2 Sheets—Sheet 1.

# C. CHAMBERS, Jr.

## Paper-Folding Machine.

No. 216,600. Patented June 17, 1879.

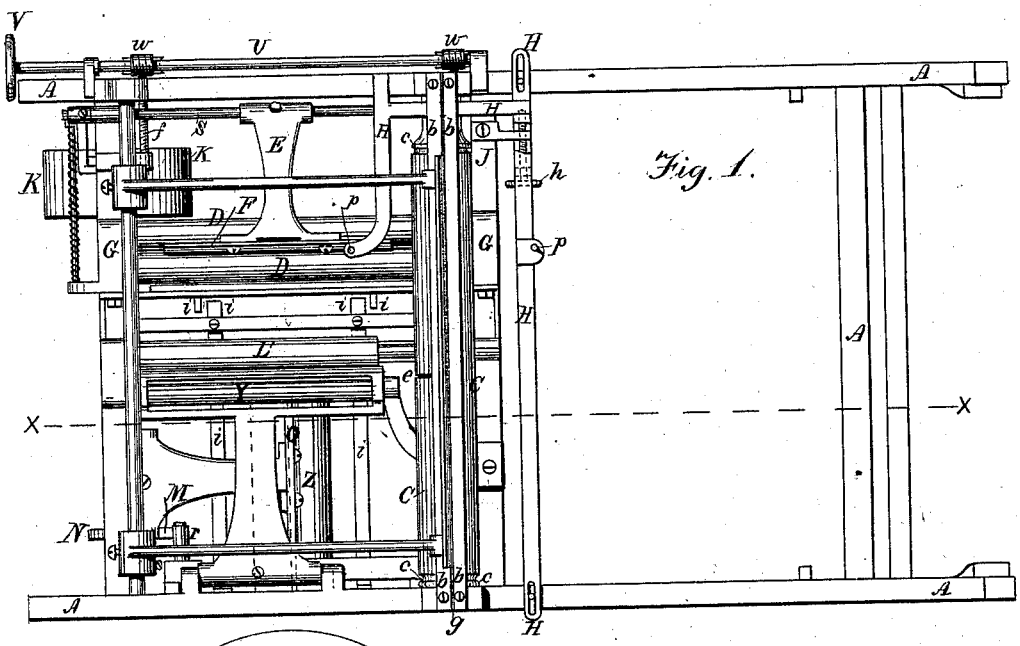

Fig. 1.

