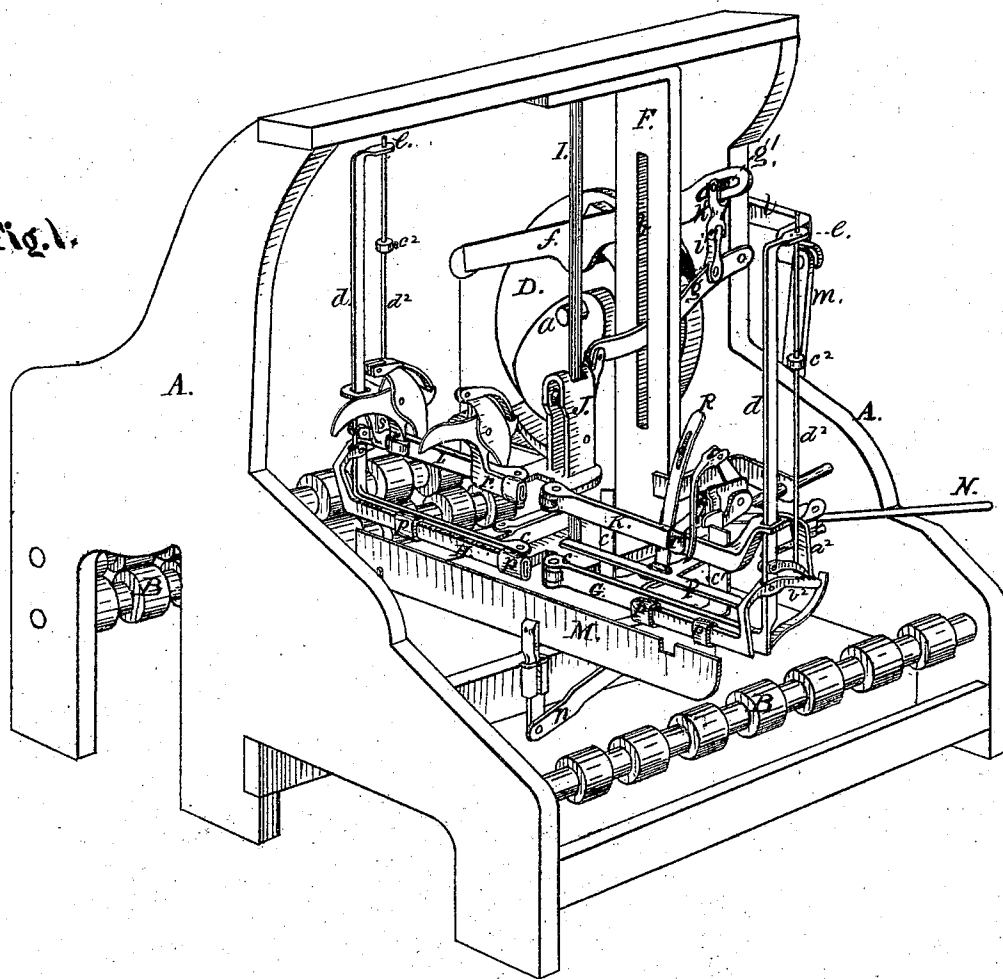


R. J. STUART.
Paper-Folding Machines.

No. 144,160.

Patented Oct. 28, 1873.

Fig. 1.



Witnesses.

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Fig. 2.

