

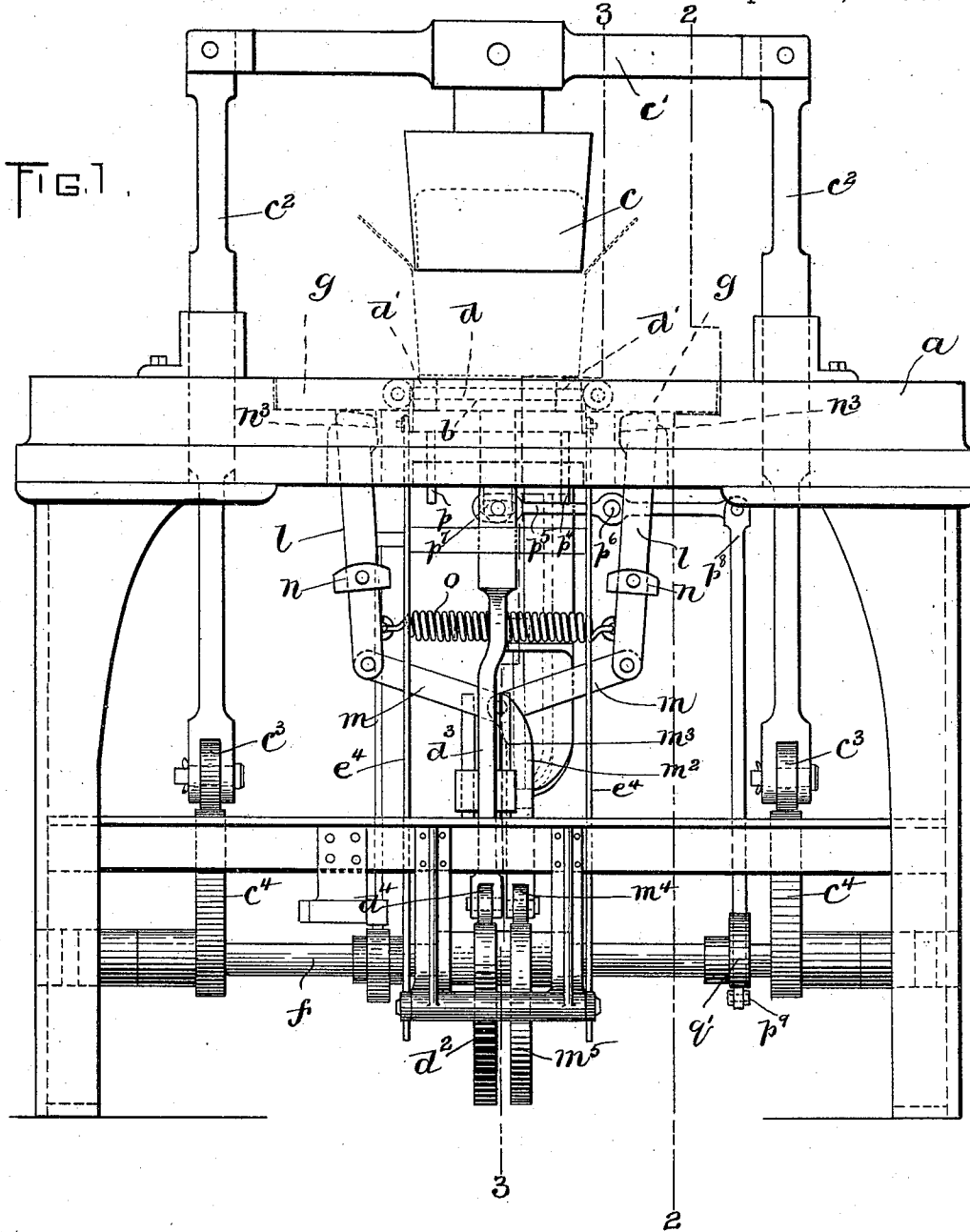
(No Model.)

7 Sheets—Sheet 1

J. M. HITCHCOCK.
PAPER BOX MACHINE.

No. 581,116.

Patented Apr. 20, 1897.



WITNESSES:

A. D. Harrison.

A. L. Adams.

INVENTOR:

