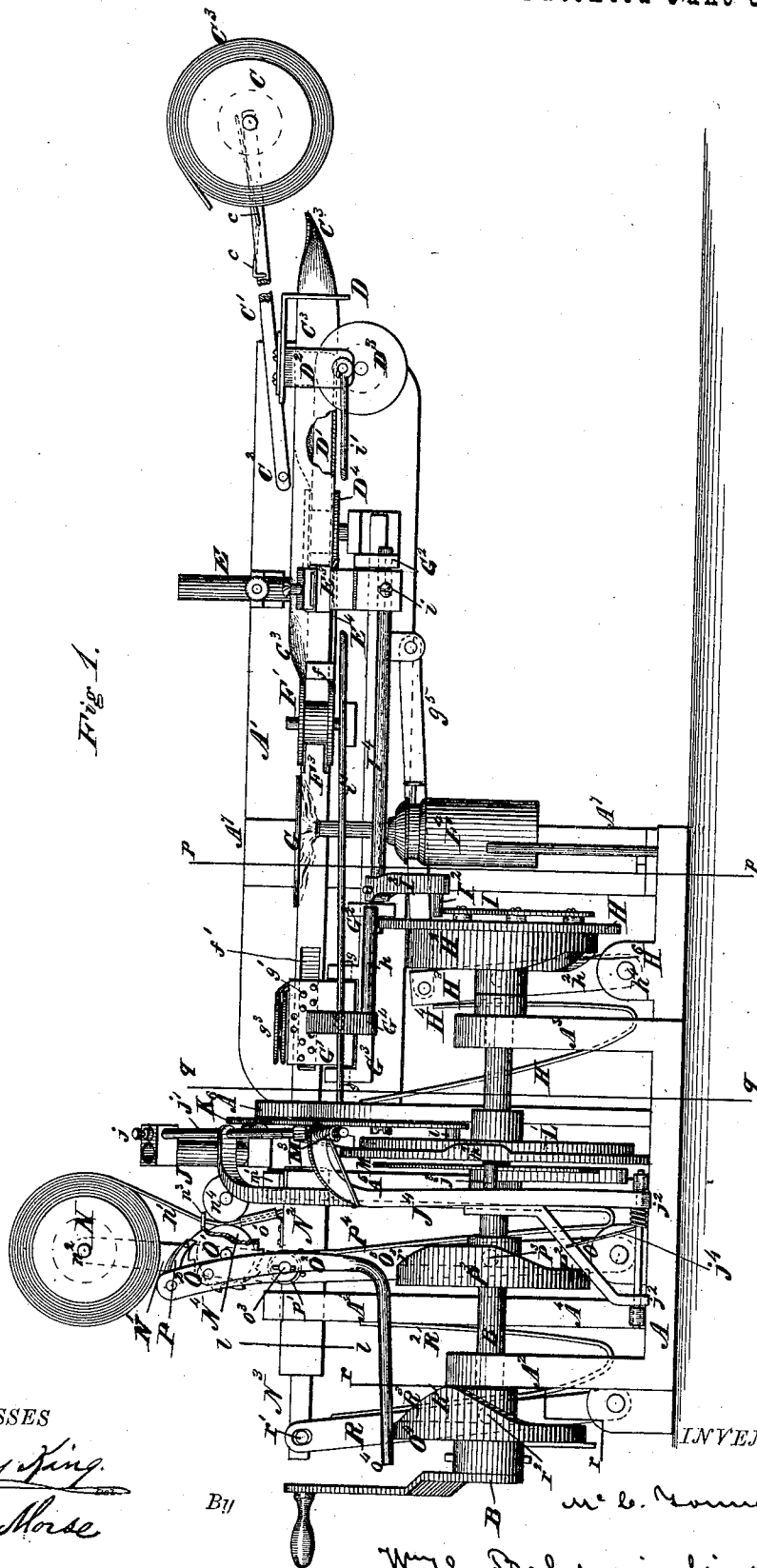


Mc C. YOUNG.
PAPER BOX MACHINE..

No. 178,499.

Patented June 6, 1876.