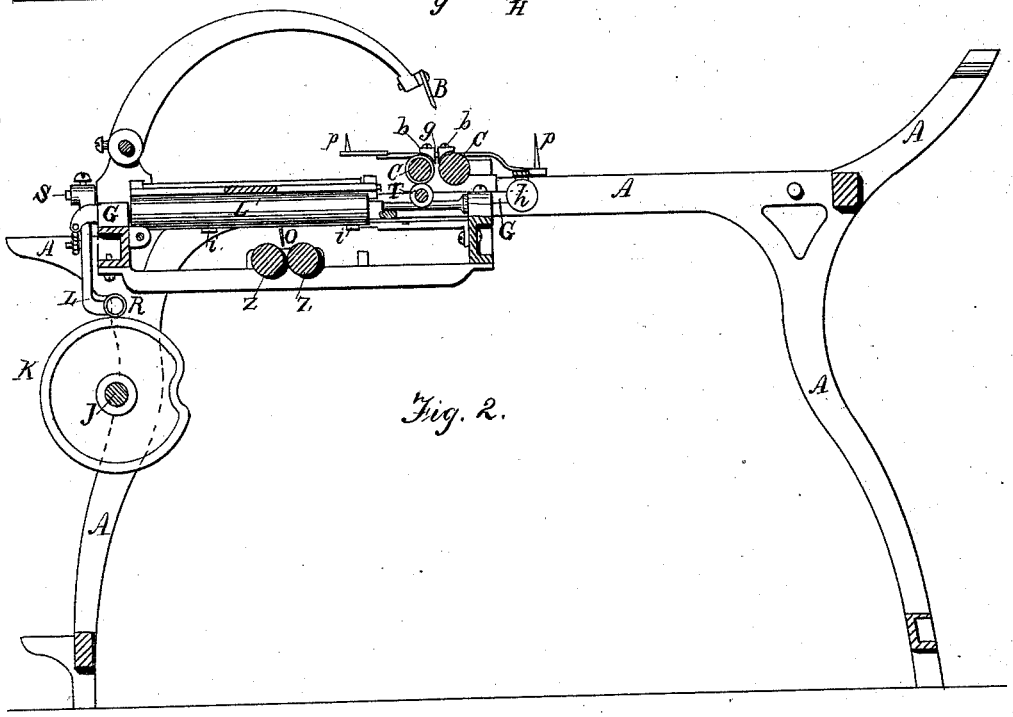

Fig. 2.

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Cyrus Chambers, Jr.
By his Attorneys,
Stansbury & Munn

2 Sheets—Sheet 2.

# C. CHAMBERS, Jr.
## Paper-Folding Machine.

No. 216,600. Patented June 17, 1879.

Fig. 3

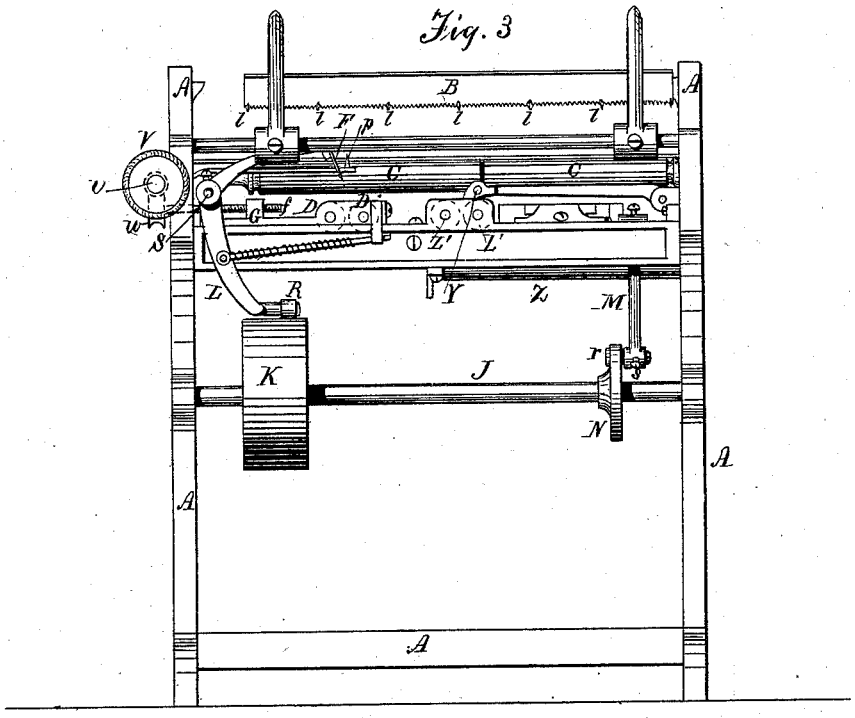



Fig. 4.

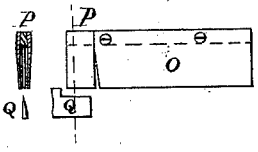



Fig. 5.

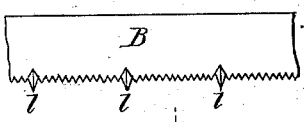



Fig. 6

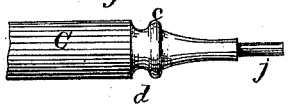



Fig. 8

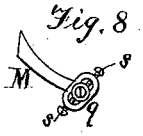
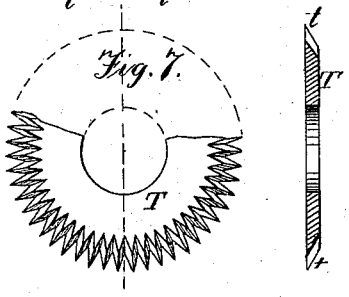



Fig. 7.




Witnesses;
Grenville Lewis
C. M. Parks

Inventor;
Cyrus Chambers Jr.
By his Attorneys,
Stansbury & Munn.

