4 Sheets—Sheet 1.

J. E. WILLIAMS.

PAPER-BOX MACHINE.

No. 170,039. Patented Nov. 16, 1875.

FIG. 1.

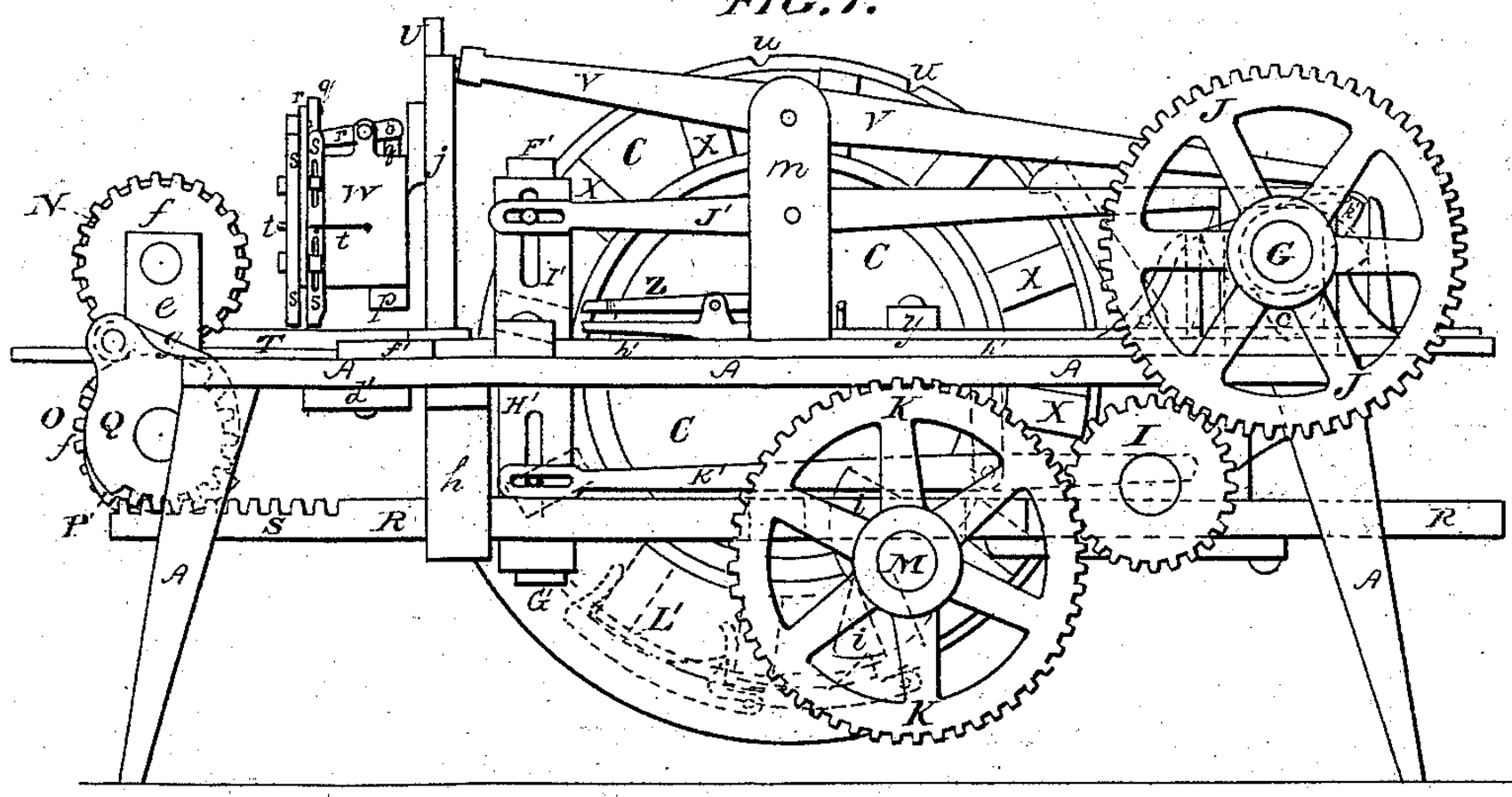
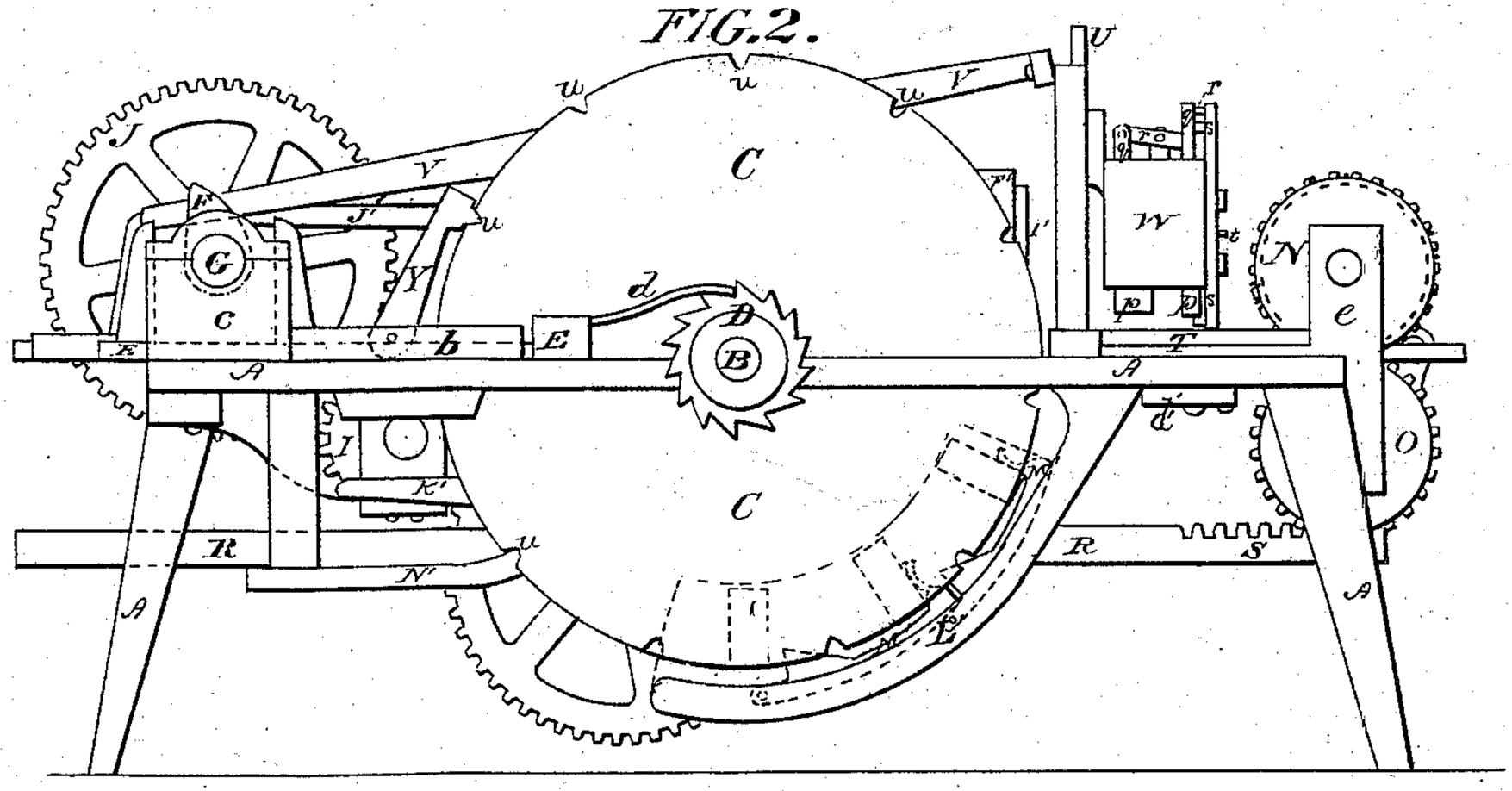