WITNESSES

Harry King
R. H. Morse

By

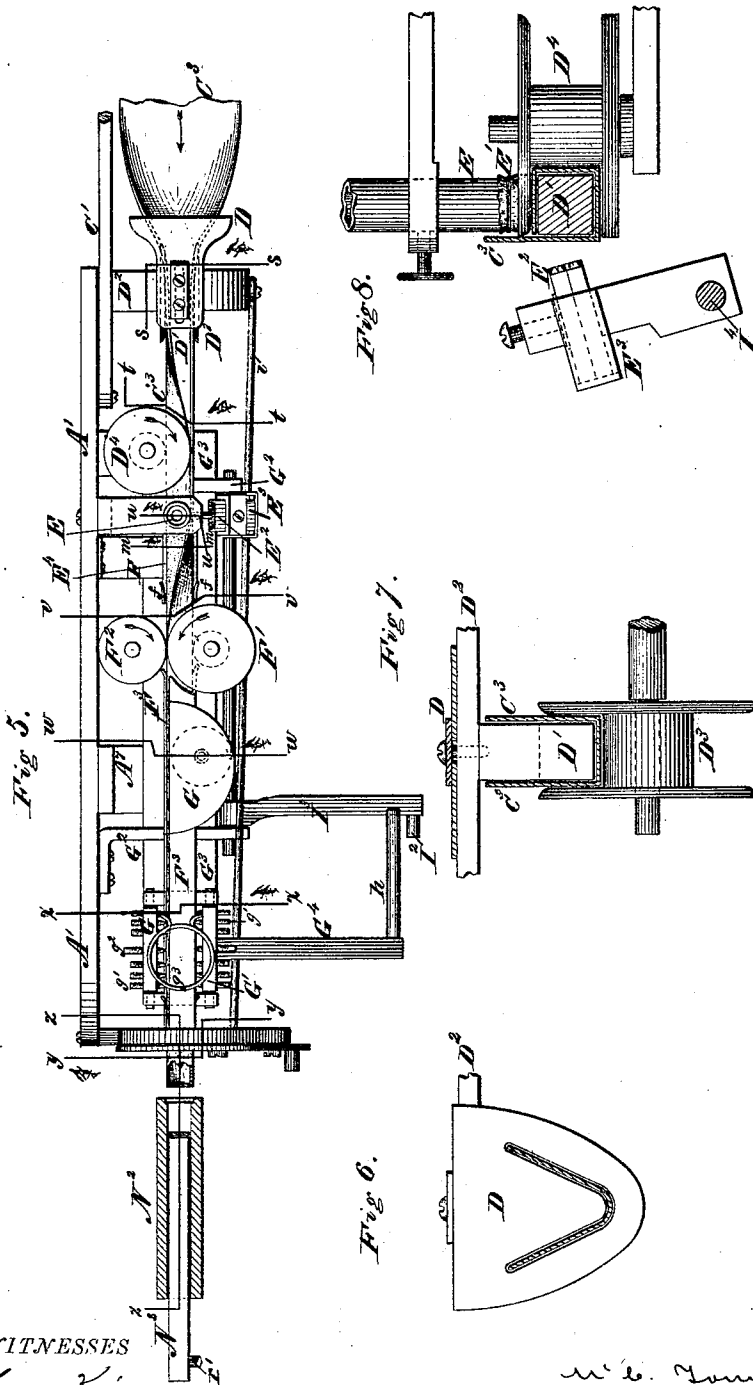
INVENTOR

Mc C. Young
Wm. Baldwin, his Attorney

McC. YOUNG.
PAPER BOX MACHINE.

No. 178,499.

Patented June 6, 1876.



WITNESSES

Harry King
B. H. Moss

By

INVENTOR

McC. Young

Wm. Baldwin, his Attorney

McC. YOUNG.
PAPER BOX MACHINE.

No. 178,499.

Patented June 6, 1876.

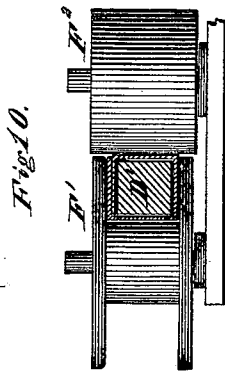
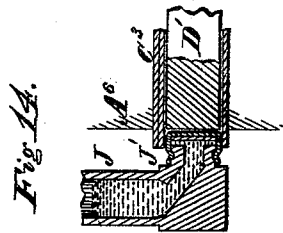
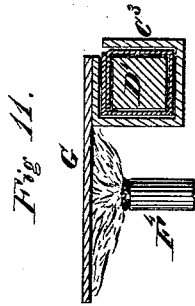
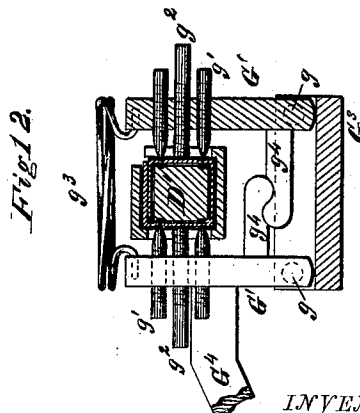
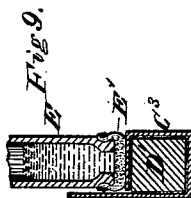
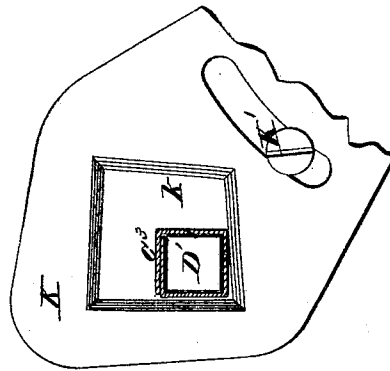


Fig. 13.