J. M. Hitchcock
by *Wm. B. Brown & Son*
attys.

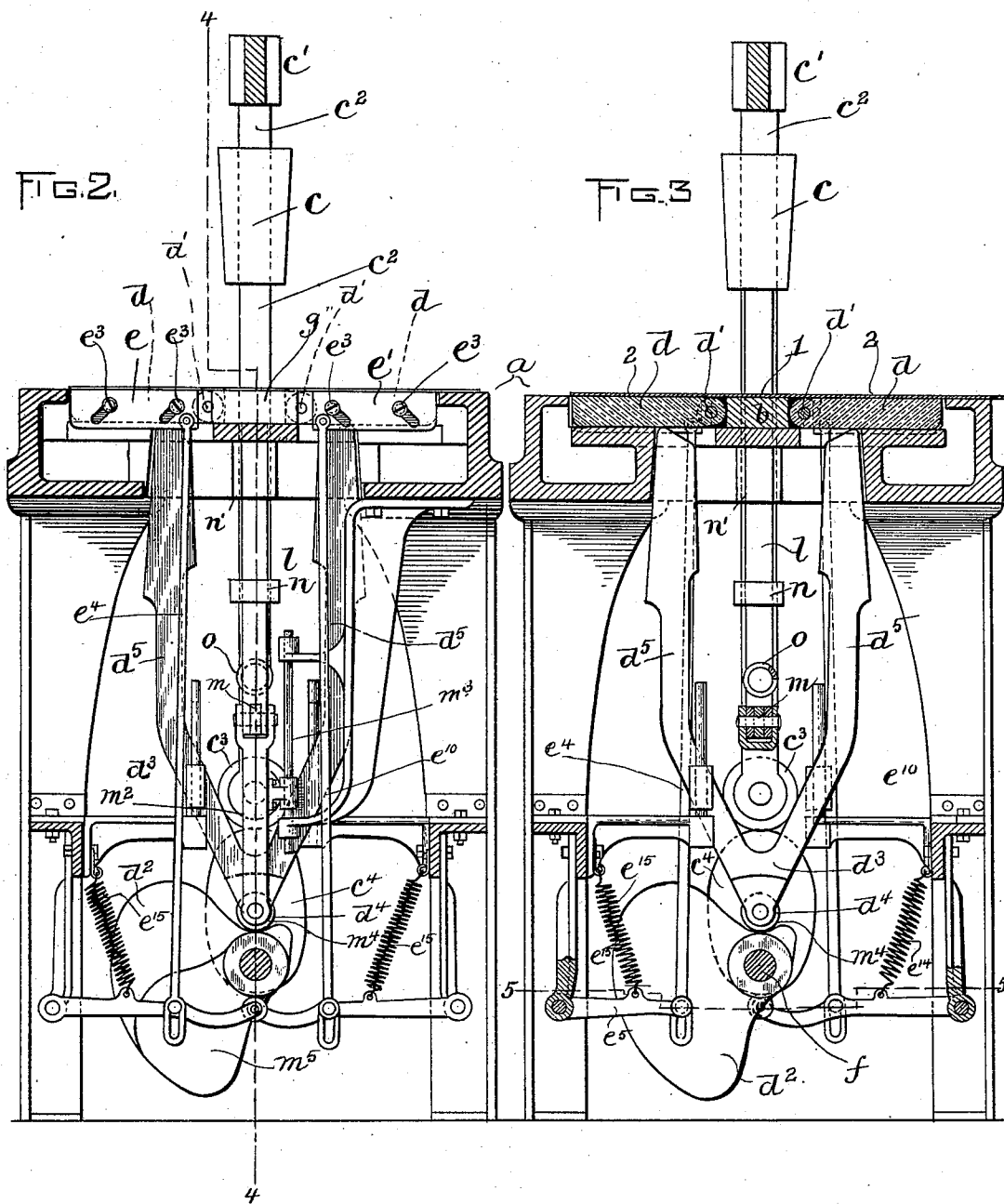
(No Model.)

7 Sheets—Sheet 2.

J. M. HITCHCOCK.
PAPER BOX MACHINE.

No. 581,116.

Patented Apr. 20, 1897.



WITNESSES:

A. S. Adams

INVENTOR:

by night Brown & Quincy
attys.

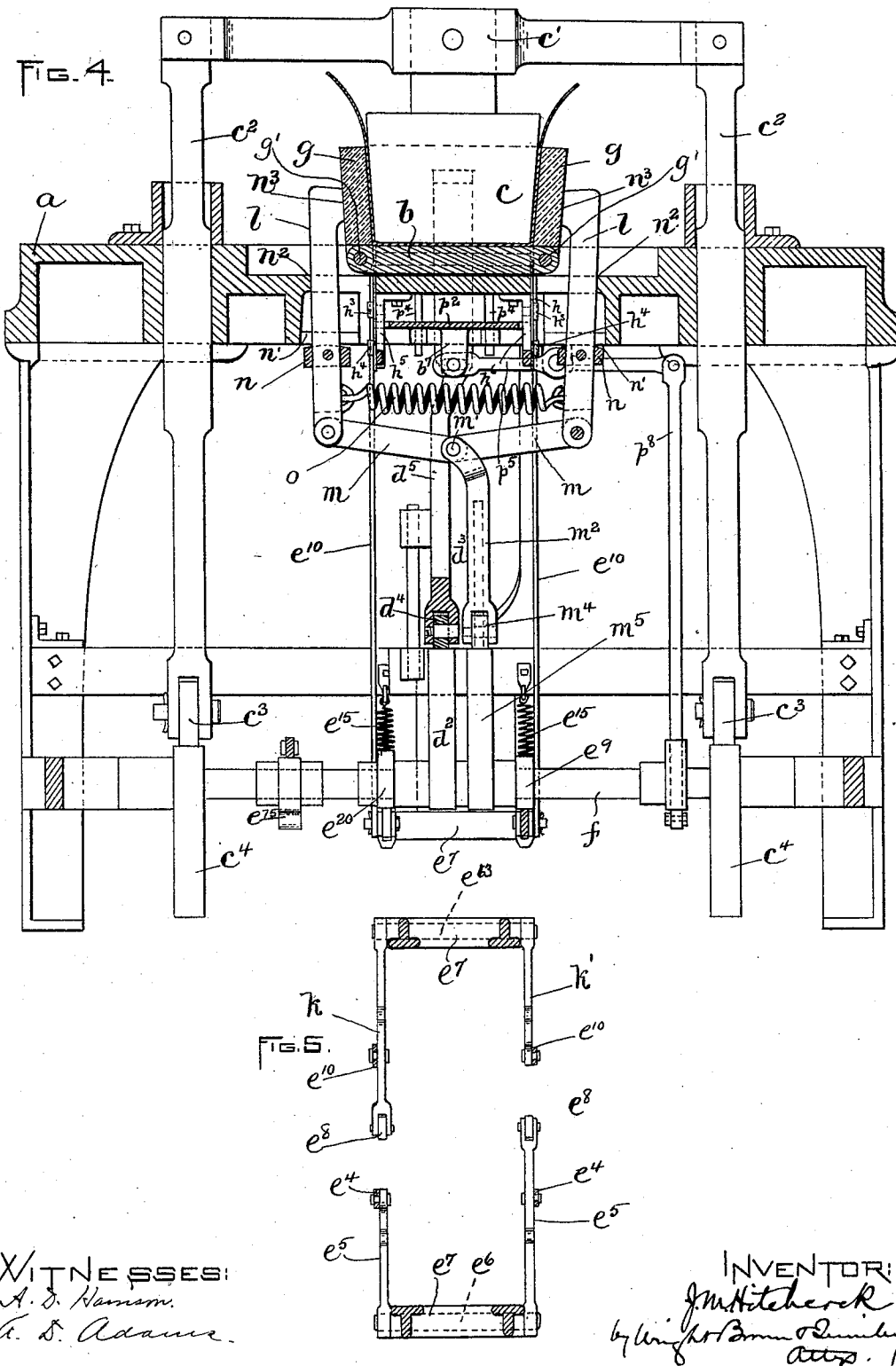
(No Model.)