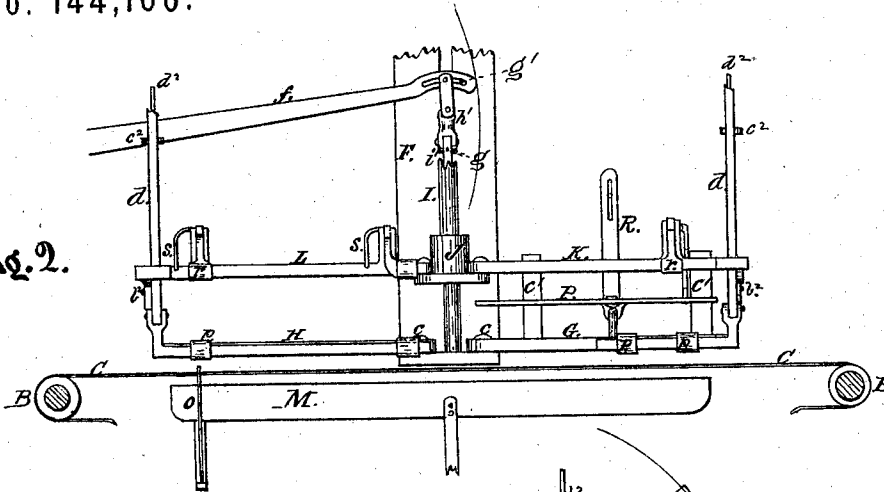
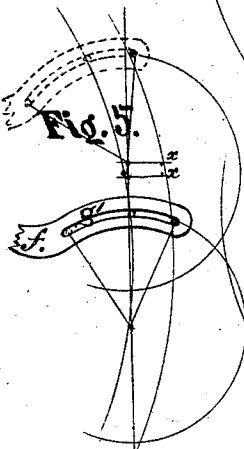
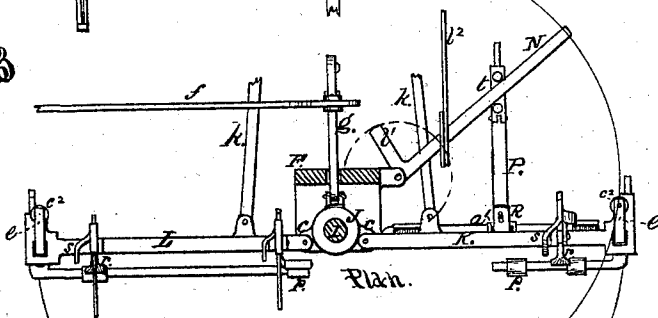


Fig. 3.



Witnesses.

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Fig. 6.

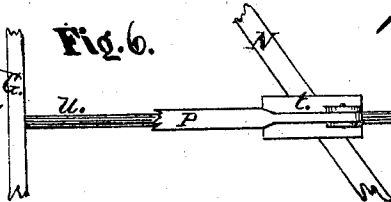
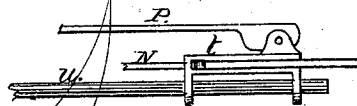


Fig. 7.



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Fig. 8. Plan.

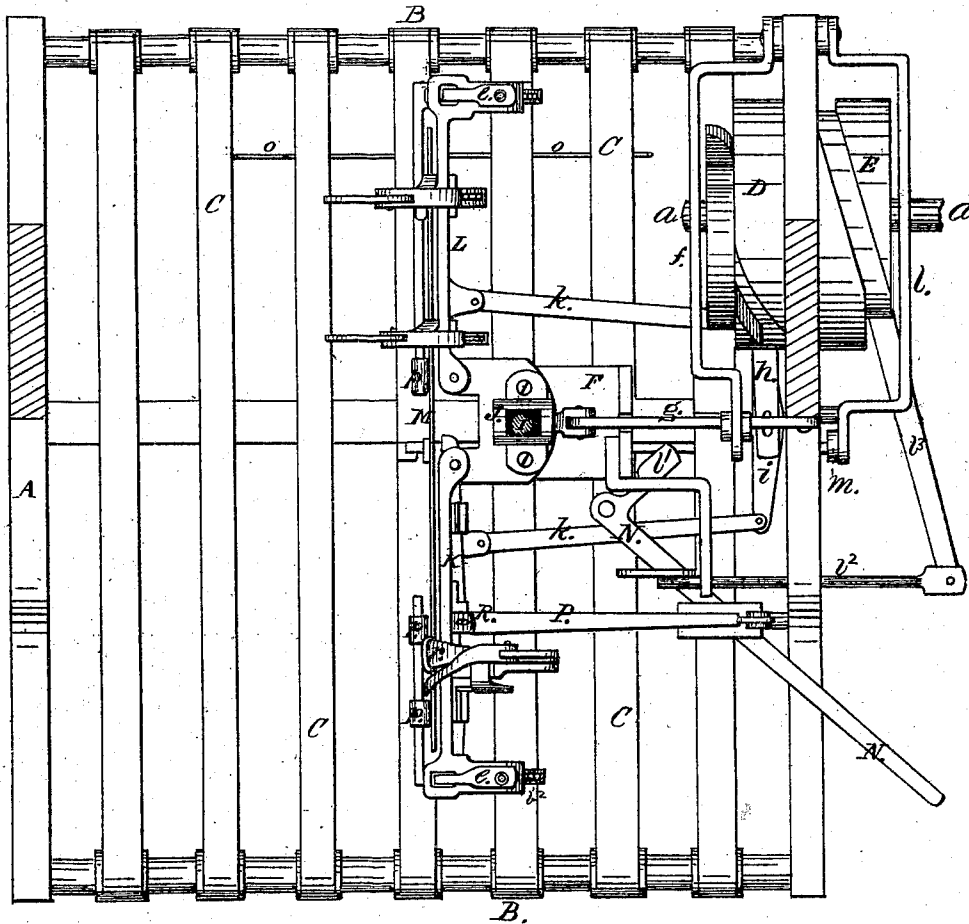
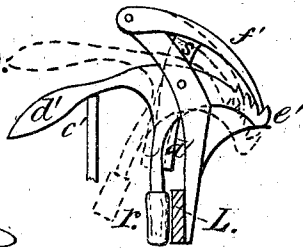


Fig. 9.