WITNESSES

Harry King
B. H. Morse

By

INVENTOR

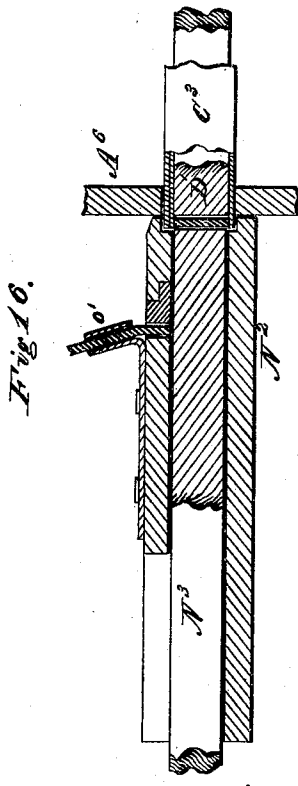
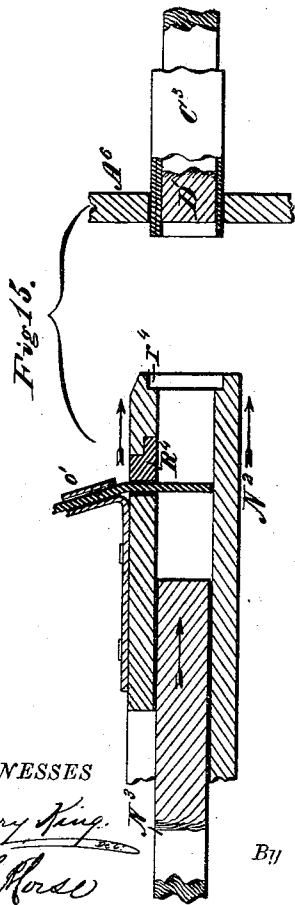
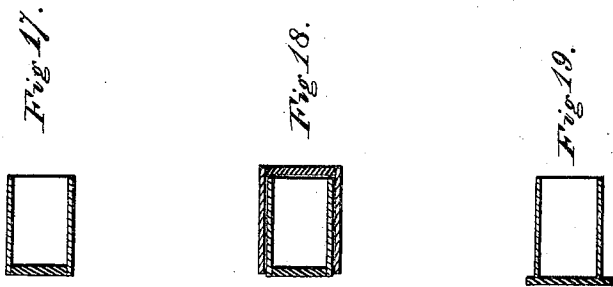
McC. Young

W. B. Baldwin his Attorney

McC. YOUNG.
PAPER BOX MACHINE.

No. 178,499.

Patented June 6, 1876.



Wm. Baldwin, his Attorney

McC. YOUNG.
PAPER BOX MACHINE.

No. 178,499.

Patented June 6, 1876.

Fig 22.

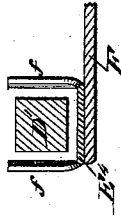


Fig 21.

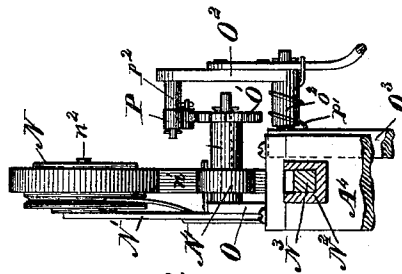
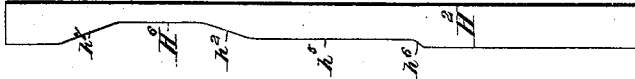


Fig 20.

WITNESSES

Harry King
B. H. Morse

By

INVENTOR.

McC. Young

Wm. B. Baldwin, his Attorney

UNITED STATES PATENT OFFICE.

McCLINTOCK YOUNG, OF FREDERICK, MARYLAND.

IMPROVEMENT IN PAPER-BOX MACHINES.

Specification forming part of Letters Patent No. **178,499**, dated June 6, 1876; application filed April 29, 1874.

To all whom it may concern:

Be it known that I, McCLINTOCK YOUNG, of Frederick, in the county of Frederick and State of Maryland, have invented certain new and useful Improvements in the Art of Manufacturing Paper Boxes, and in mechanism for making the same, of which the following is a specification:

It is the object of my invention to manufacture paper boxes from a strip of paper by one continuous connected operation.

The subject-matter claimed will hereinafter be set forth.

In the accompanying drawings I have shown all my improvements as embodied in the best way now known to me. Obviously, however, some of the parts may be used without the others, and in machines different in construction from the one herein shown. The details of construction of some of the parts may also be varied in some respects without departing from the spirit of my invention, which variations would be readily suggested to skillful mechanics, or those skilled in the art to which my invention pertains, simply by reading this specification.

Figure 1 represents a side elevation of my improved machine, showing the parts in the positions they assume when the cutter is about to sever a box from the tube. Fig. 2 is a view, partly in section, on the line *p p* of Fig. 1, showing the cams for operating the printer and tube nipper or clamp, with the parts in the positions they assume when not in operation, the cams being partly broken away to show the cam-flange by which the nipper is reciprocated to feed the paper tube. Fig. 3 is a view, partly in section, on the line *q q* of Fig. 1, showing the cams for operating the bottom paster and cutter, portions of the frame and cutter being broken away to show the parts more clearly—the positions of the parts being those which they occupy just after the bottom has been inserted in the tube. Fig. 4 is a view, partly in section, on the line *r r* of Fig. 1, showing the cams which operate the devices for forming and applying the bottoms to the tube. Fig. 5 is a plan view of the tube forming and feeding portion of the mechanism, and the plunger for cutting and placing the bottoms, the plunger-