7 Sheets—Sheet 3.

J. M. HITCHCOCK.
PAPER BOX MACHINE.

No. 581,116.

Patented Apr. 20, 1897.



WITNESSES:
A. S. Hamann.
A. S. Adams.

INVENTOR:
J. M. Hitchcock
by Wm. H. Hamann & Son
Atty.

(No Model.)

J. M. HITCHCOCK.
PAPER BOX MACHINE.

7 Sheets—Sheet 4.

No. 581,116.

Patented Apr. 20, 1897.

FIG. 6.

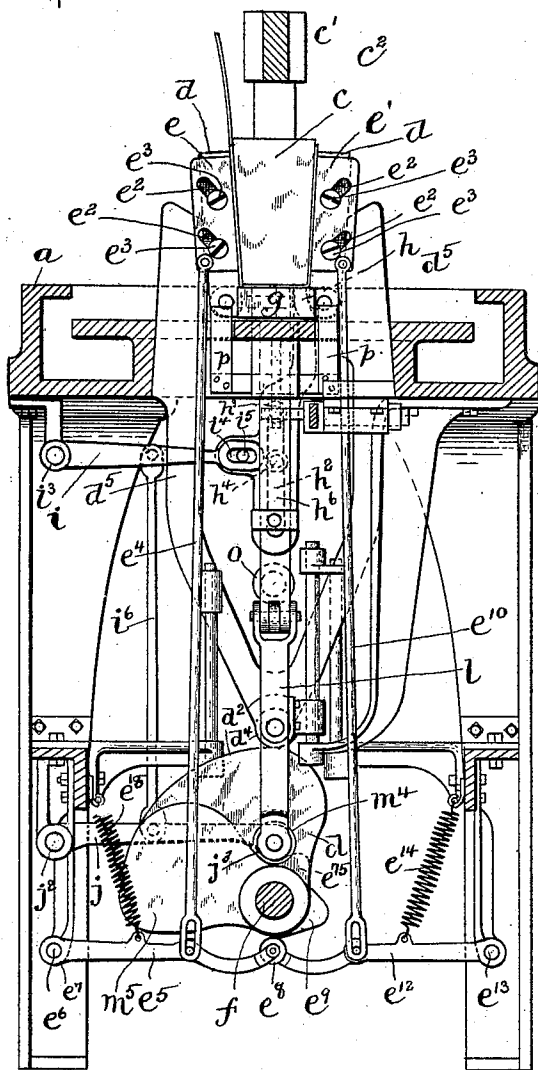


FIG. 7.

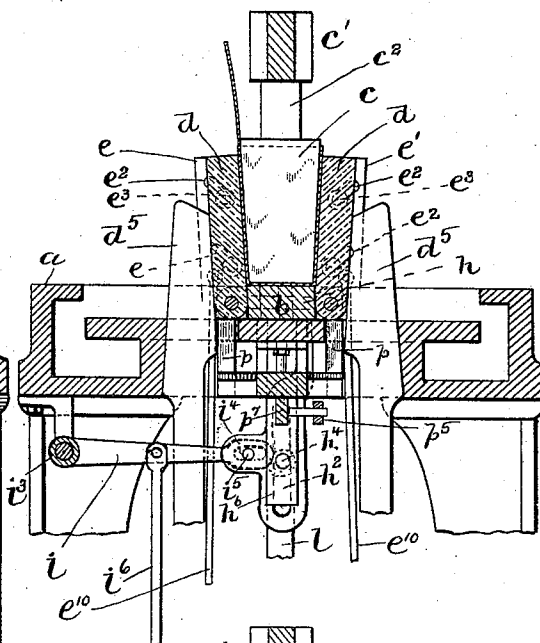
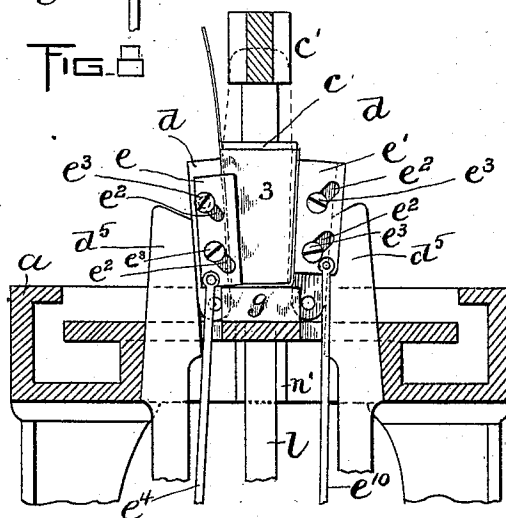


FIG. 8.



