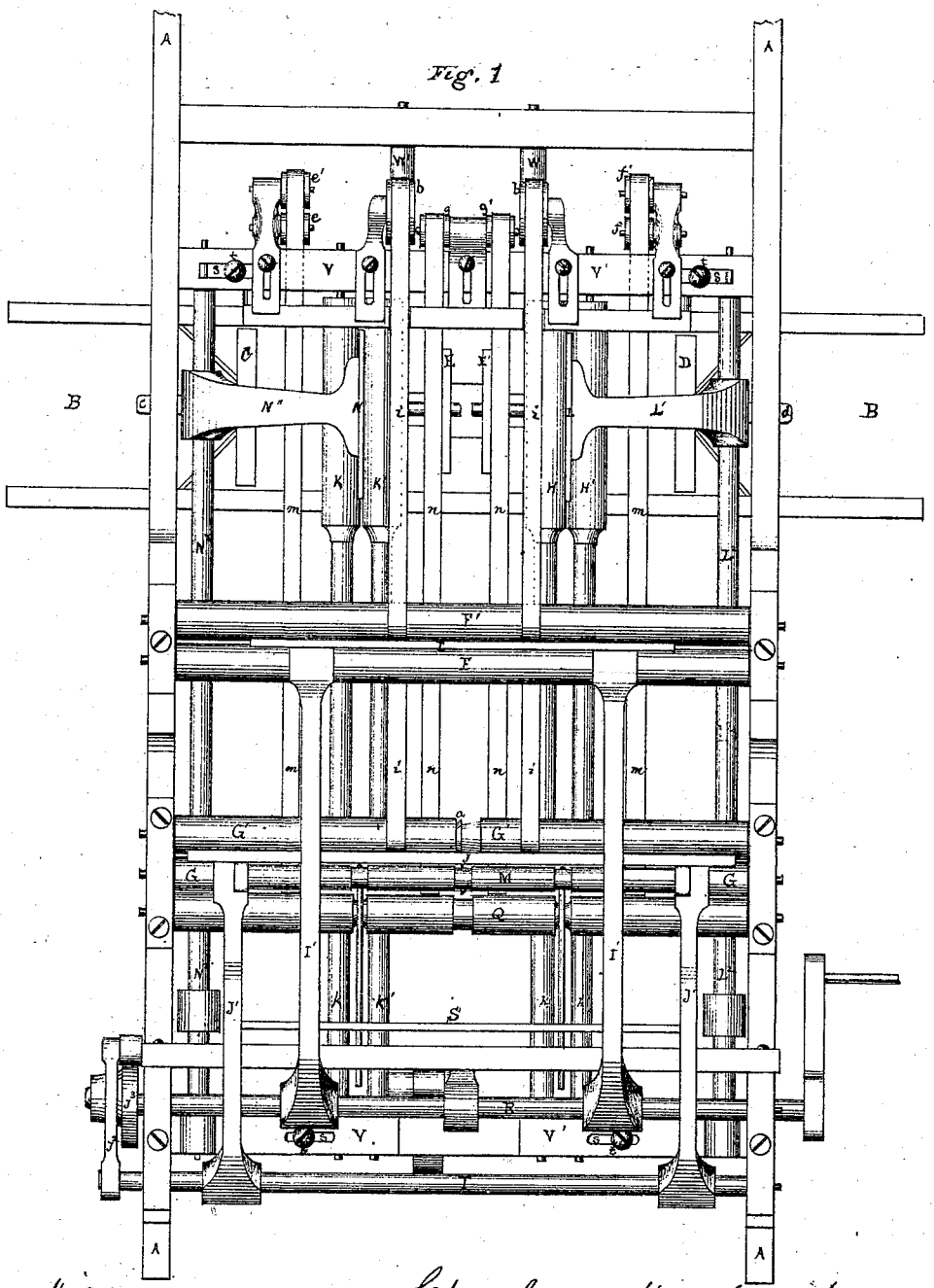
3 Sheets Sheet 1.

Chambers & Menaham,

Paper Folder.

No. 113.257. Patented. Apr. 4. 1871.