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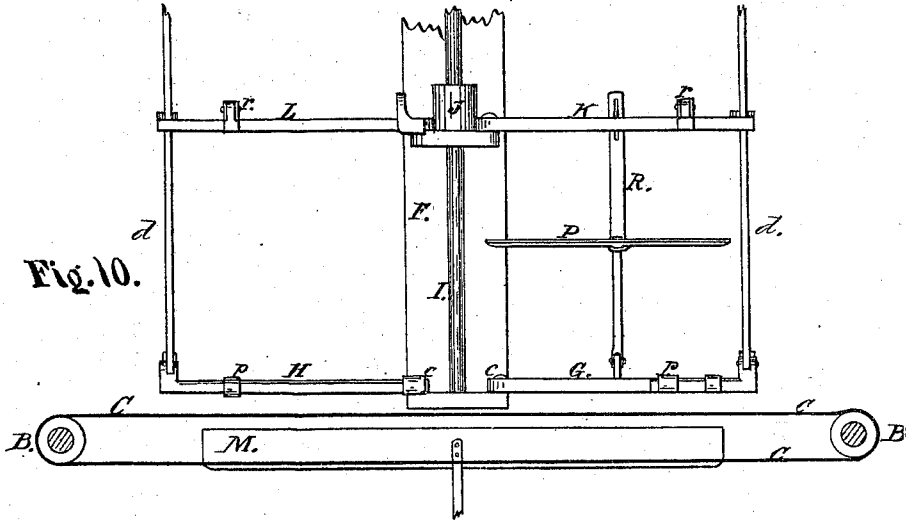


Fig. 11.

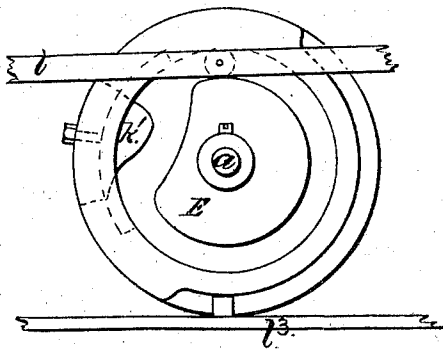


Fig. 12.

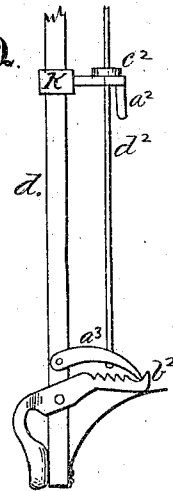
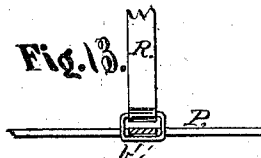


Fig. 13.



Witnesses.

E. H. Johnson
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UNITED STATES PATENT OFFICE

ROBERT J. STUART, OF YONKERS, NEW YORK.

IMPROVEMENT IN PAPER-FOLDING MACHINES.

Specification forming part of Letters Patent No. **144,160**, dated October 28, 1873; application filed November 18, 1872.

To all whom it may concern:

Be it known that I, ROBERT J. STUART, of Yonkers, in the county of Westchester and State of New York, have invented a new and Improved Machine for Folding Paper, of which the following is a specification:

My invention relates to machines for folding papers, more particularly newspapers; and the invention consists in a novel construction, combination, and arrangement of parts which have for their object to make a cheap and effectual paper-folding machine, as will be fully set forth hereafter.

Figure 1 is a perspective view of the machine; Fig. 2, a front elevation, simplified; Fig. 3, a plan view, also simplified. Fig. 4 is the same as Fig. 3, with the parts in different positions. Figs. 5, 6, and 7 are details. Fig. 8 is a plan view similar to Fig. 3, enlarged, with other parts of the machine. Fig. 9 is a detail view of a part of the machine; Fig. 10, a view similar to Fig. 2, with the parts in different positions. Fig. 11 shows one of the cams of the machine, and Figs. 12 and 13 are parts in detail.