WITNESSES:

A. D. Hannan.
A. D. Adams.

INVENTOR:

J. M. Hitchcock
by *Wm. B. Brown* Quincy
Att'y.

J. M. HITCHCOCK.
PAPER BOX MACHINE.

No. 581,116.
FIG. 9.

Patented Apr. 20, 1897.

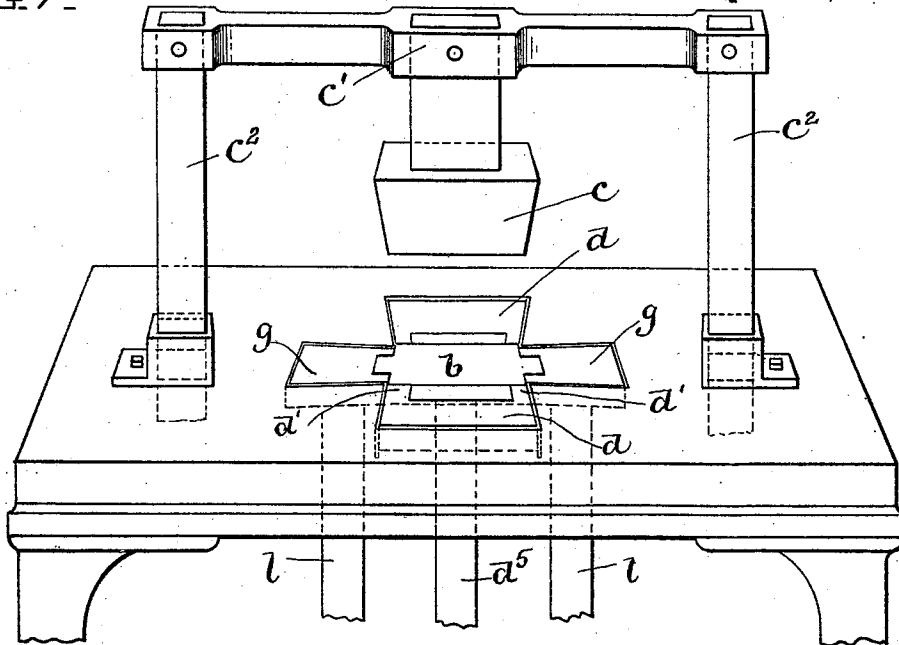


FIG. 10.

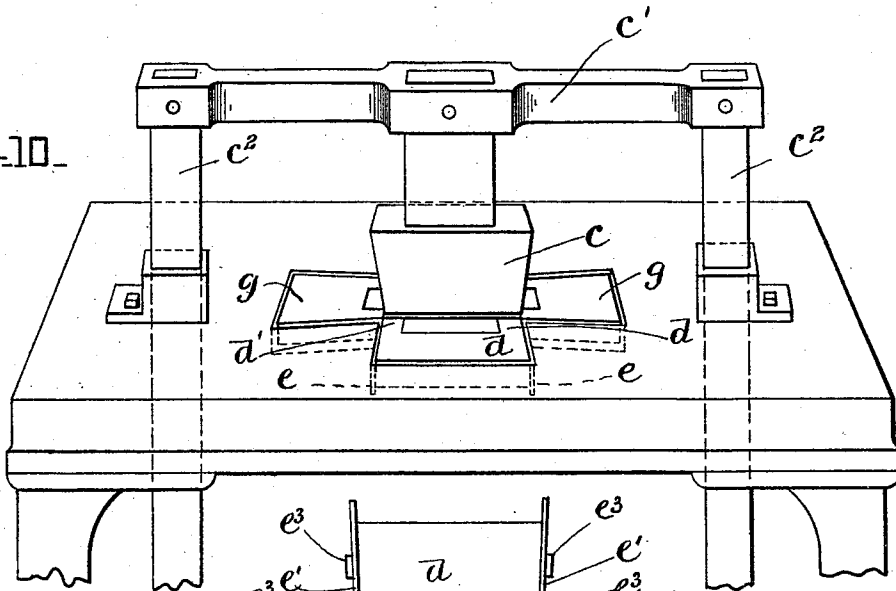
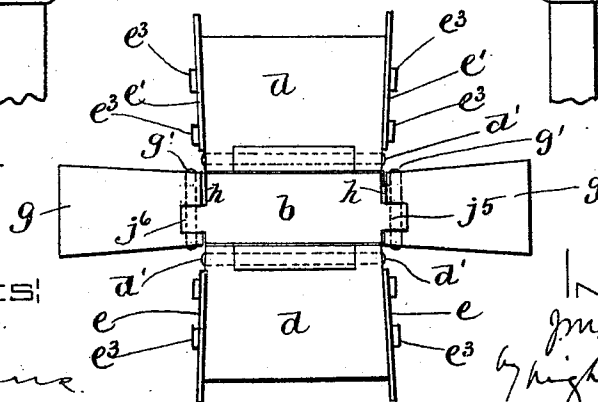


FIG. 11.