FIG. 2.



WITNESSES.

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John E. Williams

per Geo. Burgin.

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4 Sheets—Sheet 2.

J. E. WILLIAMS.

PAPER-BOX MACHINE.

No. 170,039. Patented Nov. 16, 1875.

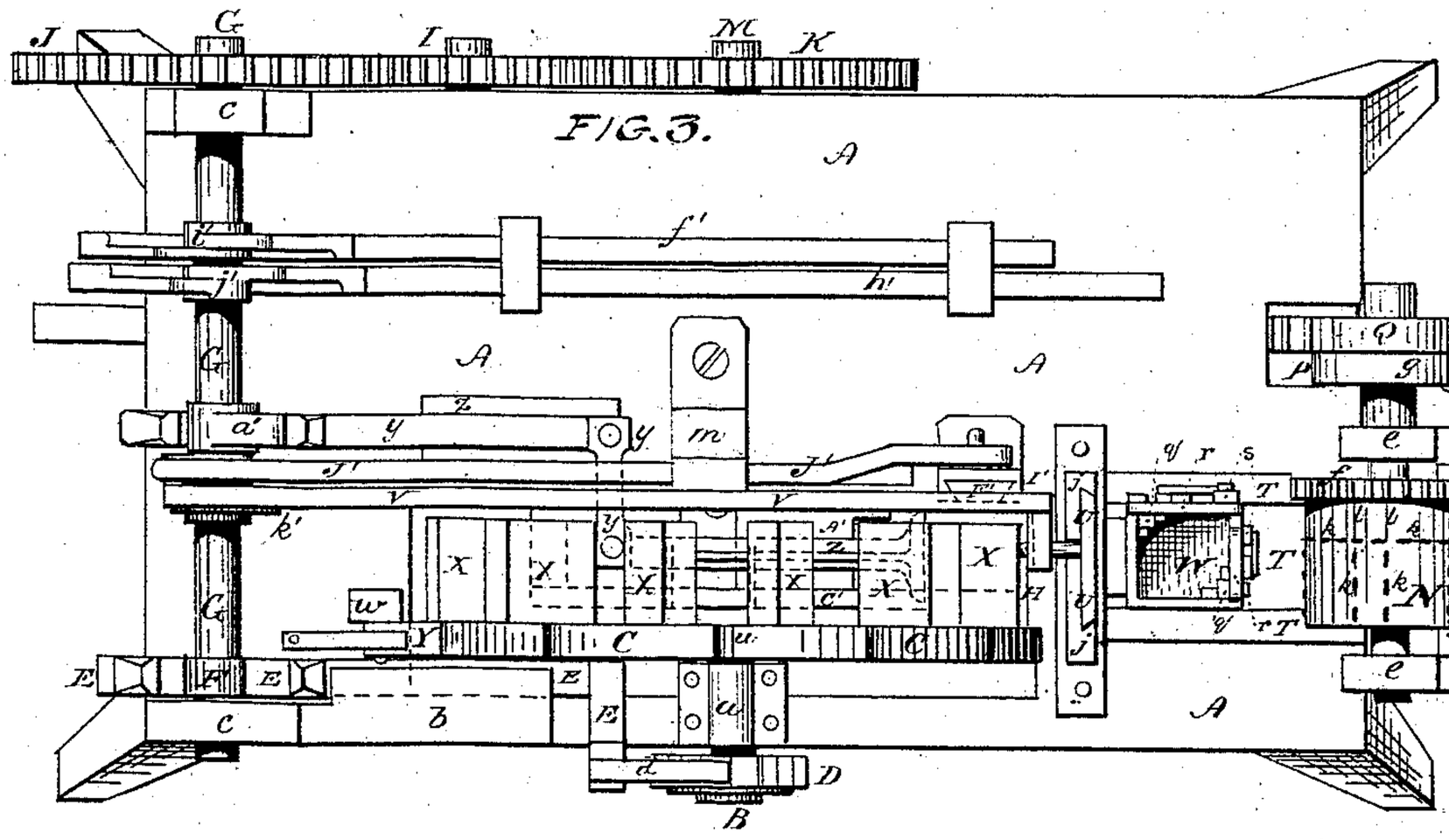

FIG. 3.

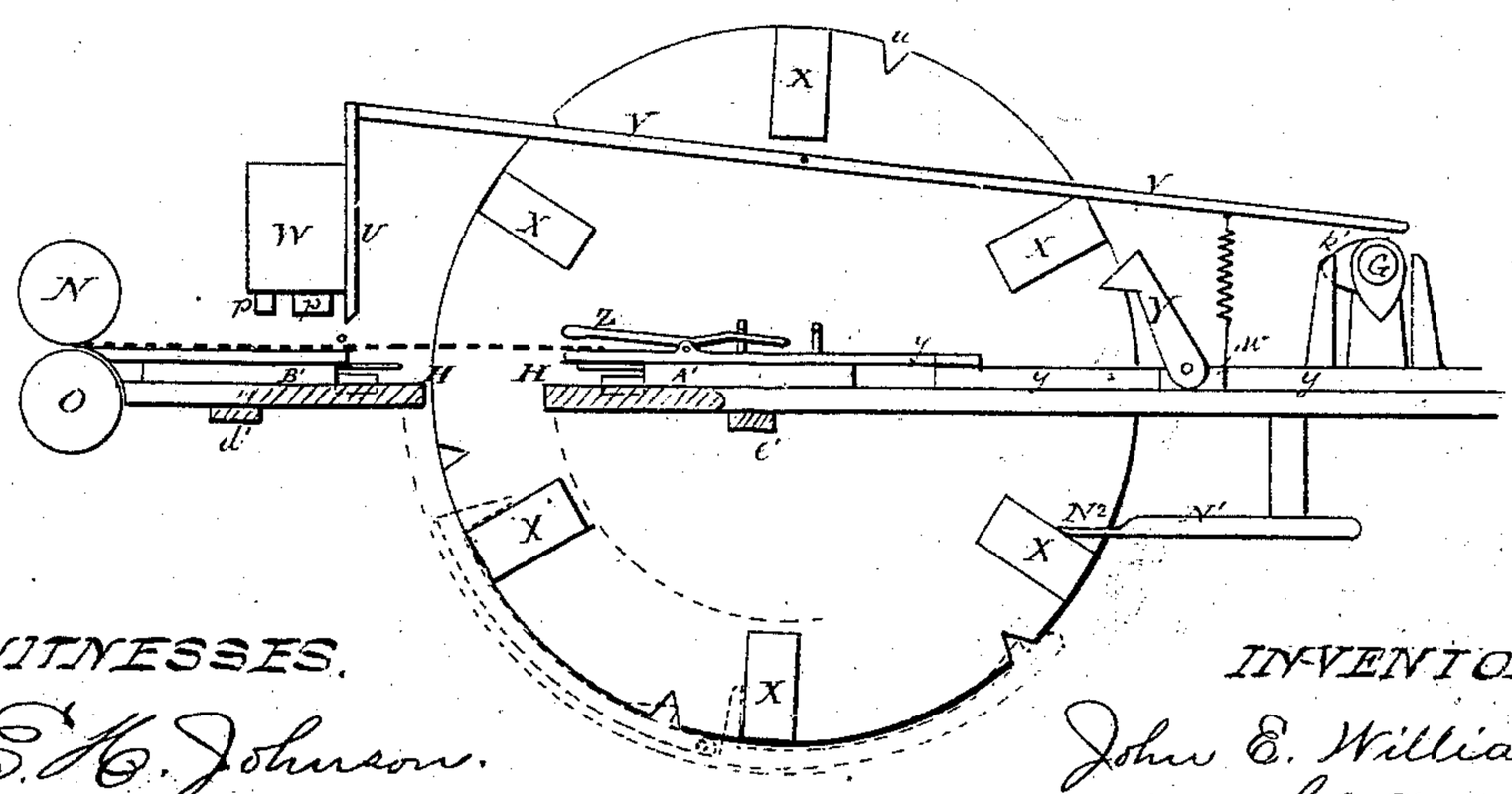

FIG. 4.

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4 Sheets—Sheet 3.