casing being shown in section, and the devices for operating the parts being omitted. Fig. 6 is a front elevation of the shaping or forming guide. Fig. 7 is a front elevation, partly in section, on the line *s s* of Fig. 5, of the mandrel and first forming-roller; Fig. 8, a view, partly in section, on the line *t t* of Fig. 5, looking in the direction indicated by the eye, showing the second forming-roller, the pasting apparatus, and printing device. Fig. 9 is a section, on the line *u u* of Fig. 5, looking in the direction indicated by the eye, through the paste-holder, paper tube, and mandrel; Fig. 10, a view, partly in section, on the line *v v* of Fig. 5, looking in the direction indicated by the eye, showing the last forming-rolling, the completed tube, and the mandrel; Fig. 11, a sectional view, on the line *w w* of Fig. 5, through the mandrel, the tube, the drying-casing, and the lamp-cover and heat-conducting plate; Fig. 12, a view, partly in section, on the line *x x* of Fig. 5, showing the mandrel, tube, casing, and nippers for clamping the paper tube and feeding it intermittently forward; Fig. 13, a view showing the mandrel, a section through the tube, on the line *y y* of Fig. 5, and the oscillating cutter for severing the boxes from the tube—the cutter occupying the position it assumes at the moment it is about to commence its first or upward stroke; Fig. 14, a vertical central section through the mandrel and tube, and also through the bottom-paster, on the line *o o* of Fig. 3; Fig. 15, a sectional view, on the line *z z* of Fig. 5, of the mandrel, tube, and bottom forming and applying devices, showing the latter in the position occupied previous to the time when the plunger acts to cut the bottom from the strip of paper; Fig. 16, a similar view, showing the positions of the parts when the bottom is being applied to the tube; Fig. 17, a vertical longitudinal central section of a completed box; Fig. 18, a similar section of a box and its top; Fig. 19, a similar section of a box having a flanged or projecting bottom, or "French edge;" Fig. 20, a rear view, partly in section, on the line *d d* of Fig. 1, showing the bottom forming and applying devices; Fig. 21, a mechanical plan view of the cam-flange which reciprocates the tube-feeding clamp, as it would ap-

pear when flattened out, showing the details of construction of the flange; Fig. 22, a view, partly in section, on the line *e e* of Fig. 5, looking in the direction indicated by the eye, showing the mandrel and guide between the second and third forming-rollers.

The mechanism is mounted in a strong frame, preferably of metal, in this instance composed of a base-plate, A, a side piece, A¹, and uprights A², A³, A⁴, A⁵, A⁶, and A⁷. A main shaft or cam-shaft, B, is mounted in suitable bearings in the uprights A² A³, and carries cams, by which the operative parts of the mechanism are actuated, as hereinafter described. A roller, C, is mounted upon an arm, C¹, hinged to the side piece A¹ of the frame at C², so that it may be turned back when not in use. A tension-spring, *c*, on the arm bears upon the roller, to prevent the paper from unwinding too rapidly. A web or strip of paper, C³, of the proper width, is wound upon the roller C, from which it passes through a forming-guide, D, secured to an arm, D², projecting from the side A¹ of the frame. This guide (shown in detail in Fig. 6) bends or partially folds the paper, as shown in Figs. 1, 5, and 6. The paper passes from this folding-guide to and beneath a former or mandrel, D¹, secured firmly to the arm D², in this instance by the screws which hold the guide D, as shown in Figs. 1, 5, 6, and 7. A forming or folding roller, D³, beneath the end of the mandrel, (between which roller and the mandrel the strip of paper passes,) turns up the sides of the paper, and presses them and the bottom against the mandrel, thus forming three sides of a tube. (See Figs. 1, 5, and 7.) The paper then passes to a second forming or folding roller, D⁴, Figs. 1, 5, and 8, which turns down one of the side flaps of the paper upon the top of the mandrel, forming a tube with one flap or portion remaining unfolded. The paper tube next passes beneath a paste-holder, E, Figs. 1, 5, 8, and 9, the lower end of which is perforated or partly open, and provided with a brush, E¹, consisting of a covering of cloth or other absorbent material, through which the paste, gum, or cementing substance penetrates. The upper side of that portion of the tube which has been turned down upon the mandrel passes in contact with the brush, and is thoroughly pasted. Removable type E² are clamped by a set-screw, or otherwise suitably held, in a holder or frame, E³, (see Figs. 1, 5, and 8,) which is operated as will hereinafter be described, to print the desired words at intervals upon the tube while supported by the mandrel, so that each box, when finished, is labeled. After leaving the roller D⁴ the tube passes over a supporting plate or guide, E⁴, supported by an arm, F, secured to the side frame A¹, (see Figs. 1 and 5,) between which plate and the mandrel the tube passes. This plate may have sides, or one or more lips or flanges, *f*, on each side, to constitute a guide to preserve the form of the tube, which next passes to the last forming or folding roll-

er F¹, which turns down the last flap upon the pasted portion of the tube. (See Figs. 1, 5, and 10.) A plain roller, F², on the opposite side of the mandrel from that on which the folding-roller F¹ is situated, serves to brace the mandrel and preserve the form of the tube.

It will be seen that the rollers D³, D⁴, F¹, and F² are all mounted upon stud-shafts supported by arms projecting from the side A¹ of the frame, and as the forming-rollers are grooved or formed with double flanges, they serve to brace the mandrel and keep it in proper position independently of its attachment to the frame at the front of the machine, which is important, as the mandrel is loose at its rear end. After the tube passes the roller F¹ it enters a casing, F³, which prevents the spreading or opening of the tube, and keeps the last-folded flap in contact with the pasted portion of the tube while the paste is drying or setting. The guide or rest E⁴, before described, terminates at the roller F¹.

To insure the thorough drying of the paste I prefer to use a lamp, F⁴, the flame of which impinges against a metal plate, G, connected with the casing F³. (See Figs. 1, 5, and 11.) This heater-plate or flame-cover conducts the heat from the lamp-flame to the casing inclosing the paper tube, and insures the rapid drying of the paste. Instead of using the lamp the casing may be perforated to allow air to circulate therethrough, or a current of air may be passed through the casing.