WITNESSES:

A. D. Harrison.

A. S. Adams.

INVENTOR:

J. M. Hitchcock,
by Hight Brown & Lundy
attys.

(No Model.)

J. M. HITCHCOCK.
PAPER BOX MACHINE.

7 Sheets—Sheet 6.

No. 581,116.

Patented Apr. 20, 1897.

FIG. 12.

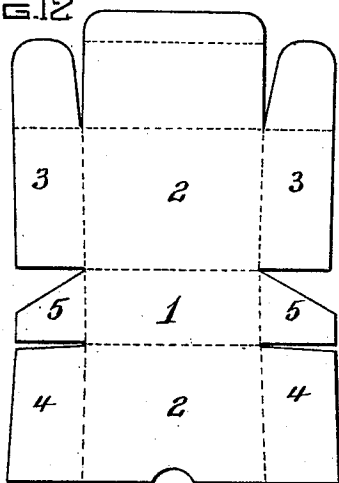


FIG. 13.

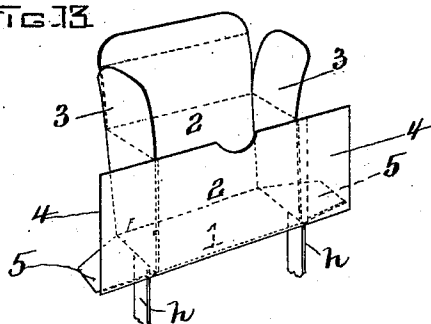


FIG. 14.

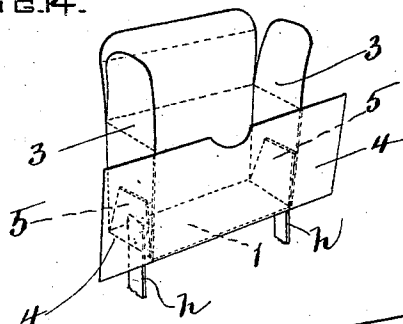
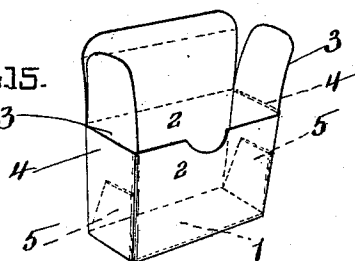


FIG. 15.



WITNESSES:

A. D. Harrison.

A. S. Adams

FIG. 16.

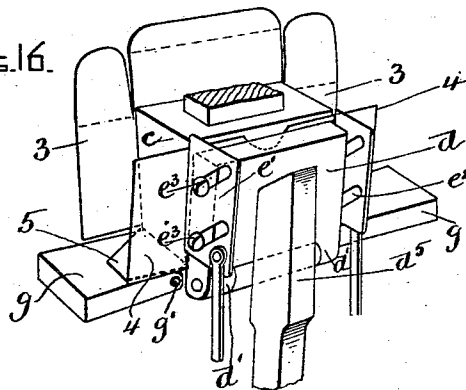


FIG. 17.

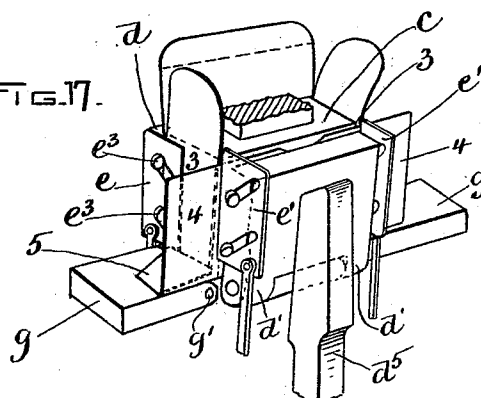
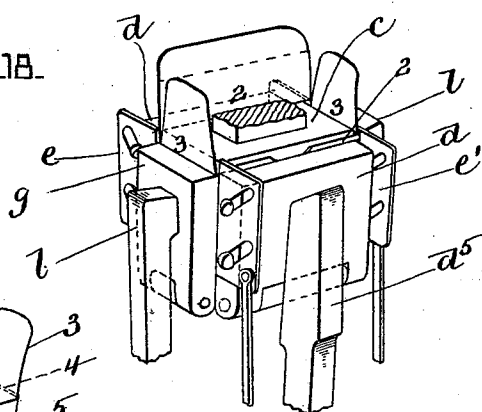


FIG. 18.



