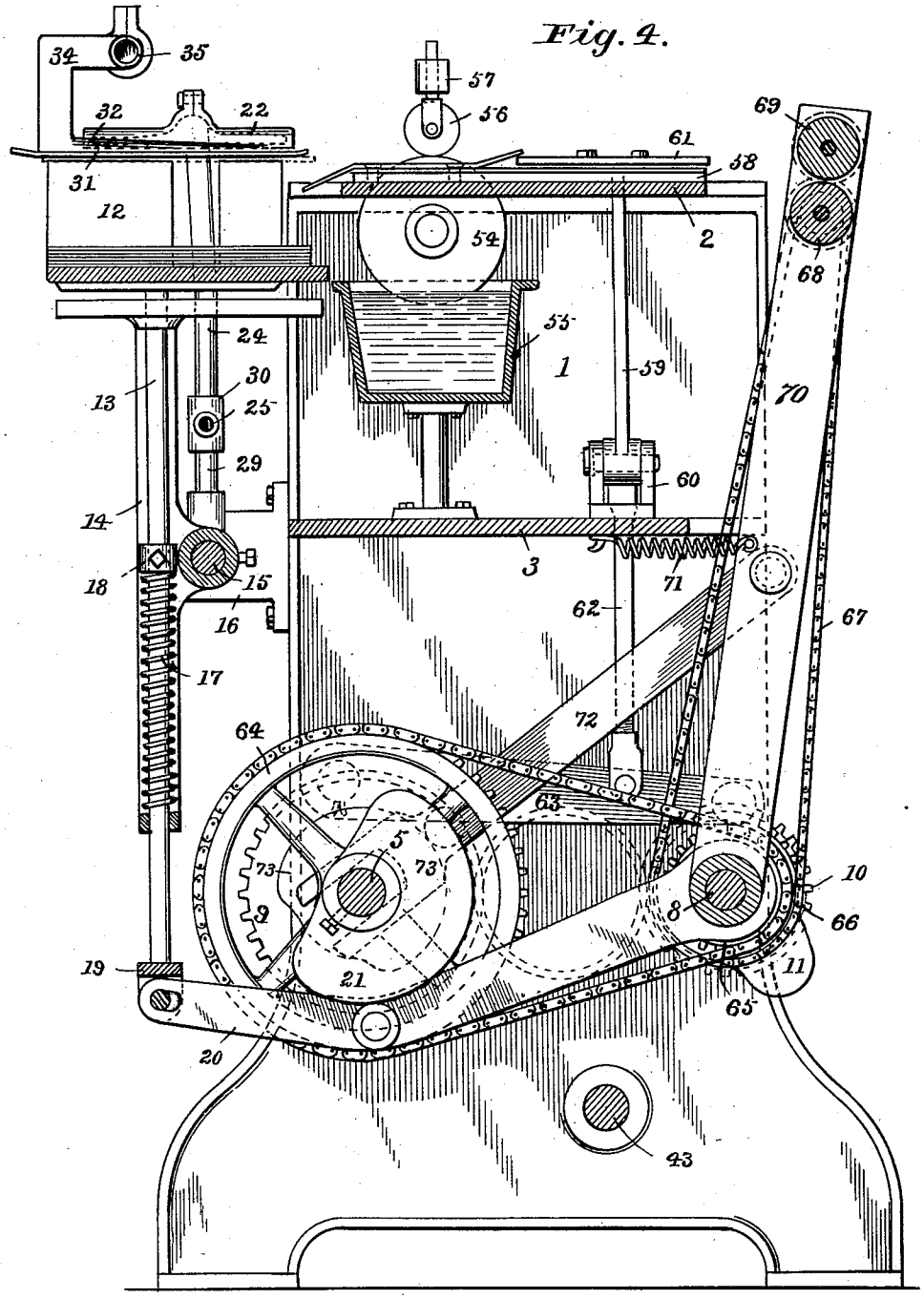
Fig. 4.



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(No Model.) 6 Sheets—Sheet 5.