# UNITED STATES PATENT OFFICE.

CYRUS CHAMBERS, JR., OF PHILADELPHIA, PENNSYLVANIA.

## IMPROVEMENT IN PAPER-FOLDING MACHINES.

Specification forming part of Letters Patent No. **216,600**, dated June 17, 1879; application filed March 24, 1876.

*To all whom it may concern:*

Be it known that I, CYRUS CHAMBERS, Jr., of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Paper-Folding Machines; and I do hereby declare the following to be a full and correct description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a top view or plan of the machine having my improvements. Fig. 2 is a vertical section on line *x x* of Fig. 1. Fig. 3 is an end elevation. Figs. 4, 5, 6, 7, and 8 are details.

The same part is indicated by the same letter of reference wherever it occurs.

These improvements relate to that class of folding-machines known as "12mo. book-folders," and are described as applied to the machine patented by me November 27, 1860, and to that patented by William Mendham June 21, 1870. In these patented machines the twenty-four-page sheet is severed while receiving the first fold, the divided parts folded separately until the last fold is reached, when the inset, previously turned, is brought in proper position over the outset and folded with it, all in the manner fully described in the patents, and well understood by persons skilled in the art of folding paper.

My present improvements have for their object to make the 12mo. folding-machine more conveniently and perfectly adjustable to varying sizes of sheets, and to increase the accuracy, certainty, and perfection with which the details of the work are performed.

My first improvement consists in placing above the first pair of folding-rollers, C C, two bars, *b b*, angular in form, and a short distance apart, the space or slot between them being immediately above the line of contact of the folding-rollers. The lower angles of these bars project down between the rollers C C nearly to the line of their contact, and the space or slit *g* between them reaches nearly to the bite of the rollers. The effect of this construction is that the folding-crease is made along the line of the blade as it enters the slit *g*, and is carried to the bite of the rollers without being permitted to shift in the least to either side of the folding-line before being introduced in accurate register between the folding-rollers. As an error in the first fold transmits and magnifies itself throughout the subsequent folds, the importance of securing perfect accuracy in the first fold is apparent.

My second improvement consists in providing the register-pins *p p*, which must be in line with the line of contact of rollers D D, with an adjustment corresponding with that of frame G and simultaneous with it. This I effect by fixing the register-pins in a frame, H, capable of sliding laterally on the main frame, and connecting this frame to the adjustable frame G by means of an adjusting-screw, *h*. By this arrangement the register-frame H moves with the frame G, and the relation between the register-pins and the rollers D D is not disturbed. Any minute adjustment of the pins which may be required is readily made by the adjusting-screw *h*.

My third improvement consists in a device termed a "head-slitter," for obviating the wrinkling which takes place in thick paper when it has been folded a number of times. When repeated folds are given to thick paper the inside sheets become wrinkled from compression and the outer ones strained or stretched, so that when after binding the edges of the book are trimmed and both of these strains relieved, the outer or stretched leaves draw back and the inner ones protrude, forming what are known in book-binders' phraseology as "cat-steps," and marring the perfection of the work. My device for obviating this difficulty relieves the strains during the process of folding, by slitting the paper at the head of the sheet on a line with the last fold at the instant that the blow of the last folding-blade is received. This is accomplished by making the folding-blade, for a short distance at one end, double, as shown at P in Fig. 4, and inserting in the stop below it, against which the folded edge of the sheet to be slitted strikes, a knife, Q, of the width of the required slit, so that when the blade O descends its double part P will force the edge of the paper down upon the knife Q and slit it a distance equal to the width of the knife, thus relieving the folding-strain at the point where it is greatest at the moment the fold is about to be imparted.

The teeth *t* of the circular cutter T, for severing the inset from the outset, are made lancet-shaped, as seen in Fig. 7, one side of the cutter being flat out to the end of the teeth, and the cutting of the teeth being done entirely on the other side. In transverse section the teeth are triangular, one side coinciding with the flat side of the cutter, running in line with the cut at the head of the inset, and the other two sides, with the angle formed by them, running against the tail of the main sheet or outset. The teeth are made so long that their whole depth does not enter the groove in the folding-roller, and hence none of the flat surface of the cut side of the disk T enters that groove, so as to bind the paper between itself and the side of the groove. The result of this construction is that a clean cut is given to the head of the inset, and the paper on the other side of the cutter is not torn and jagged. The head of the inset being cut smoothly and accurately in register with the print, I am enabled to get perfect register between the inset and outset.