Fig. 1



Witnesses.
F. W. Howard
A. C. Bradley

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By their Attorney
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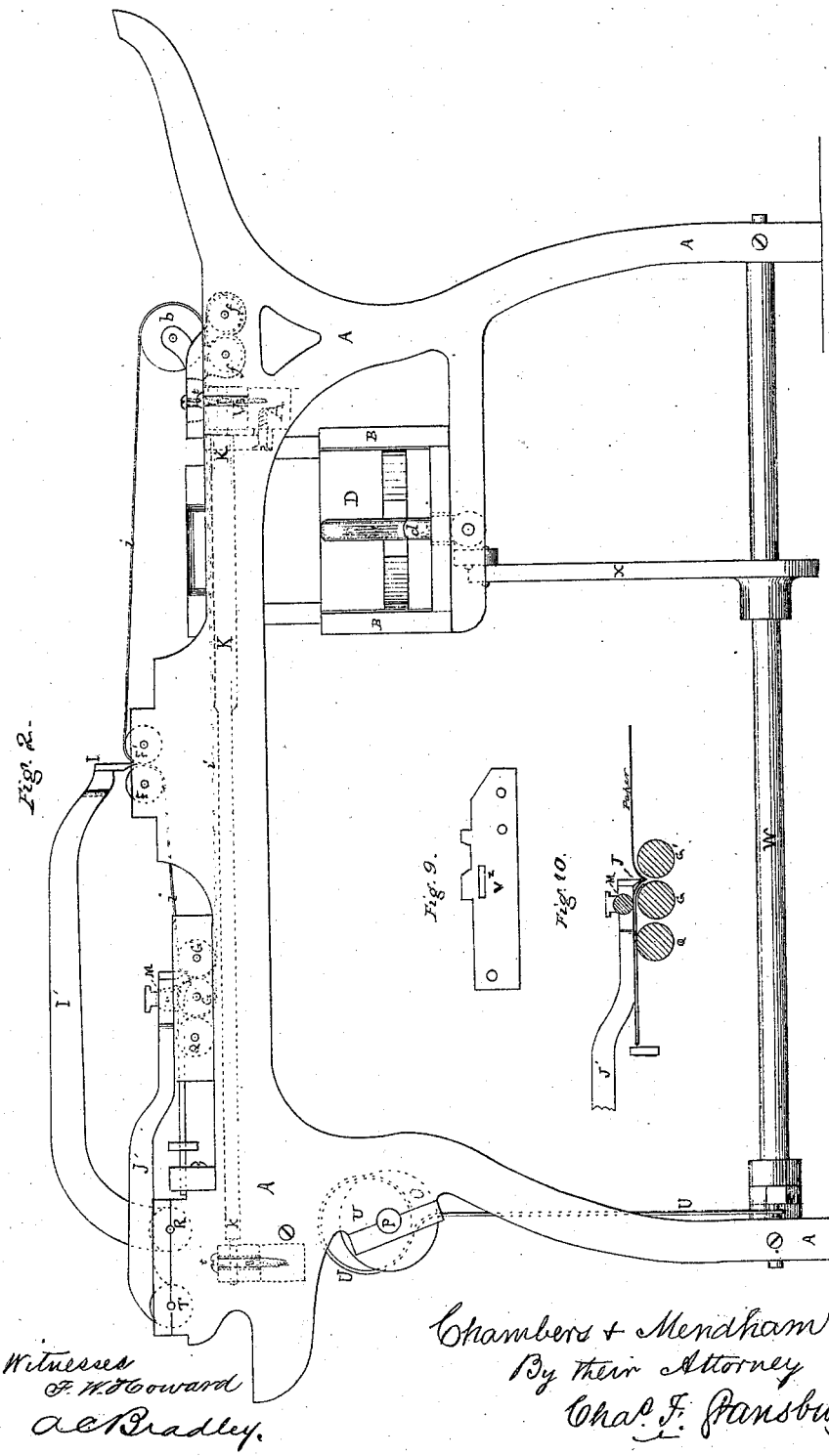
N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

3 Sheets, Sheet 2.

Chambers & Mendham,

Paper Folder.

No 113257. Patented. Apr'l 4, 1871.



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3 Sheets, Sheet 3

Chambers & Mendham,

Paper Folder.

No. 113257. Patented Apr. 4. 1871.

Fig. 3.