Fig. 6.

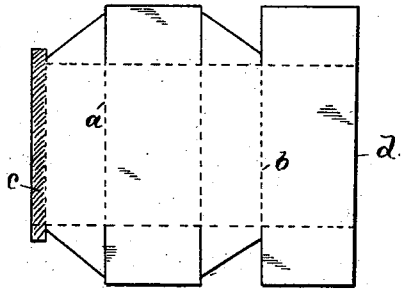

Fig. 7.

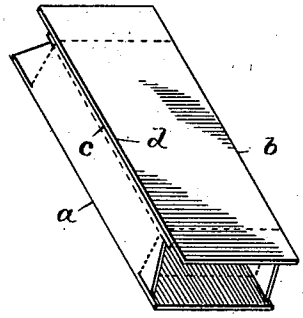

Fig. 5.

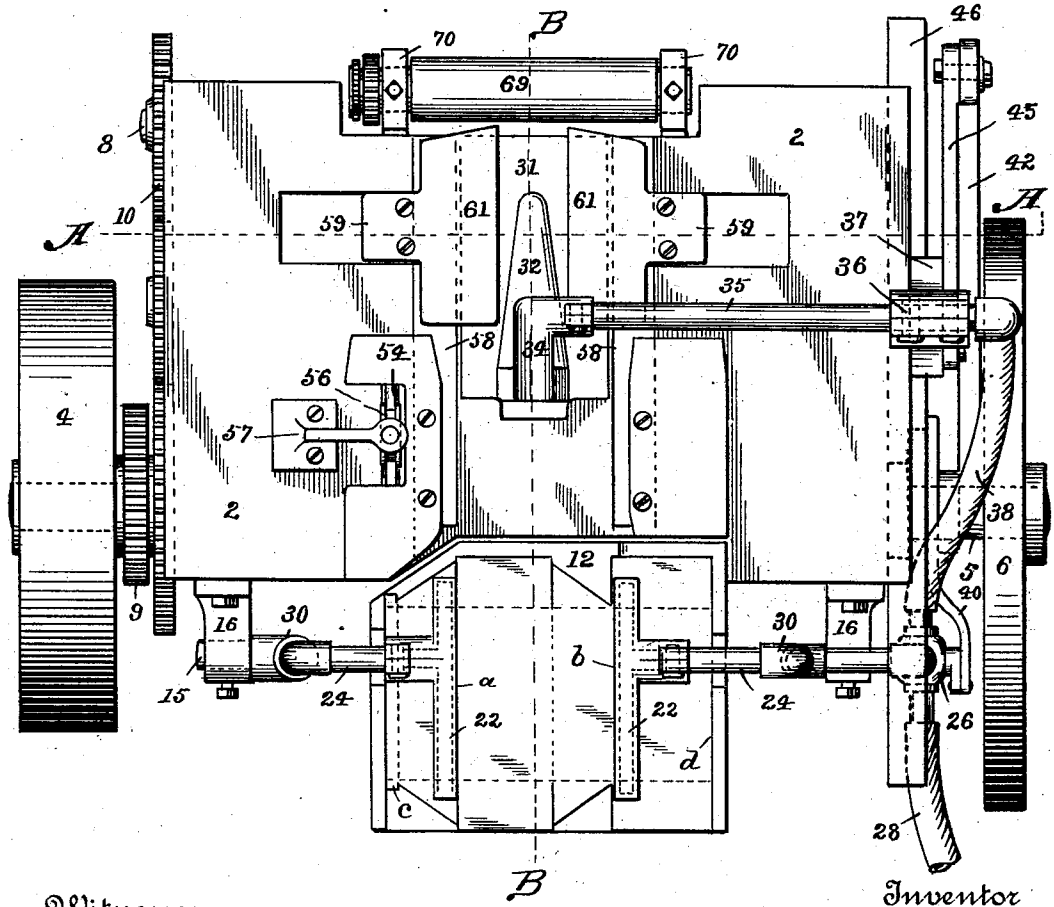

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Fig. 8.