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No. 170,039. Patented Nov. 16, 1875.

FIG. 5.

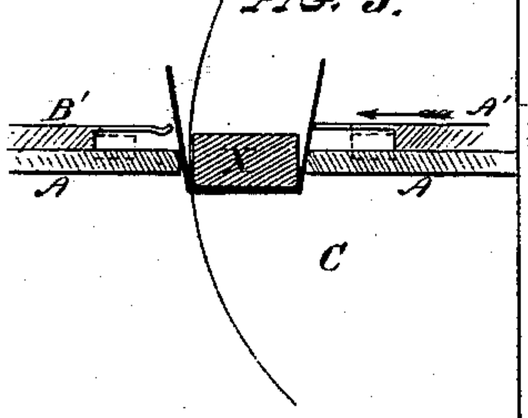


FIG. 6.

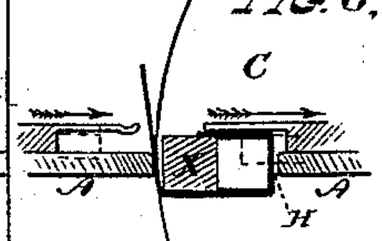


FIG. 7.

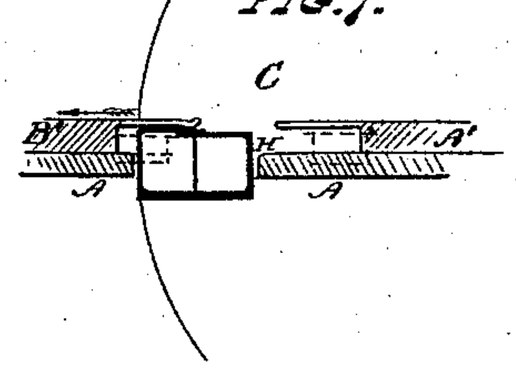


FIG. 8.

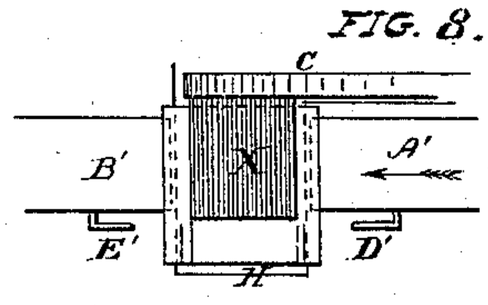


FIG. 9.

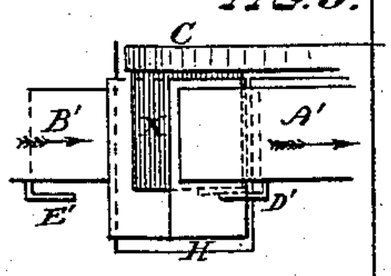


FIG. 10.

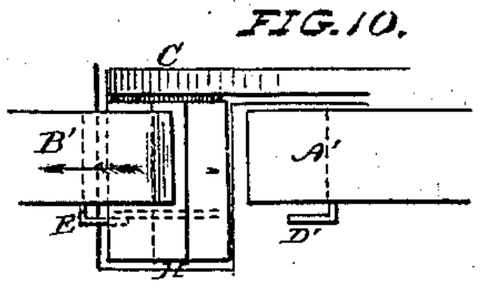


FIG. 11.

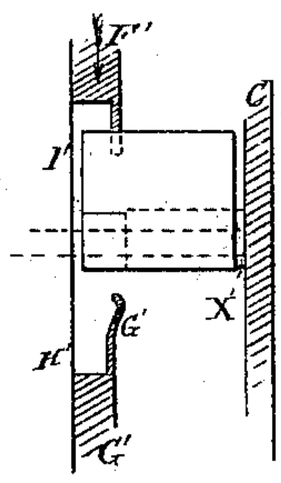


FIG. 12.

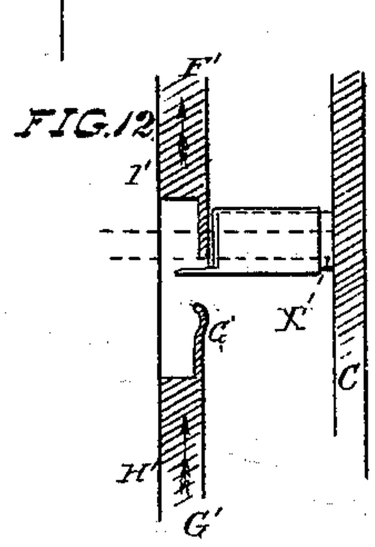


FIG. 13.