The tube now passes along the mandrel, between it and the casing, to a nipper or clamp, Fig. 12. To allow the clamp to act on the tube the casing is slotted on each side, at *f'* *f'*. (See Figs. 1, 2, 5, and 12.) This nipping device is preferably constructed in the following manner: Two corresponding sides or plates, G¹ G¹, are pivoted in lugs *g g* on a supporting-plate, G³, which is reciprocated, as will hereinafter be described, in slotted arms or guides G² G², secured to the side piece A¹ of the frame. (See Figs. 1, 2, and 5.) The clamp-plates G¹ are provided with female screws, into which are screwed pointed screw-pins *g*¹, to indent the tube and prevent the slipping of the clamp when operating. The mandrel is grooved opposite these pins to allow the paper tube to yield, and thus prevent its being punctured. To prevent the points of the pins *g*¹ from entering too far into the paper I employ stops *g*², which are formed like the pins *g*¹, except that their ends are blunt instead of being pointed. These stops, being properly set, abut against the tube when the nipper takes its hold thereon, and prevent injury of the tube. The plates are normally held apart by a spring, *g*³, and have each an arm, *g*⁴ *g*⁴, Fig. 12, on their inner faces, which interlock, and by means of which the plates are caused to act together when operated upon by their cam acting through an arm, G⁴. A cam, H, fast on the main shaft B, so as to revolve therewith, (see Figs. 1 and 2,) acts once

during each revolution on the crank h of the arm G^4 , to close the clamp upon the paper tube, and retain it in such position during that portion of the revolution of the cam during which the crank h is off the cut-away part H^1 , and in contact with the curved part h^1 of the cam. At the same time that the circular part h^1 of the cam H is traversing in contact with the crank h , a cam-flange, H^2 , on the side or face of the plate composing the cam H , acts, by means of an incline, h^2 , on a friction-roller, h^3 , Fig. 2, on a stud-shaft projecting from an arm, H^3 , pivoted in lugs h^4 on the base-plate A of the frame.

A stout spring, H^4 , bearing at one end against the frame-upright A^6 , and at the other against the pivoted arm H^3 , keeps the roller h^3 in contact with the cam-flange H^2 . As the cam-flange revolves with its incline h^2 in contact with the roller h^3 , the clamp-supporting plate G^3 is moved toward the rear of the machine, as the arm H^3 rocks in that direction, by means of a fixed stud-arm, H^5 , Fig. 2, on the arm H^3 , and a pitman, g^5 , pivoted at one end in lugs on the under side of the plate G^3 , and connected at its opposite end to the stud H^5 . As the main shaft, and, consequently, the cams H H^2 , continue to turn, the supporting-plate (and also the paper tube, which is now connected with this plate by means of the nipper mounted thereon) is moved toward the back of the machine a distance equal to the length of the box being made, the tube of paper passing through an opening in the upright A^6 , which opening is made (see Figs. 15 and 16) of a size sufficiently larger than the forming-mandrel, which rests loosely therein, to admit of such passage, the crank h of the clamp-arm G^4 sliding across the top of the cam H during the movement of the supporting-plate and tube. When the sliding plate G^3 has been moved the distance above described, the plain surface h^5 of the cam-ring H^2 is presented to the roller h^3 , and the plate and tube (the latter projecting through the opening in the frame at the end of the mandrel) are held stationary during the time the roller remains in contact with the plain portion h^5 of the cam. During this pause the box is severed from the tube, as will presently be described. The roller h^3 next has presented to it a short incline, h^6 , on the cam-flange, which, acting through the rocking arm H^3 , stud H^5 , and pitman g^5 , moves the plate and tube still farther toward the rear, but only a short distance. While in this latter position paste is applied to the inner sides of the end of the tube, and the bottom inserted after the withdrawal of the paster, as will presently be explained. In the regular order of operation the short movement to slightly project the tube for the application of the paste and insertion of the bottom takes place, before the tube is projected the length of a box to be formed, instead of afterward, as just described. The printing device E^3 , during the last-described position of the parts, is

caused to print the desired words or devices (which can be changed as desired, as before described) upon the paper supported by the mandrel, by means of a cam, I , upon the opposite side or face of the plate composing the cam H from that on which the cam H^2 is located. The curved portion I^1 of this cam I acts upon a crank, I^2 , of an arm, I^3 , keyed to a rock-shaft, I^4 , rocked in bearings in the ends of the guide-arms G^2 G^3 , in which the plate G^3 reciprocates.

The type-holder is firmly secured upon this rock-shaft, in this instance by a set-screw, i , which admits of the adjustment of the holder. By this arrangement the paper tube is printed at proper intervals, positively regulated by means of the joint action of the cams, to insure each box (or each section afterward cut from the tube to form the boxes) having the desired printing upon it. As the cam-shaft continues to revolve, the cut-away part H^1 of the cam H is presented to the crank h , upon which part the crank enters, and the spring g^3 throws apart the sides G^1 G^2 of the clamp, releasing the tube. At the same time the part I^1 of the cam I passes from beneath the crank I^2 , and the shaft I^4 is rocked, in this instance by the weight of the arm I^3 , thus throwing the type-holder out of operation, at which time it rests against a rod, i' , secured at one end to the frame-upright A^6 , and at the other end to the arm D^2 . This rod allows the printing device sufficient play to clear it from the paper, and also prevents the arm I^3 from falling low enough to come in contact with any but the operative part of the cam I . Shortly after the cut-away part H^1 of the cam H comes in contact with the crank h , a slope or decline, h^7 , leading to the bottom or plain surface of a recess, H^8 , in the cam-flange H^2 , is presented to the roller h^3 , which is caused to enter the recess by the spring H^4 , and the plate G^3 and clamp are moved forward by the rocking of the arm H^3 , ready for the above-described operations, by the cams H , H^2 , and I , to be repeated as the shaft B is revolved. A paste-holder, J , (see Figs. 1, 3, and 14,) has a side projection, J^1 , at its lower end, which is open, or provided with a partially-open or perforated bottom, to which is secured cloth or other absorbent material, through which the paste will penetrate. This holder is fastened by a clamp or set-screw, j , to a rock-shaft, j^1 , mounted in bearings in the ends of arms J^2 J^3 , which terminate in a rod, J^4 , (shown in this instance as forked at its lower end,) pivoted in supports j^2 j^3 , secured to the base A of frame. A cutter, K , (see Figs. 1, 3, and 13,) formed in this instance of a plate having an opening, k , the edges of which are beveled and brought to a sharp edge, is pivoted to the upright A^6 of the frame at k' , and is kept close against the face of the upright by means of a screw or headed bolt, K' , passed through a slot in the cutter-plate.