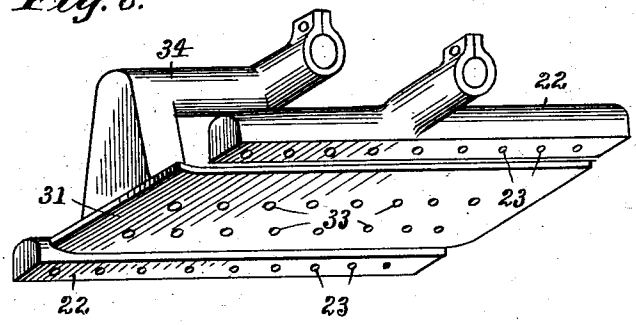


Fig. 9.

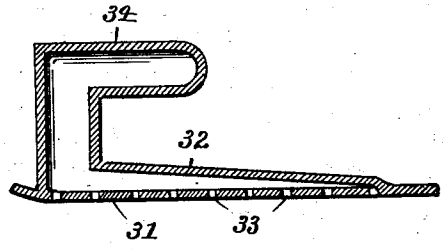
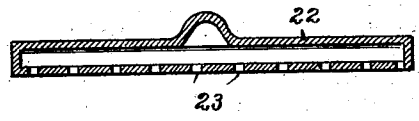


Fig. 10



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UNITED STATES PATENT OFFICE.

GEORGE M. GRISWOLD, OF NEW HAVEN, CONNECTICUT.

PAPER-BOX-BLANK FEEDING AND FOLDING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 694,635, dated March 4, 1902.

Application filed June 25, 1901. Serial No. 65,953. (No model.)

To all whom it may concern:

Be it known that I, GEORGE M. GRISWOLD, a citizen of the United States, and a resident of New Haven, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Paper-Box-Blank Feeding and Folding Mechanism, of which the following is a specification.

My invention relates to new and useful improvements in paper-box machinery, and especially to that class utilizing specially-prepared blanks from which to form the box, and further relates to mechanism of that class for feeding, gluing, and folding prepared blanks into tubular boxes.

It is the first object of my invention to provide a desirable and practical pneumatic feeding device for paper-box machinery whereby the blanks may be successively picked up from a pile and fed forward one by one to the gluing and folding mechanism, to provide novel mechanism for the above purpose which is durable, reliable, and positive in its action, yet simple in construction and operation and requiring but a single attendant for several machines; finally, to improve the construction of box-folding mechanism generally and better adapting it to my improved feed, as will later be fully described.

With the above objects in view my invention resides and consists in the novel construction and combination of parts shown upon the accompanying six sheets of drawings, forming a part of this specification, upon which similar characters of reference denote like or corresponding parts throughout the several figures, and of which—

Figure 1 shows a front elevation of a paper-box-folding machine of my own design, including my novel pneumatic blank-feeding mechanism. Fig. 2 is a side elevation of the complete machines as seen from the right of Fig. 1. Fig. 3 is a transverse cross-section taken on line A A of Fig. 5. Fig. 4 is a central cross-section on line B B of Fig. 5 and taken at a right angle to the section-line before mentioned. Fig. 5 is a plan view of the machine complete. Fig. 6 shows a separate plan view of one of the box-blanks adapted to be fed forward and folded by my novel device. Fig. 7 is a perspective view of a box folded and glued as it appears after having been operated on by my mechanism. Fig. 8 shows a perspective view as seen from the under side of the box-blank pickers and carrier comprising the essential elements of my feeding mechanism. Fig. 9 is a central longitudinal section of the carrier or former shown in the center of the preceding figure. Fig. 10 is a central longitudinal section of one of the two pickers or holders shown in Fig. 8, which operate together to pick up and hold a blank until taken by the carrier previously mentioned.

Referring in detail to the characters of reference marked upon the drawings, 1 1 represent vertical sides of the frame for the machine, 2 a top bed-plate, and 3 an intermediate plate, which together with the above parts constitute the main frame of the machine.