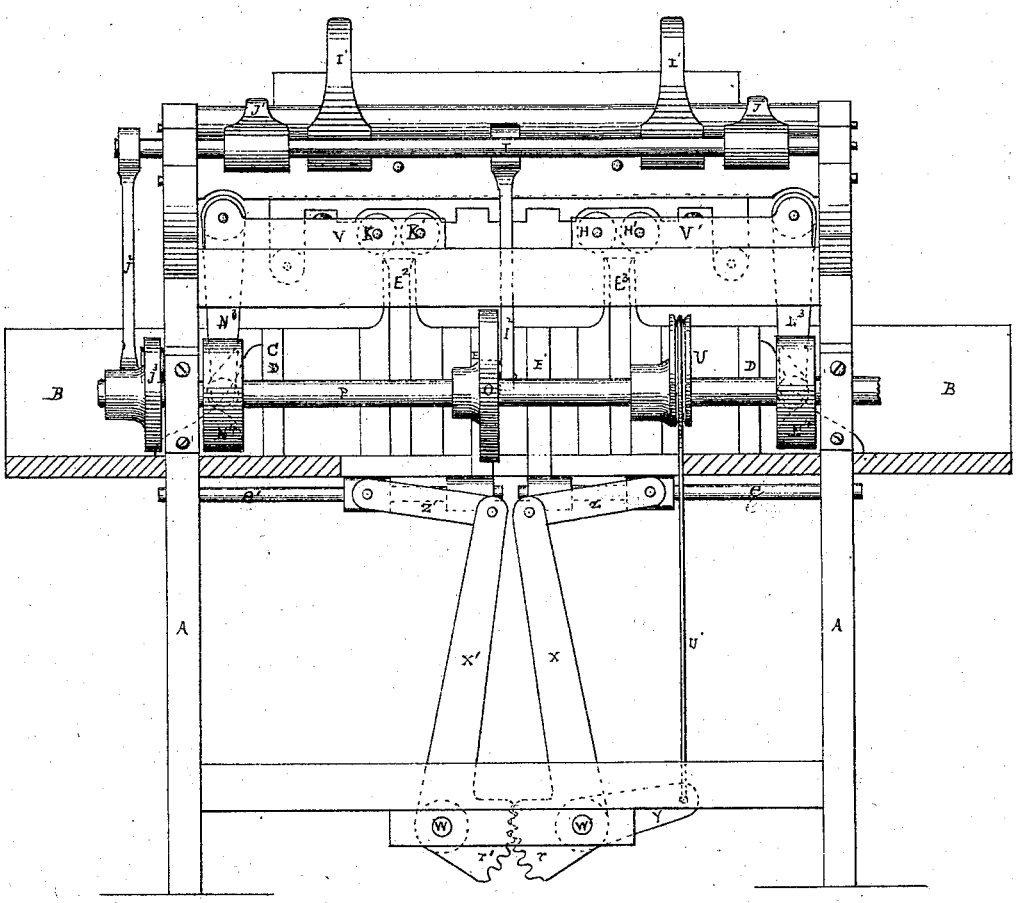


Fig. 4.

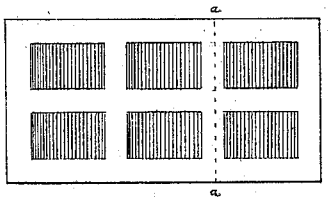


Fig. 6.

Fig. 7.

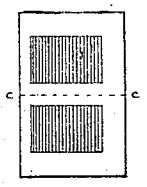


Fig. 5.

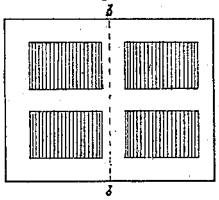
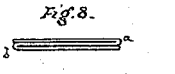


Fig. 8.



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UNITED STATES PATENT OFFICE.

CYRUS CHAMBERS, JR., AND WILLIAM MENDHAM, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO EDWARD CHAMBERS AND CYRUS CHAMBERS, JR., OF SAME PLACE.

IMPROVEMENT IN PAPER CUTTING AND FOLDING MACHINES.

Specification forming part of Letters Patent No. **113,257**, dated April 4, 1871.