The paster and cutter are operated as follows: A pin, j^3 , which may be provided with

a friction-roller, projects from the rod J^4 , and is caused, by a spring, j^4 , Fig. 1, to bear upon the irregularly-curved edge or periphery of a cam, M , which is keyed to the main shaft, and revolves therewith. During the time the pin j^3 bears against the regular portion M^1 of the cam, the paster J^1 is inoperative.

As the shaft revolves, the cut-away or recessed part m of the cam is presented to the pin j^3 , the pin entering by a decline to this recess. The rod J^4 moves parallel with the face or side of the cam, and the paster descends, so as to bring its brush or end J^1 in line with the tube of paper. When in this position, the arm J^2 rests upon a stop, m^1 , secured on one of the frame-pieces, to insure the paster being in the proper position, in line with the tube of paper. An arm or tappet, M^2 , fixed on the rock-shaft j^1 by a set-screw, now acts on a rib or projection, m^2 , on the face of a wheel, L , fast on the shaft B . The tappet is caused to bear against this rib by a spring, M^3 , which tends to rock the tappet toward the rod J^4 , but is prevented from swinging it too far toward the rod by a stop-pin on the rock-shaft-supporting arm J^3 , against which stop the tappet-arm bears, and is thus held in the proper position to be acted upon and rocked by the rib on the wheel L .

This rocking of the shaft j^1 swings the paster into the end of the tube of paper, which, as before described, has just been slightly projected beyond its mandrel. Paste is thus thoroughly applied to the inside of the end of the tube. As the brush J^1 enters it the tube may expand or yield slightly at its end where it is not confined, and thus accommodate a tight-fitting paster.

As the tube projects beyond the mandrel and frame-upright, there is no liability of gumming or clogging the mandrel or the frame by any paste that might accidentally be applied outside or slightly beyond the portion of the tube which it is desired to paste.

As the shaft B revolves, the tappet-arm M^2 is freed from the cam-rib m^2 , and swings back against its stop into proper position to be acted upon again when the revolution of the wheel brings the rib around. The pin j^3 passes out from the recess m upon the incline leading therefrom, and the paster is moved first out from the tube, and then up to its inoperative position, the arm M^2 being held clear of the wheel L , and the pin j^3 bearing upon the regular part of the cam M . The parts remain in this position until the cams repeat the above-described operation. The bottom-applying device now inserts the bottom in the tube, as will hereinafter be described, and afterward, the tube having been projected beyond the mandrel and frame-opening the length of a box, as before described, the cutter strikes off a box from the tube. A friction-roller, l , mounted on a short stud projecting from the lower part of the cutter-plate K , projects into a cam-groove, L' , in the face of the wheel L .

When the tube is projected, that part of the groove marked l' acts on the roller l , and causes the cutter to swing up against the bottom of the tube, cutting it half through close to the end of the mandrel and to the frame-opening, thus making a shear-cut, and not crushing or altering the shape of the tube. After this first cut the part l^2 of the groove acts on the cutter-roller, causing the cutter to make a cut from the top downward, meeting the first cut, and thus completely severs the box from the tube.

The roller l now is acted upon by the part l^3 of the groove, which leaves the cutter in the position in which it rests when not in operation, with its opening k opposite the opening in the frame, to allow the tube to be projected centrally through it. While in this position the roller runs in the regularly-curved part of the groove, which extends from the termination of the part l^3 to the beginning of the part l^1 . A strip of paper, n^1 , of the proper width to form the box-bottoms, is wound upon a roller, N , mounted on a stud-shaft, n^2 , projecting laterally from an arm, N^1 . This arm is securely attached to a reciprocating casing, N^2 , in which works a plunger, N^3 , as will hereinafter be explained. The strip n^1 is passed through a guide, n^3 , and between feeding-rollers N^4 n^4 , the guide being secured to a bracket, O , and the feeding-rollers mounted on shafts projecting therefrom. The bracket O is secured to the arm N^1 or to the casing N^2 . The roller N^4 , it will be seen, has a long bearing or sleeve, terminating in a ratchet-wheel, O^1 , by means of which the feed of the strip is gaged and regulated. After the strip passes between the feeding-rollers it enters a guide, o^1 , secured on the plunger-casing, which guide conducts it to an opening in the top of the casing, through which opening the strip passes, to be acted on by the plunger—first, to cut off a section for a box-bottom, and then to place it in the end of the tube. A lever, O^2 , is fulcrumed, with a long bearing, o^2 , on a shaft, o^3 , projecting from an arm, O^3 . This lever is curved and caused to bear at its lower end o^4 upon the edge or periphery of a cam-wheel, O^4 , (fastened on the main shaft B .) by the action of a spring, p^1 , coiled upon the bearing o^2 , one end of the spring resting against the lever, and the other against the arm O^3 . A pawl, P , of well-known construction, on a stud-shaft, p^2 , on the upper end of the lever O^2 , causes the ratchet-wheel O^1 to turn, and with it the feeding-rollers N^4 n^4 , a distance equal to the distance from one tooth to another on the wheel, when the lower end of the lever O^2 is elevated and the lever rocked by the peripheral projection P^1 of the cam-wheel O^4 . As the projection passes from under the lever it is rocked back to its normal position by the spring p^1 , leaving the pawl in position to resume its action, when another revolution of the cam or main shaft brings the cam in position to operate again on the lever. The space between the ratchet-