4 indicates the main driving-pulley; 5, its shaft; 6, a fly-wheel on said shaft, and 7 a cam-groove on the inside of said fly-wheel. From the shaft 5 the several parts of my machine are operated through gears, cams, lever, and sprocket-chain connections, all of which I will endeavor to describe in their respective order.

Beginning with the connections for driving the rear shaft 8, journaled in the vertical sides of the frame, it will be seen that adjacent to the pulley 4 upon the shaft 5 is a gear 9, which meshes with and drives an idler mounted on the side frame, (see Figs. 4 and 5,) which in turn meshes with and drives a third gear 10, secured to the rear shaft 8. This shaft, therefore, is continuously driven in its bearings, (see Fig. 3,) carrying with it the two cams 11, secured thereto, and serves to afford a medium through which the delivery-rolls and other mechanism are operated.

As before stated, my machine forms boxes from blanks which are supplied to the machine by an attendant, being placed in a suitable receptacle from which they are successively taken. Since this receptacle is the starting place of the blank, I will consequently begin there with the description of the machine and follow out the several sets of mechanism which in turn operate upon the blank.

12 represents the blank receptacle or box, which is provided with vertical walls on two sides and a portion of its rear end. This box

is carried (see Figs. 1 and 4) upon two vertically-disposed movable rods 13, mounted in a rectangular frame 14, rigidly secured to a transverse rod 15, which latter is likewise rigidly secured in brackets 16, secured to one edge of the vertical sides of the frame. Each of these rods 13 is provided with a coil-spring 17, wound thereon with one end abutting against the lower end of the rectangular frame, the other end being engaged by an adjustable collar 18, secured to said rod. The purpose of this spring, as will be apparent, is to normally hold the rods and its blank-carrying box in an elevated position against the pickers 22, later to be described, as shown in Figs. 1 and 2. To the lower end of these rods is attached a yoke 19, carrying a central eye for the attachment of the forward end of the cam-actuated arm 20, which latter is loosely mounted upon the rear shaft 8, before mentioned, and carries a roll for the engagement of the cam 21 on the main driving-shaft 5.

From the foregoing construction it will be seen that the blank-carrying box is successively moved up and down to the positions shown in Figs. 1 and 4. This movement is for the purpose of raising the pile of blanks up, so that the top one will come in contact with the pickers 22. (Shown on several figures of the drawings and in detail in Fig. 10.) These two pickers 22 are of like construction, arranged over the blank-box and adjacent to the sides thereof, as clearly appears in Figs. 1 and 5. The pickers in question are provided with a flat smooth under surface having a series of air-induct holes 23 therethrough into the hollow interior, as clearly appears in Fig. 10. Said pickers are further detachably connected to a piping 24, which is first carried outward and then downward to connect with a transverse pipe 25, which in turn is provided with suitable couplings to an ordinary three-way valve 26. The air-suction for the pickers controlled by this valve is generated by a blower 27, the same being connected with the said valve by a flexible pipe 28. These pickers and pipe connections are suitably supported through vertical posts 29, secured to brackets 30, rigid on the rod 15. The pipe connections described serve to communicate an air-suction from the blower through the valve to the holes 23 in the carrier sufficient to insure a grasping of the top blank by said holders when the box is in the raised position, (shown in Fig. 1,) it being obvious, of course, that as the box is lowered all the blanks therein descend with it except the top one, the top surface of which is grasped by the pickers, as recited. The top blank referred to is consequently retained by the pickers in an elevated position until the pneumatic carrier 31 (shown particularly in Figs. 8 and 9) comes forward and grasps the blank intermediate of the pickers by air-suction. This carrier, as will be seen, comprises a flat rectangular-shaped piece of sheet metal having a top central raised hollow rib 32, with a series of air-inducts 33, located through the under side, as clearly appears in Figs. 8 and 9. The carrier is provided with an elbow 34, detachably connected to a suitable transverse pipe 35, which latter in turn is mounted in a standard 36 of a reciprocating slide 37. This pipe 35 is operatively connected by a flexible pipe 38 to the three-way valve before mentioned, and consequently serves to communicate a suction to the carrier from the blower at proper intervals and at such times as may be required to insure the engagement of the blank by the said carrier and to convey it forward for delivery to the forming mechanism. The three-way valve in question is operated from the cam 39 on the main driving-shaft 5, as will be clearly seen from Figs. 1 and 2, through a link 40, one end of which is connected to a crank-arm of the valve-stem, the other end divided, straddling the driving-shaft, and provided with a spring 41 to insure the roll on said link snugly engaging the periphery of the cam, as will be obviously apparent, and causing the valve-stem to be turned to shift the suction to either the pickers or carrier.