A A represent the frame of the machine provided with rollers B B and tapes C C, to convey the paper to the folding mechanism. On one of these frames is a short shaft, *a*, carrying two cams, D and E, one on each end. Through this shaft and these cams the requisite motions are imparted to the parts of the machine, the greater portion of which is supported by the hanger F, in which the vertical slot *b* is cut. This hanger is bent over at its lower end, furnishing horizontal bearings for two arms, G H, which are pivoted to it at the extremities, swing freely thereon, and are capable of opening and closing together, having the bearings *c c* as their centers. From the swinging ends of these arms rise, vertically, the rods or bars *d d*, their upper extremities being provided with flanges or projections *e e*. Running from the upper part of the machine, and extending to the horizontal portion of the hanger F, is a stationary rod, I, which serves as a guide for the cross-head J. This cross-head has a vertical reciprocating motion imparted to it by the cam D through the levers *f* and *g*, and furnishes bearings at its lower end, similar to those on the hanger F, for two

arms, K L, one end of which is hinged to the cross-head and the other passes around the rod or bar *d* on the under arms. These arms are of the same length as those, G H; and, as they are coupled to the bar *d* on the arms G H, they close and open with these arms, which receive motion from the cam D through the lever *h*, bar *i*, and levers *k k*. (See Fig. 8, Sheet 3.) These two pairs of arms G H, K L are provided with nippers *p p r r* for seizing the paper, and are so arranged as to automatically open and close upon it at the proper time in a manner hereafter explained. From the foregoing it will be understood that the bottom arms G H are stationary as regards vertical motion, but are capable of swinging in arcs of circles in a horizontal plane, while the upper pair K L, on the cross-head J, receives a vertically-reciprocating motion, being guided by the rod I and bars *d d*; and also a swinging motion imparted to them by the lower pair G H through the rods *d d*. Parallel with the tapes of the machine, and also with the arms, and immediately under them, is a knife, M, which receives a vertically-reciprocating motion from the cam E, through the levers *l m n*, and is provided with a gage, *o*, which determines the distance the paper shall travel under the knife, and is made adjustable on the blade. This knife, during the operation of folding, passes between the tapes and the nippers *p p*, which are open to allow its passage, and, reaching the upper nippers, it passes between and closes them upon the paper it has inserted by striking upon the projection *s* and disengaging the latch *f'*. (See Figs. 1 and 9.) To the hanger F (see Fig. 3) is pivoted a right-angled lever, N, one arm of which is considerably longer than the other. This end passes through a box, *t*, on a rod, *u*, secured to the under arm G, and imparts a reciprocating motion thereto through its short arm *u'*, rod *u'*; and lever *v*. To this box *t* a T-shaped knife, P, is hinged, the part answering to the upper portion of the letter being parallel to the arms, and serving as the knife proper. From the center of the blade rises a bar, R, provided with a slot and pin, as shown. (See Figs. 1, 2, and 10.) This bar passes through a box, *a'*, on the back of the arm K, and suspends the knife by means of a link, *b'*, Fig. 13, at

its lower end. Thus, on the arms K L rising, the one K will come in contact with the pin on the bar R and elevate the knife, while the lever N can, through its motive mechanism, drive this knife back and forth in a horizontal plane. On the arm G are two projections, $c^1 c^1$, which serve to open the nippers $r r$ on the arm L, in a manner hereafter explained.

The construction of these nippers will be readily understood by reference to Fig. 9, Sheet 3, in which r represents the movable jaw acting in co-operation with the arm L to seize the sheet; d^1 , the projection for opening the jaw by coming in contact with the projection c^1 on the arm G; and e' , the serrated end for keeping the jaw open by the pawl f' . This pawl is provided with the hanging bar or projection s , against which the knife M strikes, and thus disengages it with the ratchet-teeth or serrated bar e' of the jaw. The jaws on the lower arms are opened by the projection d^2 , on the end of the arm K, coming in contact with the ratchet-arm b^2 of the nipper, and forcing it down, and as the arm rises it strikes the stop c^2 on the rod d^2 , which is attached to the pawl of the nipper, and thus trips the nipper. (See Fig. 13.) These jaws are kept closed by spring in the ordinary manner.