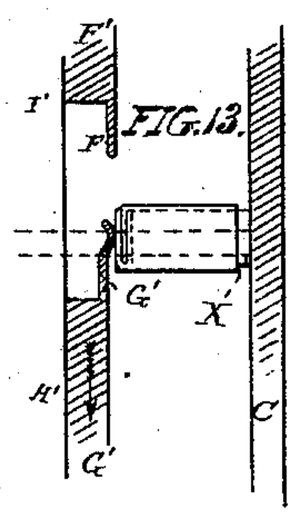
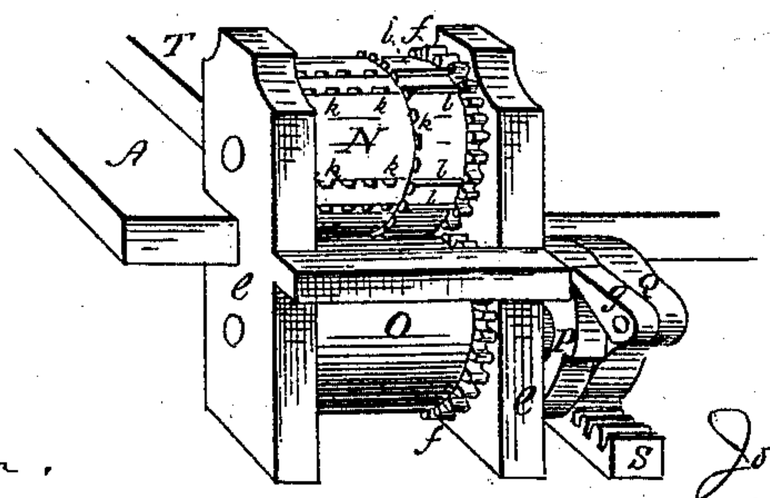


FIG. 14.



WITNESSES.

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PAPER-BOX MACHINE.

No. 170,039. Patented Nov. 16, 1875.

Fig. 15.

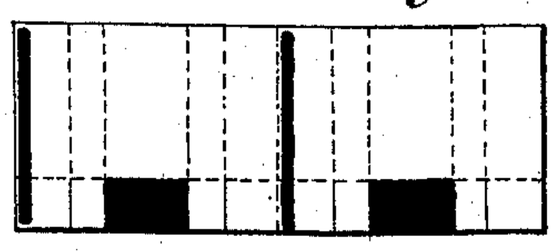


Fig. 16.

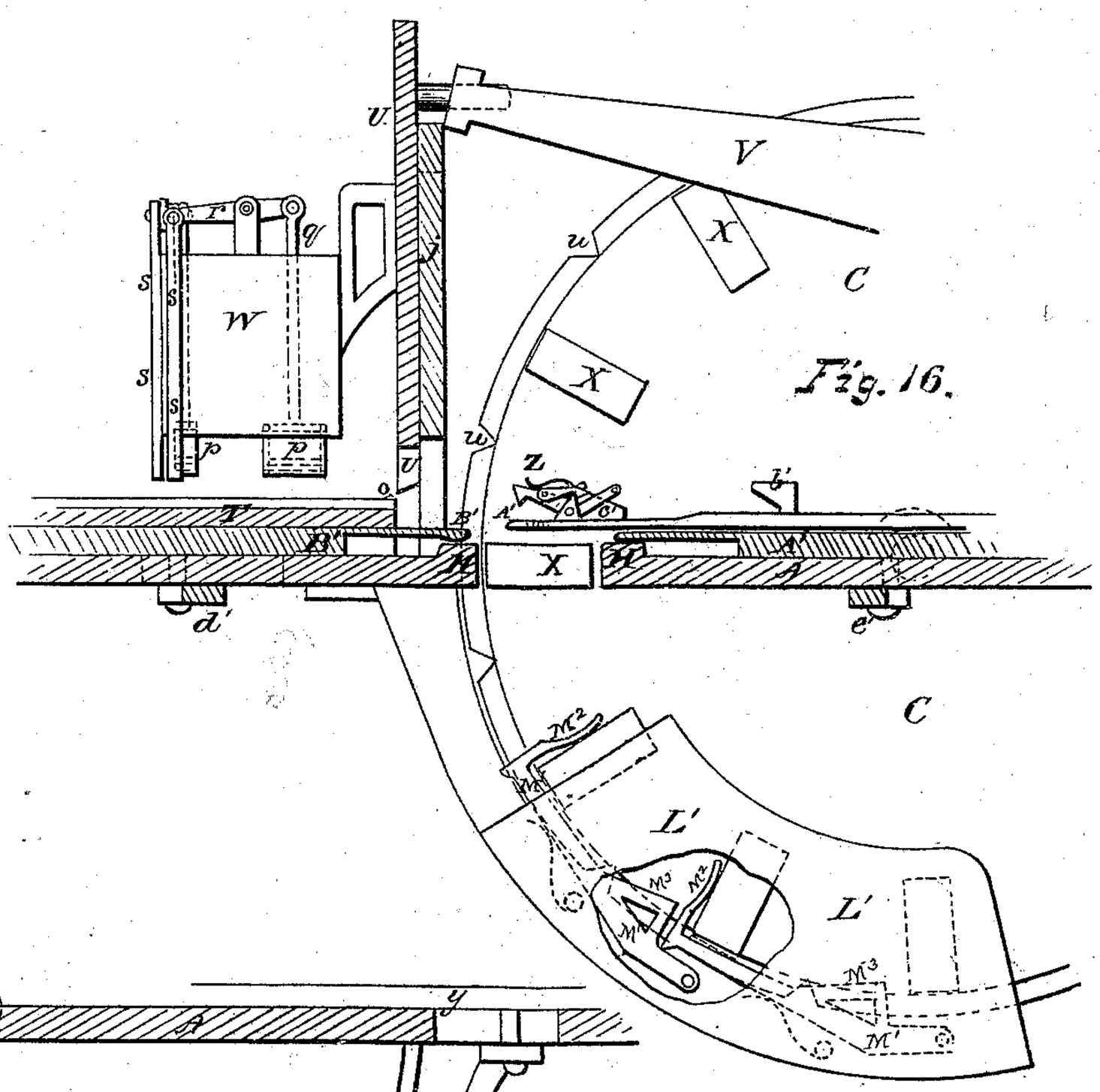


Fig. 17.