The carrier in question is provided with not only a reciprocating movement to convey the blanks from the box to the folding mechanism, but also with a slight vertical movement required to lower the blank from the line of its feeding-box and gluing-rolls to that of the folding mechanism, the latter being slightly below, as will be seen from Fig. 4. The reciprocating movement for the carrier is obtained from the cam 7 in the fly-wheel 6 through a vertically-disposed arm 42, loosely mounted upon the outer end of the rocker-shaft 43, secured in the sides of the frame and carrying a roll 44 for engagement by said cam. The upper end of this arm is provided with a link 45, connecting it with the slide 37, before mentioned, and whereby a reciprocating movement is imparted from the arm thereto. The slide 37 is mounted in a suitable way 46, which is not directly attached to the sides of the frame, but is carried by a vertically-movable slide 47, (see Figs. 2 and 3,) which is provided with suitable ways to operate in the parallel vertical edges of the side frame. This vertical slide is supported and operated through a link connection 48, one end of which is connected therewith, the opposite end being connected to an arm 49, rigidly secured to the rock-shaft 44, before recited. The rock-shaft is further provided with a second arm 49^a, intermediate of the two sides of the frame and disposed at an angle to the first-named arm, carrying one end of a cam-actuated link 50, the opposite end of said arm being divided to straddle the driving-shaft and is provided with a roll to engage the surface of a cam 51, mounted on said shaft.

From the foregoing it will be obvious that by the rotation of the driving-shaft the cam

51, through its connections, will rock the rock-shaft, which in turn imparts a vertical reciprocating movement to the slide. The cams for the several sets of mechanism are of course properly shaped and timed, so as to insure the performance of the several operations in their respective orders as may be necessary for the successful operation.

As the blank is carried forward from the box to the folding mechanism one edge thereof is glued. This operation is performed through the following mechanism: Adjacent to the gear 9 and upon the shaft 5 is a small pulley connected by a belt 52 with a similar pulley on a short shaft 53, journaled above in a bearing of the vertical side 1, and carries a gluing-wheel 54 upon its inner end. (See Figs. 1 and 4.) In practice the periphery of this wheel turns in a glue-pot 55, mounted on a suitable pedestal secured to the intermediate plate 3. The glue of this pot can be heated, if desired, in the usual manner by the connection therewith of steam-pipes. (Not shown.) The periphery of this glue-wheel (see Figs. 4 and 5) travels through a slot in the top bed-plate 2, protruding sufficiently to engage one edge of the box-blank as it is fed forward. A small adjustable wheel 56, mounted in a bracket 57, secured to the bed-plate, serves to hold the edge of the box-blank down against the glue-wheel as said blank is fed thereover.