To all whom it may concern:

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

Figure 1 is a plan or top view of a paper-folding machine embodying our improvements. Fig. 2 is a side elevation of the same. Fig. 3 is an end view. Fig. 4 is a top view of the sheet of paper before the first fold is given. Fig. 5 is a similar view after the first fold. Fig. 6 is an edge view of the same after the first fold. Fig. 7 is a top view of the sheet after the second fold. Fig. 8 is an edge view of the sheet after the second fold. Fig. 9 is an elevation of the back boxes of the third folding-rollers. Fig. 10 is a transverse vertical section through drop-roller M and rollers Q G G′, showing the sheet of paper with its folded edge against the stop and one of its free edges at the line of the second fold, above rollers G G′ and under folding-blade J.

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 "book-folders" which are designed to fold two signatures of a single 12mo. sheet at once. In other words, they fold a sheet containing twenty-four pages, cutting it in two and folding each half separately, so as to have twelve pages in each. This is accomplished by making the first fold in each half-sheet on a line one-third of the length of the sheet from the end edge and in the center of one of the head margins.

Fig. 4 represents one of the half-sheets referred to, and the line *a a* shows the position of the first fold.

Fig. 6 is an edge view of the same sheet after the first fold has been given. The folded edge *a* is now a guide for the second fold, which is made on the line *b b* of Fig. 5, and in a reverse direction to that of the first fold. The signature then presents the appearance shown in Fig. 7 in top view, and in Fig. 8 in edge view. The paper is so printed that the folded edge *a* shall project beyond the margin of the paper. The third fold is made on the line *c c* of Fig. 7, and completes a section of six leaves or twelve pages.

The machine by which the severing and folding are thus effected is similar in general construction and appearance, and in the manner of registering the sheet and effecting the folds, to those described in numerous patents heretofore granted to Cyrus Chambers, Jr., and does not, therefore, require minute description here.

It is clearly represented in the accompanying drawing, whereon A marks the frame; B, the packing-trough; C and D′, the back plunger; E and E¹, the packing-plungers; F F′, the first pair of rollers; G G′, the second pair; H H′, the third pair; K K′, the fourth pair; I, the first folding-knife, hung to arms I¹; J, the second folding-knife, hung to arms J¹; L, the third knife, attached to arm L¹; M, drop-roller, with journals, in boxes sliding in recesses in arms J¹ J¹; N, the fourth knife, attached to arm N¹; O, cam operating knife-arm L¹; P, cam-shaft; Q, supplementary roller; R, shaft of knife-arm I¹; S, stop; T, rod or shaft of knife-arms J¹; U, cam operating packing-plungers; V, journal-boxes of rollers K K′; V′, journal-boxes of rollers H H′.

Power is communicated to the rollers, blades, and tapes in the usual manner.

The first set of folding-rollers, F F′, is placed immediately under the table, as usual. The second pair of rollers, G G′, is arranged parallel to the first pair, but on a lower level, the upper surface of the second pair being level with the under side of the first pair, and at a distance from them equal to the length of the longest page to be folded. On the second pair of folding-rollers we locate the cutters *a a*, so that the double sheet may be divided when the second fold is made. There is a third roller, Q, alongside of the second pair of rollers, G G′, raised a little above their level, for the purpose of carrying or propelling that portion of the sheet that projects beyond the

second pair of rollers to the stop S, so as to bring the sheet in position for the action of the second folding-blade, J.

Immediately over roller G of the second pair, and having its journals in boxes sliding vertically in grooves in the ends of the arms J^1, that carry the second folding-blade, J, is a drop-roller, M, which clamps the once-folded paper at its open or loose end just beside the line of the second fold at the time the second blade, J, strikes the sheet, thus insuring the passage of the loose end between the rollers G G′ with the rest of the sheet as the second fold is being made, securing accuracy and preventing the wrinkling of the paper.

The roller M, resting by its weight upon the folding-roller G, and its boxes sliding in the grooves in arms J^1, the blade J is free to descend, while the roller M still remains on the paper, holding it in contact with roller G. On the upward movement of the arms J^1, the roller M is raised by reason of lugs on its boxes resting on the upper surface of the arms.