teeth is such as to feed the strip into the casing—where it fits snugly—a proper distance to be cut off and form a bottom piece of the required size by each partial revolution of the ratchet-wheel. A spring bearing on the roller N prevents the strip from unwinding too freely. The arm O³ is pivoted in lugs on the base A of the frame.

A friction-roller, p³, on a stud-shaft projecting from this arm bears against a cam-flange, P², on a wheel, P³, fastened to the main shaft. The roller is kept against the cam by means of a strong spring, P⁴, one end of which bears against the upright A⁵ of the frame, and the other against the rocking arm O³, to which the roller is secured. This arm is slotted near its upper end to receive a pin secured to the plunger-casing N². The plunger is secured, by means of a pin, r¹, to a rocking arm, R, pivoted in lugs on the base A of the frame, the arm being slotted near its upper end to receive the pin. This arm is provided with a stud-shaft carrying a friction-roller, r², which is caused to bear against a cam-flange, R¹, on the face of the cam-wheel O⁴, by means of a strong spring, R², one end of which bears against the upright A⁴ of the frame, and the other end against the arm R.

When the strip of paper n¹ has been properly fed into the casing, (beyond the end of the plunger,) as before described, an inclined projection, r³, on the cam-flange P² of the wheel P³, begins to act on the roller p³, rocking the arm O³ and causing the casing N² to move toward the paper tube, carrying with it the paper strip n¹ (and other parts connected with the casing,) the bent end o⁴ of the lever O³ sliding across the regular portion of the periphery of the cam-wheel O⁴. This movement of the casing continues, as the roller is acting on the inclined part of the projection r³. Soon after the beginning of this movement, an inclined projection, R³, on the cam-flange R¹ of the wheel O⁴, is presented to the roller r², and, as the shaft B is revolved, causes the plunger N³ to slide in its casing N². When the plain portion, at the termination of the incline r³, is presented to the roller p³, the casing has been moved forward until its end rests against the upright A⁶ of the frame, the enlarged or shouldered part r⁴ of the casing fitting over the end of the paper tube. (See Fig. 16.) During this time the plunger has been advancing, and when the casing rests against the upright A⁶ the plunger cuts off the strip n¹ a piece to form the box-bottom. This cutting is effected by the upper edge of the end of the plunger acting with the edge of a cutter-plate, R⁴, secured upon the casing on the side of its top opening, through which the strip passes, as before described, the casing being now at rest, and the roller p³ acting on the regular surface or plain portion of the projection r³, the plunger continuing to move in the casing, pushing along before it the bottom piece, and finally forcing it into the end of the tube, (which has been gummed and

slightly advanced, as hereinbefore described,) without altering the shape of the tube, as it is supported on its outside by the enlargement r⁴ of the casing-opening, fitting over the tube.

As the cam-shaft B continues to revolve, the projection r³ passes the roller r², the spring R², acting on the arm R, throws back the plunger, and the roller works on the regular portion of the face of the cam-flange R¹. The roller p³ now descends from the projection r³, on the cam-flange P² of the wheel P³, to the regular portion of the face of the cam-flange, and the casing is retracted by its spring P⁴. The parts are now in position for the repetition of the above-described operation as the shaft B revolves, so as to present the projections again to the rollers. During the time that the bottom forming and applying mechanism is at rest the tube is projected and a box struck off, as before described.

The tops for the boxes are formed by a machine similar to the one above described, and may be equal in length to the box, so as to form a sliding inclosing-cover, or may be made short, like an ordinary top.

The boxes may be made with projecting bottoms, if desired, the bottom-forming casing and plunger being made large enough to produce bottom pieces of the desired size, the strip-feeding devices correspondingly changed, the paste being so constructed as to apply the paste to the end instead of inside of the tube, and the bottom being presented to the end of the tube instead of inserted in it.

By changing the form of the mandrel, and correspondingly altering the forming-rollers, mandrel-casing, and bottom-forming devices, boxes of different shapes may be manufactured.

Instead of the knife-cutter herein described, to sever the boxes from the tube, rapidly-revolving circular saws may be employed, and be swung up automatically to the tube from opposite directions to strike off the boxes.

The main or cam shaft is shown, in this instance, as revolved by a hand-crank; but it is obvious that the mechanism may be driven by any suitable motive power. It is also obvious that the same set of cams may be employed to operate two or more machines, and thus the rapidity with which the boxes may be manufactured increased.

I claim as my invention—

1. The improvement in the art of manufacturing paper boxes by machinery hereinbefore set forth, which consists in forming a tube from a strip or web of paper, pasting together the lapping edges of said tube, pasting the end of the tube, applying a separately-formed bottom piece to the pasted end of said tube, and severing the tube to form a box of proper length, these operations being automatically, successively, and repeatedly carried out by mechanism substantially such as described.