After the blank is carried forward from the box through the gluing-rolls the slide 47 is lowered, thus lowering the carrier and its blank (see Fig. 3) down between the strips 58 secured to the top bed-plate, thus causing the blank to bend on the lines *a b* (see Figs. 6 and 7) between the side edges of the carrier and the vertical inner edges of the strip in question, whereupon the folders 59, located at either side, are moved inward, so as to turn said vertically-disposed bent edges of the blank in over the top of the carrier, pressing the edge *d* down upon the glued edge *c*, thus uniting the two, forming a tubular box, as shown in Fig. 7. The folders 59 consist of bell-crank levers pivoted to brackets 60, secured to the intermediate plate of the frame, and carry adjustable plates 61 on the upper ends, which constitute the means for directly engaging the blanks. These folders are alike in construction and are each provided with link connections 62 with an arm 63, pivoted to the vertical sides of the frame. (See Figs. 1 and 3.) The free end of these arms contain rolls to ride upon the surface of cams 11, secured to the rear shaft 8. It will thus be seen that with the rotation of the shaft the arm 63, together with its link, is raised and lowered, thus throwing the operative ends of the formers in and out to and from the carrier in a manner to fold and stick the blank.

After the blank has been folded in the manner described the next and final requisite of the machine is to strip the box from the carrier and eject it from the machine. This is done by the employment of a pair of continuously-driven rolls located at the rear of the machine adjacent to the end of the carrier and which I will next describe.

Upon the main driving-shaft 5 is a large sprocket-wheel 64, (see Figs. 1, 3, and 4,) connected with and driving a smaller sprocket 65, mounted on a short hub loosely journaled on the rear shaft 8. This hub also carries a second sprocket 66, which is connected by a chain 67 with a smaller sprocket on the shaft of the lower stripping-roll 68. This roll-shaft is connected by means of small gears with the shaft of the upper stripping-roll 69, which operates in conjunction with the lower one to grasp the folded box and deliver it from the machine to the rear into any suitable receptacle or stacking device. These rolls 68 and 69 are journaled in the upper end of a vertically-disposed arm 70, loosely mounted on the rear shaft 8. A spring 71 is interposed between this arm and the intermediate plate 3 and serves to draw the arm inward, so that the rolls thereof will be moved close to the folding mechanism in a manner to engage the forward edge of the box folded thereby. One end of a shoving-link 72 is connected to this arm, (see Fig. 4,) while the other and divided end straddles the main driving-shaft and carries a roll to engage the peripheral surface of a cam 73, which construction serves to force the arm rearward against the resistance of the spring before mentioned better to insure the free delivery of the folded box from the machine.

From the foregoing it will be seen that the rolls in question are continuously driven and that the arms in which they are mounted are given a swinging movement backward and forward. Consequently as the rotating rolls are brought forward they engage the rear end of the folded box and draw it off of the carrier and away from the folding mechanism. As the box is being drawn rearward through the rolls the arm is given its rearward throw, thus ejecting the completed box away from the machine.

Having described the construction of my machine, I will now briefly refer to its operation, which is as follows: As before stated, the blanks from which the boxes are formed are previously cut into the form shown in Fig. 6, and these blanks are stacked in the box 12 one upon the other, as shown in Fig. 4. This stack may be of any desired height, and with the starting of the machine from the position shown in Fig. 4 the box will be raised up by the pressure of the spring 17 when released by the cam 21 until the top blank engages the under side of the pickers 22, at which instant the cam-controlled valve 26 opens to insure a suction through its connections to the pickers, thus drawing the top surface of the blank snugly against the under side of the pickers, where it is retained. (See dotted lines, Fig. 4.) By a further movement of the main shaft the box and its

blanks again descend to the position shown in Fig. 4, whereupon the carrier moves forward from the position shown in Fig. 2 and is drawn downward between the pickers against the central surface of the blank, whereupon the air-controlling valve is again shifted to create a suction through its connections to the carrier and to cut the suction off from the pickers, thus drawing the blank up snugly against the under side of the carrier, which retains the same and carries it forward between the glue-rolls and to the folding mechanism. During the backward movement of the carrier and its blank the blank-box acts to stick another blank to the under side of the carrier and returns to its lowered position, thus allowing ample time for any blanks which might adhere to the top one to drop back to its proper place in the box. When the carrier reaches its extreme backward position, as shown in Figs. 2 and 5, it is lowered down between the strips to bend the blank on the lines *a b*, deflecting the two edges upward, whereupon the folders are moved inward against said deflected edges, turning one over on the other in a manner to unite the extreme edges *c* and *d* thereof. With the completion of this folding operation the vertically-disposed stripping-roll arm is moved forward, so that said rolls will engage the rear end of the box and draw it off of the carrier and discharge it from the machine. With this stripping movement of the box from the carrier by the rolls the folders recede from their outer or normal position and the carrier again travels forward to obtain a further blank. The machine, therefore, may be continuously and practically operated in the manner set forth with the assurance that single blanks will be rapidly picked from the pile and fed to the formers in a straight line.