The general construction and operation of the machine having been fully described in the patents hereinbefore referred to, and being familiar to persons acquainted with the art of folding paper, no minute description is necessary here in addition to what has been incidentally given in the statement of the nature of my improvements.

A suitable frame, A, supports the table (not shown) on which the bank of paper to be folded is placed. The register-holes having been made by the printing-press in the sheet to be folded, it is placed on the register-pins *p p*, under the first folding-blade, B, which descends and forces the paper between bars *b b* into the bite of the first pair of folding-rollers, C C. In passing these rollers the inset of eight pages is severed from the outset of sixteen pages by the cutter T. The inset passes under drop-roller Y, which forces it between rollers L′ L′, which turn it over and present it above the last pair of folding-rollers, Z Z, and under folding-blade O. There it awaits the arrival of the outset, which, in passing from the first pair of rollers, C C, is carried over the second pair, D D, between which it is forced by blade F, and carried by tapes and rods over the rollers Z Z, and under the inset in position to receive the last fold together with the inset. Here the two divisions of the sheet receive the blow of the last folding-blade, O, and are simultaneously driven between the last pair of folding-rollers, Z Z, the inset being inside the outset, and folded in exact register with it. It is when the sheet is in position to receive the final fold that the head-slitter comes into operation to relieve the folding-strain upon the paper, as before described.

It should be observed that the throw of the last folding-blade, O, is made by cam N, operating against a roller, *r*, in the end of arm M, connected with the shaft of the blade O. The shaft of roller *r* is adjustable in a slot, *q*, on the end of arm M by means of set-screws *s s*, as shown in Fig. 8.

By this arrangement, which is claimed in a joint application of Chambers and Mendham, the throw of the blade is regulated with the utmost precision.

G is an adjustable frame placed in ways in the main frame, and capable of being moved back and forth by means of screws *f f*, operated by worm-wheels *w w* on shaft U, turned by hand-wheel V. To this frame are attached the rollers D D, the shaft of blade F, and the pulleys which support the tapes which conduct the outset to the rollers D D. The blade F is operated by cam K, which gives motion to arm L, attached to shaft S of the blade. A small roller, R, in the end of arm L runs on the face of cam K, which is made broad enough to allow of the extreme adjustments of the frame G, and give the same throw to the blade in all positions of that frame.

The bars *i i*, which hold the sheet down as it leaves the second pair of folding-rollers, are made in two sections, one section being fixed to the adjustable frame G, carrying the second pair of rollers, D D, and the other to the permanent framing of the machine and they are so placed relatively to each other that they will slide by one another when frame G is moved, thus making a continuous guide for the paper, regardless of the relative positions of the folding-rollers D D and the reversing-rollers L′ L′, all as clearly shown in Fig. 1.

The tapes carrying the outset from the second folding-rollers, D D, to receive the last fold pass down between rollers D D, along under the reversing-rollers L′ L′, under the third folding-blade, O, around pulleys at the side of the frame, and then back to and around pulleys at the other side of the frame, and thence again to the rollers D D.

By this arrangement the tapes are always in a proper condition to operate, however the position of the rollers D D may be changed.

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

1. The angular bars *b b*, having the form described and placed above the folding-rollers, in the manner and for the purpose specified.

2. In combination with the adjustable frame G, the register-frame H, united to it by the adjusting-screw *h*, as and for the purpose described.

3. The combination, with the folding-blade, made double at one end, of the slitting-knife Q, inserted in the stop which arrests the folded edge of the sheet, in the manner and for the purpose stated.

The above specification of my said invention signed and witnessed at Philadelphia this 21st day of March, A. D. 1876.

CYRUS CHAMBERS, JR.

Witnesses:

ALFRED MOORE,

D. NEWLIN FELL.