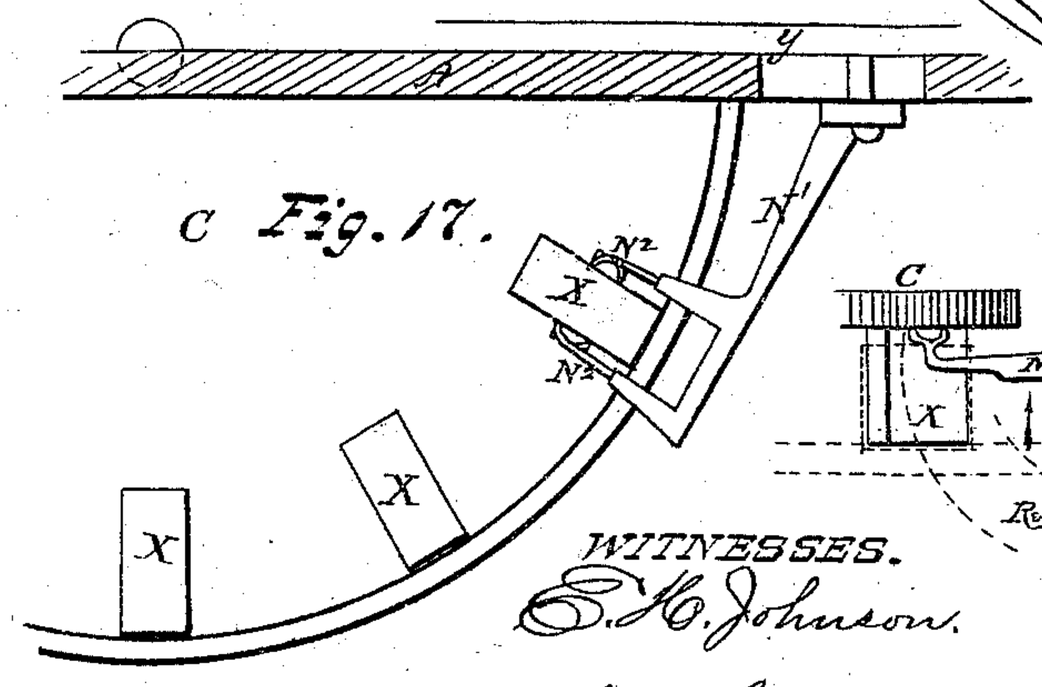
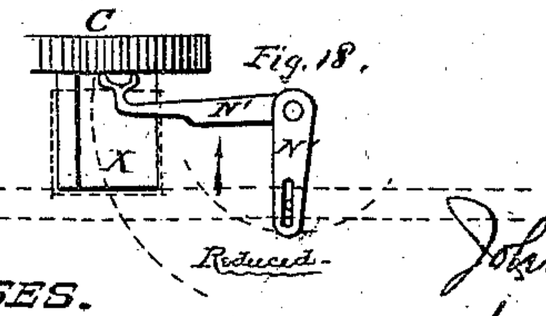


Fig. 18.



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UNITED STATES PATENT OFFICE.

JOHN E. WILLIAMS, OF NEW HAVEN, CONNECTICUT, ASSIGNOR TO HIRAM STEVENS, OF SAME PLACE.

IMPROVEMENT IN PAPER-BOX MACHINES.

Specification forming part of Letters Patent No. **170,039**, dated November 16, 1875; application filed April 7, 1875.

To all whom it may concern:

Be it known that I, JOHN E. WILLIAMS, of New Haven, in the county of New Haven and State of Connecticut, have invented certain Improvements in Paper-Box Machines, of which the following is a specification:

My invention relates to machines for making paper boxes; and consists in a novel construction, combination, and arrangement of parts, which have for their object to improve the operation of the machine, as will be fully hereafter set forth.

Figures 1 and 2 are elevations of the two sides of the machine. Fig. 3 is a top or plan view. Figs. 4 to 13 are diagrams illustrating the principles of action of the machine. Figs. 14 to 18 are detail views.

In this machine the web of paper from which the blanks are cut is introduced between a pair of rollers, which score and incise the paper at the proper points and feed it along under a reciprocating knife which, after the length of a blank has passed under it, descends and cuts this blank off. To this reciprocating knife is attached a paste or gum box, provided underneath with openings, through which the paste or gum is ejected, and as the knife descends to sever a blank from the web of paper, the paste-box is carried down until its openings rest on the succeeding blank and gum it at the required points.

In this machine the boxes are formed on formers of proper shape, which are secured on a rotating disk or wheel near its periphery, and are retained on these formers by suitable means until the gum has sufficiently set to permit of the box being stripped therefrom.

The blank having been gummed and cut off is seized by reciprocating nippers, between the jaws of which it had entered, and is by these drawn over an opening or die in the table of the machine, which is some larger than the formers on the disk or wheel, and as the former-wheel is turned a certain distance, the former which is next to pass this opening or die descends and presses the paper through it. As soon as this has been accomplished, reciprocating folders are operated to fold over the flaps of the blank one over the other, and the wheel rotates again, which brings the box on the former under the operation of the devices for holding its parts together until it is sufficiently set to hold together. This having taken place, the box is stripped from the former by a reciprocating stripper, and is delivered complete.