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

1. The combination with paper-box folders, of a pneumatic device for feeding blanks to said folders, the same comprising a reciprocating rectangular perforated former around which the boxes are folded, an air-suction for said former and means for delivering blanks to said former.

2. The combination of reciprocating rectangular pneumatic carrier for engaging and feeding box-blanks and for holding said blanks while being folded, folders for turning the edges of the blank over upon the carrier to form said blank into boxes, and means for removing said boxes.

3. The combination with paper-box folders, of a reciprocating former with pneumatic means for grasping and holding a blank during transit and while being folded over said former.

4. The combination with paper-box folders, of a former around which the blank is folded, means for reciprocating said former to and from the folders, and pneumatic means for causing the blank to adhere to the former during transit and while the blank is being folded thereon, and means for automatically delivering blanks to said former.

5. The combination with paper-box folders, of a flat perforated hollow former over which the blanks are bent to form substantially a rectangular box, means for reciprocating said former to and from the folders, an air-suction for said former whereby the blanks are caused to adhere thereto during transit, and rolls for stripping the finished box from the former.

6. The combination with paper-box folders, of a hollow rectangular former with perforations through its under side and means for providing a pneumatic suction for said perforations to cause a box-blank to adhere thereto, means for reciprocating said former to and from the folders, and automatic means for ejecting the finished box from the machine.

7. In a paper-box-forming machine, the combination with a pair of stationary pneumatic pickers, of a blank-holder beneath the pickers, springs for normally holding said holder into engagement with said pickers, and means for lowering said holder against the action of said springs, a reciprocating pneumatic blank-carrying former, folders to bend the blank around said former, and means to strip the box from said former.

8. In a blank-feeding device for box-forming machines the combination of a pair of pneumatic pickers comprising hollow tubular bodies having a series of holes on their under sides to form engagements across the two outer edges of the blank, connections for creating a suction through said holes and a valve for controlling said suction, a reciprocating pneumatic blank-carrying former adapted to operate intermediate of said pickers to take the blanks therefrom to suitable folders.

9. A paper-box-blank feeding device comprising a pair of elongated hollow pickers, having a series of holes on their under side, means for insuring an air-suction therethrough, means for controlling said suction, means for successively causing the pickers to engage a blank adjacent to its side edges in a manner to separate the same from the bulk, and a pneumatic former for engaging said separated blank and feeding it therefrom to folding mechanism, where it is held during the folding operation.

10. The combination in a feeding device for box-forming machinery, of a reciprocating blank-holder, means for successively taking a single blank from said holder, a pneumatic device for receiving said blank and feeding it to the folding mechanism and constituting a former around which the box is formed, and means for removing said folded blank from said receiving mechanism, substantially as described.

11. In a box-forming machine, the combination with a device for separating and receiving a single blank from the pile, a gluing de-

vice, a pneumatic former around which the blank is folded into a box and for feeding the blanks to the folding mechanism, folders to bend and stick the box around the former, means for stripping said folded box from the pneumatic former and ejecting the box from the machine.

12. In a box-forming machine the combination with suitable folding mechanism, of a reciprocating former and blank-carrier around which the box is formed, pneumatic connections for said former whereby a blank is engaged and conveyed thereby to the folders, means for delivering the blanks to the former, substantially as described.

Signed at Bridgeport, in the county of Fairfield and State of Connecticut, this 21st day of June, A. D. 1901.

GEORGE M. GRISWOLD.

Witnesses:

C. M. NEWMAN,

J. S. PULLMAN.