2. The combination of a roller, C, carrying

the web of paper, a forming-guide, D, through which the paper passes, a mandrel, D¹, around which the paper is bent, and a forming-roller, D³, the flanges of which overlap the mandrel, these members being constructed and operating in combination, substantially as set forth, whereby the paper is first shaped by the forming-guide, and then acted upon by the forming-roller, as soon as presented to the mandrel.

3. The combination of a mandrel, D¹, a forming-roller, D³, to fold the sides of the paper strip upon the mandrel, a second forming-roller, D⁴, to turn one flap of the strip over upon the mandrel, and a paster, E, which pastes the flap previously turned over upon the mandrel, these members being constructed and operating in combination, substantially as set forth.

4. The combination of a mandrel, D¹, a forming-roller, D³, to fold the sides of the paper strip upon the mandrel, a second forming-roller, D⁴, to turn one flap of the strip over upon the mandrel, a paster, E, to paste said flap, and a folding-roller, F¹, which folds the second flap upon the pasted one to complete the tube while on the mandrel, these members being constructed and operating in combination, substantially as set forth.

5. The combination of a mandrel, D¹, forming or folding rollers D³ D⁴ F¹, which fold the paper strip upon the mandrel, and a supporting-guide, E⁴, which conducts the strip enveloping the mandrel from the second to the final folding-roller, these members being constructed and operating in combination, substantially as set forth.

6. The combination of a mandrel, D¹, and a long tabular casing, F³, between which and the mandrel the paper tube passes, substantially as set forth, whereby the form of the tube is preserved during the manipulations to which it is afterward subjected.

7. The combination of a mandrel, D¹, a folding-roller, F¹, which imparts the final fold to the pasted strip, and a casing, F³, into which the completed tube passes directly from the folding-roller, substantially as set forth.

8. The combination, substantially as set forth, of a mandrel, D¹, upon which the paper tube is formed and pasted, a casing, F³, through which the pasted tube passes, and a heater-plate, G, whereby the tube is dried while passing between the casing and mandrel, directly after being pasted.

9. The combination, substantially as set forth, of a mandrel, D¹, upon which the paper tube is formed, and a reciprocating feed-clamp, which intermittently moves the paper tube upon the mandrel twice for every box formed, for the purposes specified.

10. The combination, substantially as set forth, of a mandrel, D¹, upon which the paper tube is formed, a casing, F³, inclosing the mandrel, and a reciprocating feed-clamp, working in a slot in the casing, and acting upon a paper tube interposed between the casing and mandrel.

11. The combination, substantially as set forth, of a mandrel, D¹, upon which the paper tube is formed, and a printer, E³, which prints the paper strip while supported by the mandrel.

12. The combination of a mandrel, D¹, upon which the paper tube is formed, a feed-clamp, which moves said tube intermittently upon the mandrel, a printer, E³, acting upon the tube upon the mandrel while the feed is intermitted, and connecting mechanism, substantially such as described, to secure the harmonious co-operation of the feeding and printing mechanisms.

13. An end-paster, J¹, constructed substantially as described, and adapted to move both transversely to and parallel with the line of movement of a paper tube upon a mandrel on which it is formed, whereby the end of said tube may be pasted and the paster retracted out of the way, as specified.

14. The combination, substantially as set forth, of a mandrel, D¹, an intermittent feed-clamp to move the tube upon the mandrel, an end-paster, J¹, and connecting mechanism, substantially such as described, whereby the harmonious co-operation of the tube-feeding and end-pasting devices is attained.

15. A reciprocating plunger-casing, N², constructed substantially as described, having mechanism for feeding the strip from which the end piece of the box is formed mounted upon and moving with it, as specified.

16. The combination of a reciprocating plunger-casing, N², and a reciprocating plunger, N³, having a variable movement relative to that of the plunger-casing, substantially as set forth, whereby the bottom piece is severed from the end strip, and applied by the plunger to the pasted end of the paper tube, as specified.

17. The combination of a mandrel, D¹, upon which the paper tube is formed, feed mechanism to move the tube upon the mandrel, an end-paster, J¹, mechanism for applying the bottom piece to the pasted end of the tube, and connecting mechanism, whereby the harmonious co-operation of these parts is secured, these members being constructed to operate in combination, substantially as set forth.

18. A cutter, K, constructed to operate substantially as set forth, whereby one portion of the paper tube is severed by a cut in one direction, and the other portion by a reverse cut, as set forth.

19. The combination, substantially as set forth, of a mandrel, D¹, upon which the paper tube is formed, feed mechanism, which projects the finished tube beyond the end of the mandrel the distance required for the length of the box to be made, a cutter, K, shearing across the end of the mandrel to sever the tube, and connecting mechanism, which insures the harmonious co-operation of these parts.

20. The combination, substantially as set forth, of a mandrel, D¹, upon which the paper

tube is formed, a perforated cutter, through which the tube is fed, and an end-paster, J¹, which pastes the end of the tube fed through the cutter.

21. The combination of a mandrel, D¹, upon which the paper tube is formed, feeding mechanism, end-pasting mechanism J¹, mechanism for applying a bottom piece to the pasted end of the tube, a cutter, K, to sever the completed tube, a cam-shaft, B, parallel with the

mandrel, and actuating mechanism, to secure the harmonious co-operation of all the moving parts from a single shaft, substantially as set forth.

In testimony whereof I have hereunto subscribed my name.

McCOLINTOCK YOUNG.

Witnesses:

E. C. DAVIDSON,
BALTIS DE LONG.