A represents the frame and table of the machine; B, a shaft, turning in bearings *a* and carrying at one extremity the former-wheel C, and at the other the ratchet-wheel D. E is a bar reciprocated in the guide *b*, by means of the cam F on the shaft G, turning in bearings *c*. This bar carries at one extremity the spring-pawl *d*, which, as the bar reciprocates, engages with the teeth of the ratchet-wheel D, and rotates the former-wheel C. The former-wheel works in an opening in the table, and the formers pass through the square opening or die at H, (as shown in Figs. 4 to 7, and in Fig. 16.) I is the driving pinion, which gears with the two wheels J and K on the extremity of the shafts G M, one above the other below the table. These shafts carry the cams which produce the motions in the several working parts of the machine. N O are the scoring, incising, and feeding rollers, working in the bearings *e e*, and geared together by the gear-wheels *f f*. To one extremity of the shaft of the lower roller is secured a ratchet-wheel, P, and outside of this wheel is secured loosely the mutilated pinion Q, the upper part of which projects to form a bearing, to which is pivoted a pawl, *g*, engaging with the ratchet P. R is a bar working in the bearings *h h*, depending from underneath the table, and having a reciprocating motion imparted to it by the cams *i i* on the shaft working against lugs on the side of the bar. At one extremity of this bar is the rack S, which gears with the teeth on the mutilated pinion Q, and as the bar reciprocates this pinion is given a semi-rotary or rocking motion, and the pawl *g*, engaging with the teeth of the ratchet-wheel on the shaft of the lower roller, imparts to the rollers an intermittent rotary motion, which is just sufficient to feed through paper the length of a blank. The upper roller N is provided on its surface with incising-knives *l*, and scoring-teeth *k*, which slit or incise and score the paper at the proper points, and by these slits and scores the lines of the folds are determined, which renders the corners of the

box sharp, square, and straight. The roll of paper from which the machine is fed, may be supported on any suitable bearings outside of the feed-rollers. T T are guides or ways along which the paper marked off into blanks is fed to the cutting and pasting devices. U is a reciprocating knife for cutting off the blanks from the web. This knife reciprocates vertically in the guide-frame *j*, and is operated by the cam *k'* on the shaft G, through the lever V, pivoted to the standard *m o*. Figs. 4 and 15 show the edge against which the edge of the knife acts in cutting.

To the outside of this knife is secured the paste-box W. This box is provided at its bottom with tubes or openings *p*, the bottom of which corresponds in area and shape to the surface of the blank to be gummed. Through these spouts or openings the gum or paste is ejected by a valve, plunger, or other convenient device, operated by the rods *q q* pivoted to the arms *r r*, to which the rods *s s* are pin-jointed. These valves are kept closed by the springs *t*, but as the knife descends to sever a blank from the web the rods *s s* come in contact with the guide bars T, and force the rods *q q* down, thus operating the valves or plungers in the tubes *p*, and ejecting or squeezing out a sufficient quantity of gum to gum the blanks, as shown at Fig. 15. The formers X on the wheel C are of the size and proportions which it is desired to make the box, and are sufficiently far apart to give space and time for the necessary movements of the folders, nippers, &c., to act between them. The periphery of the wheel is nicked, as shown at *u*, and into these nicks the dog Y, pivoted to the block *w*, enters to hold the wheel stationary during the process of folding the blank over the formers. In the drawings the form of the nicks and the dog is such that the pressure brought on the former-wheel in turning it is sufficient to throw the dog out of the nick; but in practice the holding device is operated positively by some actuating part of the machine, as the bar E, for instance, so as to hold the wheel firmly against all posibiiity of rotation. The opening or die in the table through which the formers pass is sufficiently large to admit of their free passage, allowance being made for the thickness of the paper which forms the box, and the movement of the wheel is so regulated that each time it rotates a former is carried into this opening or die, its upper surface being flush with or slightly above the upper surface of the die or opening. Z is a pair of nippers secured to the bar *y*, which reciprocates horizontally in the guides *z z*, and is operated by the cam *a'* on the shaft G. These nippers are operated—*i. e.*, opened and closed—by any suitable means. In Fig. 16 they are shown as operated by coming alternately in contact with the blocks *b' c'*. These nippers receive the blank and draw it over the die or opening in the table and under the former next to pass into the die.

The folding system consists of six reciprocating folding plates or fingers, four working horizontally—two to fold the two extremities of the blank one over the other to form the upper side of the box, and two to fold in the edge ends of the blanks—and two working vertically to fold the ends of the two sides of the box one over the other to form the bottom of the box.

A' B' are the horizontally-reciprocating side-folders, which work in guides T C', and are operated by the levers *d' e'*, which are pivoted underneath the table, and pin-jointed to the reciprocating bars *f' h'*, working above the table, which are reciprocated by the cams *i' j'* on the shaft G. The folding-plate B' is elastic, so as to yield as it passes over the former, and thus exert pressure on its edge, where a roller may be provided to obviate friction. To the outer side of the folders A' B' are secured the folding-fingers D' E', Figs. 8, 9, and 10, which pass over the end of the former, and act to fold in the edge ends of the box.

F' G', Figs. 1, 11, 12, and 13, are the bottom folders, which reciprocate vertically, and pass over the end of the former to fold over the side ends or bottom pieces of the box. Their construction and operation are substantially similar to those of the horizontal folders. The lower one, which forms the last fold, is elastic, to exert pressure on its edge on the bottom of the box. These vertical bottom folders are reciprocated in the guides H' I', one above the other below the table, and are operated by cams on the shafts G M through the levers J' and K'.