INVENTOR:

J. M. Hitchcock
by *high & Bunn & Quincy*
Attys.

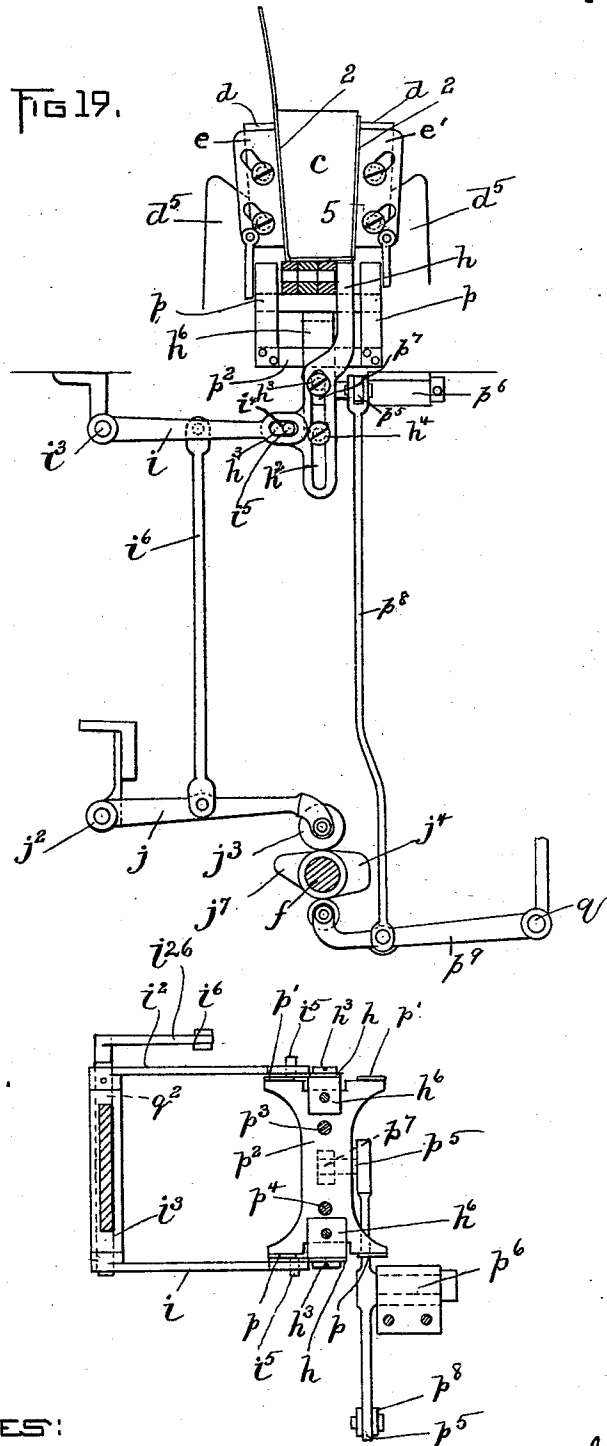
(No Model.)

7 Sheets—Sheet 7.

J. M. HITCHCOCK.
PAPER BOX MACHINE.

No. 581,116.

Patented Apr. 20, 1897.



WITNESSES:

A. D. Harrison.

A. S. Adams.

INVENTOR:

J. M. Hatcher
by Knight Brown & Quincy
Atty.

UNITED STATES PATENT OFFICE.

JOHN M. HITCHCOCK, OF LONG MEADOW, MASSACHUSETTS.

PAPER-BOX MACHINE.

SPECIFICATION forming part of Letters Patent No. 581,116, dated April 20, 1897.

Application filed May 8, 1896. Serial No. 590,675. (No model.)

To all whom it may concern:

Be it known that I, JOHN M. HITCHCOCK, of Long Meadow, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Paper-Box Machines, of which the following is a specification.

This invention relates to machines for making paper boxes from prepared blanks, each blank containing the material for the bottom, four sides, end flaps to partially cover the box, and a cover to be turned over upon the end flaps.

The invention has for its object to provide an effective machine for automatically performing the operations of folding the said blank to form all parts of the box excepting the final operations of folding over the end flaps and cover.

The invention consists in the improvements which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a side elevation of a machine embodying my improvements. Fig. 2 represents a section on line 2 2 of Fig. 1. Fig. 3 represents a section on line 3 3 of Fig. 1. Fig. 4 represents a section on line 4 4 of Fig. 2, the cams upon the main shaft being shown in elevation and the block or former being in depressed position. Fig. 5 represents a sectional plan view on the line 5 5 of Fig. 3. Fig. 6 represents a view similar to Fig. 2, showing a different stage of the operation. Fig. 7 represents a sectional view of the upper portion of Fig. 6, representing the same stage of operation shown in said figure. Fig. 8 represents a view similar to Fig. 6, showing an additional step in the operation. Figs. 9 and 10 represent perspective views of the top portion of the machine. Fig. 11 represents a top view of the box-support and side-folding devices. Fig. 12 represents a plan view of the box-blank. Figs. 13, 14, and 15 represent views showing the different steps in the operation of folding the blank into a box. Figs. 16, 17, and 18 represent perspective views showing the manner of performing the operations which produce the results shown in Figs. 13, 14, and 15. Figs. 19 and 20 represent detail views of devices hereinafter described.

The same letters and numerals of reference indicate the same parts in all the figures.

In the drawings, *a* represents a supporting-frame, in the central portion of which is a fixed horizontal bed *b*, suitably secured to the frame *a*, which bed coöperates with a vertically-movable block or former *c*, the bottom portion of which corresponds in shape to the bottom portion 1 of the box-blank shown in Fig. 12. To the bed *b* are hinged the wings *d d*, which are adapted to swing upwardly against the side portions of the block *c* and bend the portions 2 2 of the blank upwardly against said sides. The wings *d d* are hinged at *d' d'* to the bed *b* and are adapted to lie horizontally in recesses formed in the supporting-frame. The wings *d d* may be raised to the position shown in Fig. 7 by means of a cam *d²* on the driving-shaft *f* and a yoke *d³*, vertically movable in guides on the supporting-frame and having a trundle-roll *d⁴* at its lower end bearing on said cam, the arms *d⁵ d⁵* of said yoke bearing at their upper ends against the wings *d d*. The rotation of the shaft *f* causes the cam *d²* to raise the yoke *d³* and wings *d*, thus causing the latter to fold the box-blank upwardly against the sides of the block *c*.