In the operation of the machine the ascent of the upper arms K L, and the time of motion of the T-shaped knife P, will require to be regulated to correspond to the size of sheet to be folded. To accomplish the first, the lever f (see Figs. 1, 2, and 5) is provided with a slot, g' , formed in the arc of a circle, the center of which is situated at the point where the link h' is hinged to the link i' . By adjusting the pin of the upper link in the slot the ascent of the arms is varied, while the lowest point of descent remains fixed. This will be understood by observing that the line of travel of the pin of the link is in a perpendicular line, which passes through the center of the circle of which the slot is an arc when the chord of this arc is horizontal; but on turning the lever about a center this circle is thrown out of the line, which then becomes a chord, and equal distances from each end of this slot will fall on different points on the line. This will be best understood from Fig. 5. The lines $x x$ show the difference of ascent.

The time of the knife P is altered by turning the cam E on the shaft a so as to change its relation to the cam D. This cam also operates the lever l , connected with the knife M, and any alteration in its position would change the time of the knife M; but this is obviated by making the projection K' (see Fig. 11) of the cam adjustable by the set-screw and slot, so as to compensate for the movement of the cam.

In practice, the parts of the machine are so made and arranged as to be easily adjusted to any size of sheets, and by a multiplication of the foregoing elements, any reasonable number of folds may be accomplished. The parts being constructed and arranged as described,

they will co-operate to fold sheets of paper in the following manner:

The paper is fed along on the tapes C, over the knife M and under the arms H G, it being stopped or gaged by the wires o on the knife when it has traveled the desired distance. The shaft a carrying the cams D E being rotated, and all the nippers on the four arms open, the levers $m n$ will operate the knife M, the edge of which, in its ascent, will strike the sheet of paper in the center of the required fold and carry it between the lower nippers G H, and up to and between the nippers $r r$ and the arms K L. In introducing the sheet between these nippers the knife comes in contact with the projections on the pawls f' and raises them, thus closing the nippers on the sheet. These nippers are provided with frictional surfaces, to retain the sheet while the knife descends. The knife having reached its lowest point of travel, the cam D operates the levers f and g and the cross-head J, to which, as before explained, the arms K L, holding the sheet, are attached, and elevates these arms and also the paper a given height, according to the size of sheet to be folded. (See Fig. 10.) In this manner the first fold is accomplished, and the arms in their ascent strike against the stop on the rod d^2 , and, tripping the pawl a^3 , and close the lower nippers $p p$ on the arms G H, secure the two lower edges of the folded sheet between them. The sheet is now ready for the second or quarto fold. The cam D now operates the lever h , bar i , and the two levers $k k$ attached to the lower arms G H, and through these swings the four arms together, and thus closes or folds the sheet a second time, making it quarto. This position of the arms is seen in Fig. 4. To accomplish the third fold, making the sheet octavo, the cam D allows the levers f and g , and the cross-head J, to descend along with the arms K L, these arms being in their closed position, and as the paper is thus slackened, the T-shaped knife P, which has been elevated by the arms to the center of the required fold, is operated by the cam E, and levers P , P , and N, (see Figs. 3 to 8,) presses against it, keeping it extended as the arms descend, and when they have nearly reached their lowest point of descent the projections d^1 on the nippers $r r$ strike against the upright bars $c^1 c^1$ on the arm G, and slightly open the nippers to allow the knife P to withdraw the folded sheet.

Owing to the limited space between the pairs of arms when they are swung together, the nippers cannot be fully opened; but from the curved shape of the projections d^1 , they are opened the requisite width by this curved edge sliding over the upright bar c^1 as the arms swing apart. The lower nippers are opened by the projection on the arms K L striking the ratchet end, and thus forcing them open, as before described. (See Fig. 12.) The folded sheet is now either delivered from the knife P to the tapes and passed between rollers for the folds to be properly creased, or

it may be received by nippers, which will insure its being delivered squarely to their receiver.

I claim—

1. In combination with the tapes C to advance the sheet, the folding-knife M, and jaws K L and *r r*, G H and *p p*, (one of which is adjustable to make the first fold,) constructed and operating substantially in the manner described.

2. The combination, with the knife M and jaws *r r* K L, of the nippers *p p* G H, for holding the sheet in position for the second fold, constructed and operating substantially in the manner described.

3. The combination, with the folding-knife M, jaws *r r*, and nippers *p p*, of the swinging arms G H and K L, for making the second fold,

constructed and operating substantially in the manner described.

4. The combination of the nipper-arms K L with the jaws *p*, to form the bight or double for the third fold, substantially in the manner described.

5. The combination, with the swinging arms G H K L, jaws *r r*, and nippers *p p*, of the knife P for completing the third fold, substantially in the manner described.

6. The nippers *r* and *p*, constructed to automatically hold and release the sheet, substantially in the manner described.

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Witnesses:

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