The cam J^3, which operates the second folding-blade, J, is so shaped as to allow the blade to fall with such velocity as to carry the paper, at the line on which the knife first strikes it, to the bight of the rollers G G′ without slip or wrinkle, thereby making the fold accurately, the drop-roller M, in conjunction with roller G, carrying the double thickness of paper uniformly between the rollers.

The two pairs of rollers H H′ and K K′, and their blades L and N, making the third fold in each half-sheet, are arranged in the usual manner below the level of the second pair and at right angles to them. They are held in place by their boxes V being united, and made adjustable by means of the slots *s* and set-screws *t*, so that, if it be desired to move them nearer to or farther from the center of the machine, on the line of the cutters on the second rollers, or to or from each other, no separate adjustment of the blade-boxes will be required. They may be moved parallel to each other and retained in proper position by a suitable adjusting device.

The once-folded paper is carried from the first pair of folding-rollers by tapes *i i*, which run around the first and second rollers and the tape-pulleys *b* at the back of the machine, in the manner shown in Fig. 2. The sheet is held down on said tapes by bars (not shown) in the usual manner.

The twice-folded sheet is carried from the second pair of rollers, G G′, by the joint action of the second set of tapes, *m n m n*, which run from roller G to the tape-pulleys *e e′ f f′ g g′* at the back end of the machine, and that portion of the first set of tapes, *i*, running from the roller G to pulleys *b*. Thus, the twice-folded sheet, which has one unfolded edge on each side, is carried between two tapes which hold the edges together.

The tapes *i i m m n n* are so arranged that no one of them comes directly under or over any other, so as to bind the sheet between them. They may be so arranged as to corrugate the sheet running between them, as described in Cyrus Chambers's Patent, 26,090, of November 15, 1859. They should, in every case, be so placed as to give the necessary amount of friction upon the surface of the paper, to secure its ready transportation from point to point in the machine as required.

The folding of the halves of the divided sheet having been completed in the manner described, the final operation is the packing of the folded signatures in the packing-trough B. This trough is of the usual form, but is provided with two packing-plungers, E E^1, and two back plungers, C D, one of each to each of the sets of final folding-rollers H H′ and K K′. The folded sheet, as it drops from between either of these pairs of rollers, falls into the trough B, and is received between one of the back plungers C or D and one of the packing-plungers E or E^1. Previous to their being operated upon by either, they are held in an upright position by the guides E^2 E^3, between which they fall. The packing-plungers E E^1 have lugs below, attached respectively to rods *e e′*, having horizontal reciprocating motion in suitable guide-holes in the frame. To these rods are attached the links Z Z′, pivoted to the upper ends of the bent levers X X′, having their fulcrums on the rods W W′. The short arms of these levers are the toothed segments *r r′*, which mesh into each other, as shown in Fig. 3. An arm, Y, projecting from lever X, has pivoted to it a rod, U′, the upper end of which is a ring, which embraces the eccentric U on cam-shaft P. The rotation of shaft P gives motion to levers X X′, and communicates through them the proper movements to the packing-plungers E E^1.

The back plungers C D operate in the usual way, holding their positions by friction, and receding before the increasing thickness of the pile of folded sheets, in obedience to the positive impulses of the packing-plungers. The cam-shaft P, from which the motions are derived, carries five cams, viz: J^3, which, by means of arm J^2, gives motion to knife J; N^4, which, by means of arm N^3, rod N^2, and arm N^1, gives motion to knife N; L^4, which, by means of arm L^3, rod L^2, and arm L^1, drives knife L; O, which, by means of arms I^2 and I^1, drives knife I; and U, which, as before mentioned, drives the packing-plungers.

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

1. The described combination and arrangement of the drop-roller M with the folding-blade J, for carrying positively the once-folded sheet to the folding-rollers G G′, as and for the purpose shown and set forth.

2. A drop-roller whose journal-boxes slide

up and down in the knife-arms carrying them, as described, so as to allow an independent movement to the blade when said drop-roller rests upon the folding-roller, as specified.

3. The trough B, provided with plungers E and E^1, operated by the segment-levers X X′, in the manner and for the purpose specified.

The above specification of our said invention signed and witnessed at Philadelphia this 20th day of May, A. D. 1870.

WILLIAM MENDHAM.
CYRUS CHAMBERS, JR.

Witnesses:
THORWALD CHR. DAMBORG,
W. PRICE DAVIS.