The block *c* is secured to a vertically-movable cross-head *c'*, which is supported by standards *c² c²*, which are vertically movable in guides on the supporting-frame and have trundle-rolls *c³ c³* at their lower ends, bearing on cams *c⁴ c⁴* on the driving-shaft *f*, the cams *c⁴* being timed to permit the depression of the standards *c²*, cross-head *c'*, and block *c* from the position shown in Figs. 1, 2, and 3 to that shown in Figs. 4, 6, and 7 before the wings *d d* are raised, the block being thus caused to clamp the blank against the bed *b*.

To the ends of the wings *d d* are secured folding-blades *e e'*, which are movable crosswise of the wings *d* in such manner as to fold inwardly across the ends of the block *c* the parts 3 3 and 4 4 of the box-blank. The folders *e* first operate to fold the parts 3 3 across the end of the block *c*, as shown in Figs. 8 and 17, after which the parts 5 5 are folded against the parts 3 3 toward the block *c*, as shown in Fig. 14. The parts 5 5 are folded by upwardly-projecting tongues *h*, consisting of thin strips of metal, each having a slot *h²*, through which pass screws *h³ h⁴*, which con-

nect the tongues $h h$ with supporting-brackets $h^5 h^6$, secured to the under side of the bed b . The tongues h are operated vertically by means of arms or levers $i i^2$, attached to a shaft q^2 , pivoted at i^3 to a bracket attached to the frame a . The outer ends of said arms are each provided with a slot i^4 , with which slot engages a pin i^5 , which is attached to the lower end of the upwardly-projecting strips h . To the central portion of the arm i^2 is attached a rod or pitman i^6 , the lower end of which is connected to an arm j , pivoted at j^2 to the frame a . The outer end of the arm j has a trundle-roll j^3 , engaging a cam j^4 upon the shaft f , the arrangement being such that when the cam j^4 raises the outer end of the lever j motion is communicated to the rod or pitman i^6 to raise the free end of the levers i , and through the latter to the upwardly-projecting tongues h and the flap portion 5.

The hinge members $j^3 j^6$, Fig. 11, to which the wings $g g$, hereinafter referred to, are connected, are arranged at one side of the center of the bed b , and slots are provided between the said wings and the ends of the bed b to enable the tongues h to move between said wings and bed in folding the flaps 5 5 against the block c .

The parts 3 3 and 5 5 having been folded in upon the block c , the folders e' operate to bend the parts 4 4 of the blank inwardly upon the parts 3 3 and 5 5, the mechanism shown for actuating the folders $e e'$ being as follows: Each folder is provided with diagonal slots e^2 , through which pass screws e^3 , connecting the folders to the wings $d d$, the arrangement of the slots and screws being such that when the folders $e e'$ are depressed from the positions shown in Fig. 6 they will also be moved edge-wise partially over the ends of the block c . In Figs. 8 and 17 two of said folders $e e$ are shown thus depressed and moving inwardly. The folders e are operated by means of rods e^4 , with levers e^5 , which are attached to a shaft e^6 , pivoted to a fixed support e^7 , one of said levers having a trundle-roll e^8 at its swinging end, which engages a cam e^9 upon the driving-shaft, against which the roll is held by springs e^{15} .

The means for operating the folders $e' e'$ are similar to those just described, with the exception that a separate cam e'^{10} is provided upon the shaft f to operate arms $k k'$, so that the folders $e' e'$ will not be operated to fold the part 4 against the block c until after the part 5 has been folded. The arrangement of the means for operating the folders will be understood by reference to Fig. 5, from which it will be seen that while there are two arms upon each shaft e^7 but one arm upon each shaft is in engagement with a cam at any given time, so that the folders are operated successively.

$g g$ represent wings which are similar to the wings $d d$ and are hinged at $g' g'$ to the ends of the bed b , the hinges g' being at right angles with the hinges d' of the wings d , as

shown in Fig. 11. The wings g , when depressed, are contained in recesses in the supporting-frame and are arranged to be raised to press together the portions of the box-blank which have been previously folded and cause the cement coatings on said portions to adhere to each other.

The wings $g g$ are raised by means of arms $l l$, the upper ends of which normally bear against the under sides of said wings, as shown in Fig. 1. The lower ends of the arms $l l$ are pivotally connected with arms $m m$, pivoted at m' to a vertical arm m^2 , which is suitably secured to a guide m^3 on the frame a and has a trundle-roll m^4 attached to its lower end, which engages a cam m^5 upon the shaft f . The rotation of said shaft and cam raises the arms $l l$, and, through the latter, raises the wings $g g$ against the block c . The arms $m m$ as arranged in connection with the vertical arm m^2 and arms $l l$ constitute a toggle-joint arranged to apply pressure to the folded portions of the box-blank and cause their cemented surfaces to firmly adhere to each other. The arms $l l$ are provided with collars $n n$, arranged to come into contact with shoulders $n' n'$ upon the under side of the bed, the latter arresting the upward movement of the arms $l l$ when the wings $g g$ have been brought into their raised position. The cam m^5 continues to carry up the arms $m m$ and causes said arms to assume a substantially horizontal position, as shown in Fig. 4, the lower portions of the arms $l l$ being forced outwardly, causing the outer edges of said arms at the points $n^2 n^2$, Fig. 4, to bear against the frame, which provides a fulcrum for the arms and causes the inner faces $n^3 n^3$ of the arms to be brought against the wings with strong pressure. o represents a spring connected to the lower inner portions of the arms $l l$, which exerts sufficient tension to preserve the alinement of the arms $m m$, as shown in Fig. 1, while they are being raised to their operative position, so that when the collars $n n$ engage the frame the angularity of the arms $m m$ may be sufficient to force the lower ends of arms $l l$ apart, as hereinbefore described.