L' is a segmental plate depending from underneath the table. This plate is in a plane parallel with that of the wheel C, and, as the wheel rotates, the formers pass close to the inner surface of this plate, there being space between it and their ends of about the thickness of the bottom of the box. The plate commences at a point a little below the die or opening in the table, and continues any desired lenth around the wheel. This plate may be made to perform the function of the bottom vertical folder G' by continuing it up to the die or opening, and providing its upper edge with a roller, which would press against the formers as the wheel rotated. This plate acts to keep the bottom of the box together until the gum has dried sufficiently by exerting a continuous pressure on it while it is passing against it.

M^1 M^1 are presser-arms pivoted to the plate L'; and M^2 are spring-fingers projecting from the upper extremities of these arms, which in their normal position press against the side of the formers X X.

M^3 are inclines or cams formed at the lower ends of the presser-arms, against which as the wheel is rotated the formers act so as to throw out the arms and permit the formers to pass the presser-fingers, which they having done the formers move off the inclines, and the springs throw the arms back in their nor-

mal position and the fingers over the formers; thus the side of the box is kept pressed down until the gum has dried sufficiently.

There may be any number of these pressing arms and fingers to correspond with the formers.

N^1 N^2 is the stripping device for removing the dried boxes from the formers. It consists of a bar or lever carrying at its lower extremity the spring fingers or catches N^2, which straddle the former; and as the bar is operated in the direction shown by the arrow in Fig. 18 they pass over the box and catch behind its top edge, and on an outward motion being given to them they strip or draw the box off the former.

The stripping-bar and fingers are operated by the bar *y*, to which it is pivoted, as shown at Fig. 17.

The machine being constructed and arranged as above described will operate as follows: The paper is fed from a continuous roll through the scoring, incising, and feeding rollers, and is there scored and incised or slit at the proper points to form blanks. It is then fed along under the paste-box until its edge reaches the edge of the knife U, which then descends, carrying the paste-box down on the blank, and gumming it at the proper points, as shown at Fig. 15. The knife and paste-box then ascend and the feed-rolls are again operated, feeding through another blank, and introducing the one just gummed into the nippers Z, which advance and close upon it. The knife and paste now descend again, and the knife severs the blank from the preceding one. The nippers then recede and draw the blank into place over the die or opening in the table, and then open, leaving it free to be operated upon by the former, which is next to pass into the die. The wheel is now rotated, and the former descends, carrying the blank into the die, as shown at Figs. 5 and 8. The wheel is then locked in place by the dog Y, and the folders A′ D′ advance, folding one side and the edge end of the blank over the former; and as soon as they commence to recede the opposite folders B′ E′ advance, as in Figs. 6 and 9, and fold the other side over and above the side folded by the preceding folder, and also fold in the edge end of the blank, as seen at Figs. 7 and 10.

The moment these folds have been accomplished the bottom of the box is folded up by the vertical folders F′ G, the upper one descending, and, as it commences to recede, the lower one following it up and folding the bottom fold over the top.

The box is now completely formed, and, the folders having all resumed their normal positions, another blank is delivered to the nippers and severed from the succeeding one. The wheel is then unlocked and rotated as before, which carries the box on the former to the retaining devices. Its bottom is retained in place by the segmental plate L′, while the presser-fingers M^2 M^2 press down its side and retain it until the gum has sufficiently set. Thus the operation is continued until the perfect box arrives at the stripper N^1 N^2. By this time the gum or glue has sufficiently set and the stripper is operated to straddle the box, and its fingers, catching behind the edges of the box, draw the box from the former.

The machine is capable of various modifications, and the motions may vary considerably, in practice, from those shown or described.

I have aimed in this description, not at a minute enumeration of detail, but at a clear exposition of the principles of the machine and the manner of its operation, and have shown in the drawings an embodiment of these principles in a working machine.

One modification of this invention might be in constructing the machine double—that is, in duplicating the parts on the opposite side of the former-wheel, so as to make the boxes on the formers on one side of the wheel, and the covers on the formers on the other.

I claim—

1. The combination, with the formers X X, of the presser-arms M^1, having the incline or cam M^3 formed thereon, constructed and operating substantially in the manner described and specified.

2. The combination, with a reciprocating paste-box, of the pasting-tubes *p p*, through which the gum or paste is ejected by a pumping or valve mechanism, operated by the descent of the box, constructed and operating substantially in the manner described and specified.

3. The reciprocating nippers Z, in combination with the reciprocating paste-box and knife, constructed and operating substantially in the manner described and specified.

4. The combination, in a paper-box machine, of a series of formers, X, a die, H, through which these formers pass, a series of folders, and a system of devices for retaining the boxes in shape on the formers while drying, constructed and operating substantially in the manner described and specified.

5. The combination, in a paper-box machine, of a series of formers, X, a die, H, through which these formers pass, a series of folders, a system of devices for retaining the boxes in shape on the formers while the paste or gum is drying, and a device for stripping the boxes from the formers, constructed and operating substantially in the manner described and specified.

6. The combination of a pair of incising, scoring, and feeding rollers, a reciprocating knife and paste-box, a pair of nippers, a series of formers, a die through which these formers pass, a series of folders, a system of retaining devices, and a stripping device, constructed and operating substantially in the manner described and specified.

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WM. F. LETT.