The folding-blades $e e'$ and the upwardly-projecting tongues $h h$ may remain in the position in which they are brought to fold the portions 3 3, 5 5, and 4 4 of the box-blank until the wings $g g$ are raised to press said portions together, and means are provided to retract the same just previous to the pressure of the wings $g g$ against the parts 3 3 of the box. The means provided for restoring the folding-blades to their normal position are thin metal blades $p p p' p'$, Figs. 19 and 20, secured at their lower ends to a cross-head p^2 and projecting upwardly in line with the lower edges of the folding-blades $e e'$. The cross-head p^2 is adapted to be moved vertically upon guides $p^3 p^4$, secured to the under side of the frame of the machine by an arm or lever p^5 , pivoted at p^6 to the frame and

connected at one end to a lug p^7 on the cross-head (see Figs. 1 and 7) and at the other to the upper end of a rod p^8 , the lower end of said rod being connected to an arm p^9 , one end of which is pivoted to a fixed support q on the frame a . The outer or swinging end of the arm p^9 engages a cam q' upon the main shaft f , so adjusted that motion may be communicated to the cross-head p^2 by the intermediate connections to raise the cross-head and bring the upper ends of the blades $p p'$ into contact with the lower ends or edges of the folding-blades $e e'$ and cause the latter to be pushed upwardly and at the same time outwardly out of the path of the wings $g' g'$ to the position shown in Fig. 6. (See, also, Figs. 19 and 20.) The weight of the cross-head and the blades $p p'$ serves to return the parts after the operation of the cam q' .

The means for folding the portion 5 of the box-blank consists, as before described, of an upwardly-extending blade adapted to engage with the under side of said portion and be moved upwardly to fold said portion against the block c .

In the operation of my box-folding machine the blank is coated with suitable adhesive material and placed upon the bed b . The block c is then caused to descend until the bottom portion thereof rests upon the part 1 of the blank, as shown in Fig. 10. The side wings $d d$ are then raised to the position shown in Figs. 6, 7, 8, 16, 17, and 18 by means of the cam d^2 and yoke d^3 . The flaps or portions 3 are then folded over against the ends of the block by means of the folding-blades e , as shown in Figs. 8, 13, and 17. The portions 5 are then folded upwardly against the block by the upwardly-extending blades $h h$, as shown in Fig. 14. The portions 4 are next folded against the block c by the folding-blades $e' e'$. The wings $g g$ are then caused to fold against the ends of the block c ; but just previous to their contact with the latter the folding-blades that have operated to fold the portions 3, 5, and 4 are retracted from their folding position and the wings press the parts together, as shown in Fig. 18, after which operation the block is raised to permit the box to be removed from the machine in the condition shown in Fig. 15.

As above stated, the folding-blades that operate against the portions 3, 5, and 4 are retracted only just previous to the contact of the wings $g g$ with said portions 4 to finally press the parts together. Therefore the portions 3, 5, and 4 have no opportunity to open from their folded positions for the reason that they are held by their respective blades dur-

ing the greater part of the upward movement of the wings $g g$. Furthermore, the wings $d d$ remain in holding position during the entire time of the operation of the blades e, h , and e' and the wings $g g$ and thus insure the making of boxes of uniform size, according to the dimensions and shape of the block or former c .

It will be seen that the operation of the machine involves, first, the folding of two sides 2 2 of the blank upwardly against two sides of the former, leaving the end portions of the sides and bottom of the blank—namely, the parts 3 4 5—projecting from the ends of the blank, and, secondly, the folding of said parts 3 4 5 successively against the ends of the former, the box being thus completed excepting the turning inwardly of the parts that form the cover.

The tapering shape of the former not only gives the box the desired taper, but also enables the former and box to be withdrawn from the folders and from the end wings or presses $g g$ and enables the box to be readily detached from the former.

I do not confine myself to the details of mechanism here shown and described, as I may vary the same in many respects without departing from the spirit of my invention.

I claim—

In a machine for folding box-blanks, the combination of a fixed bed adapted to firmly support the blank, a former movable toward and from the bed, upwardly-movable folders at opposite sides of the bed adapted to turn two sides of the blank upwardly against the corresponding sides of the former, a pair of side end-folders adapted to turn the end portions of one of the upwardly-turned sides inwardly against the ends of the former, a pair of bottom end-folders adapted to turn the end portions of the blank bottom upwardly against the ends of the former, another pair of side end-folders adapted to turn the end portions of the other upwardly-turned side inwardly against the ends of the former, wings or presses adapted to press said end portions against the former, and mechanism for successively operating said folders and presses.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses this, 1st day of May, A. D. 1896.

JOHN M. HITCHCOCK.

Witnesses:

WM. C. HARDING,
FREDERICK C. HITCHCOCK.