(No Model.) 3 Sheets—Sheet 1.

J. L. COX.

PAPER FOLDING MACHINE.

No. 441,646. Patented Dec. 2, 1890.

Fig. 1.

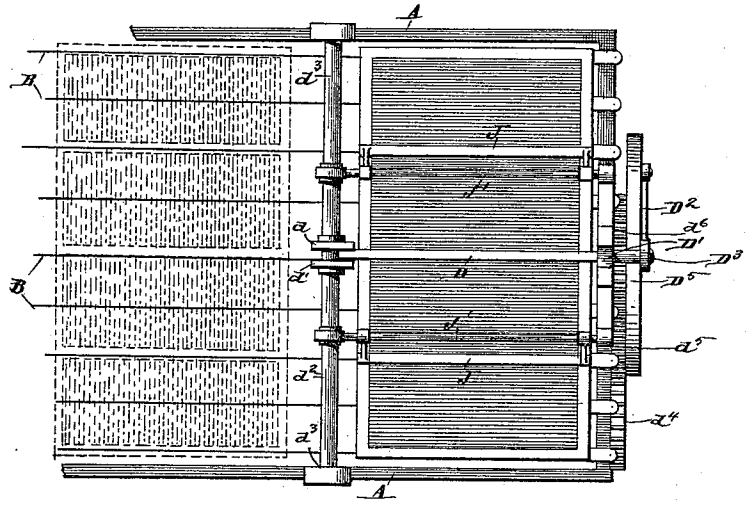
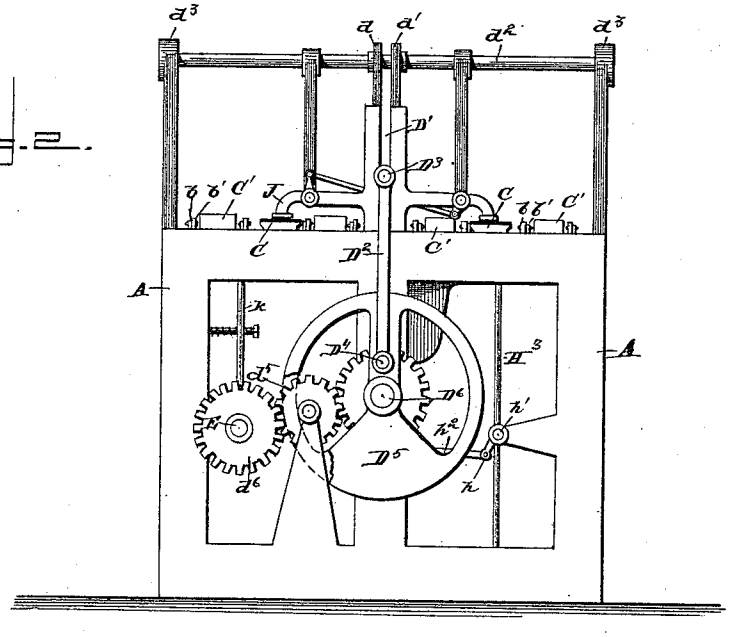


Fig. 2.



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(No Model.) 3 Sheets—Sheet 2.

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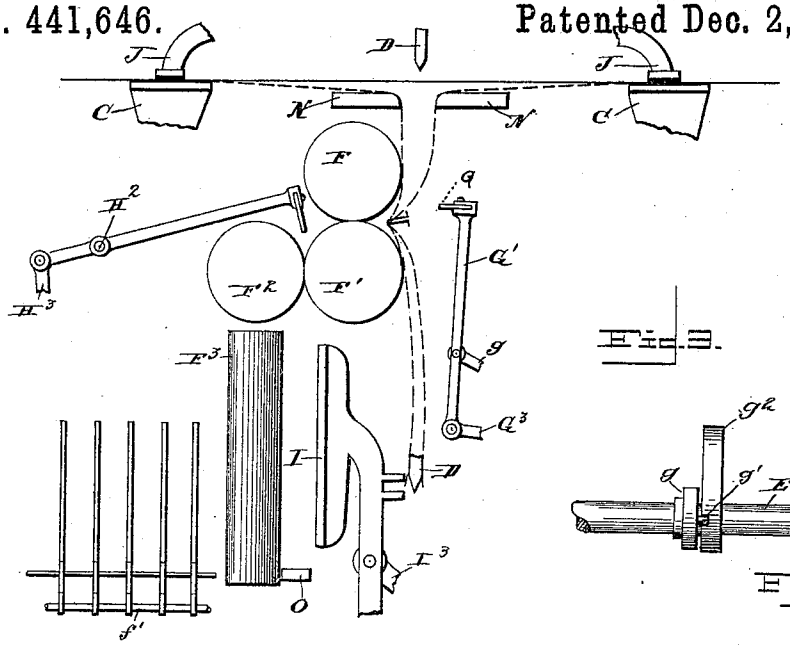


Fig. 3.

Fig. 7.

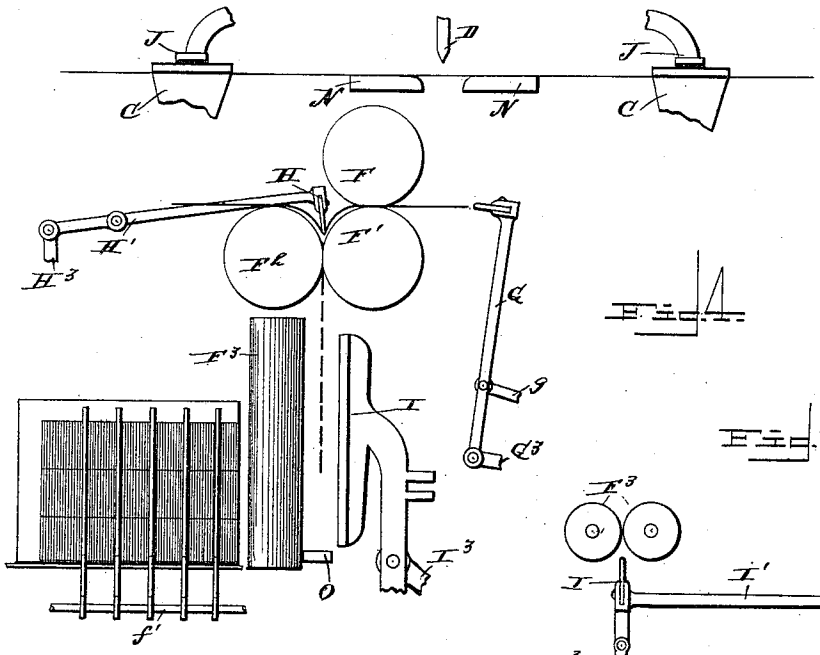


Fig. 4.

Fig. 5.

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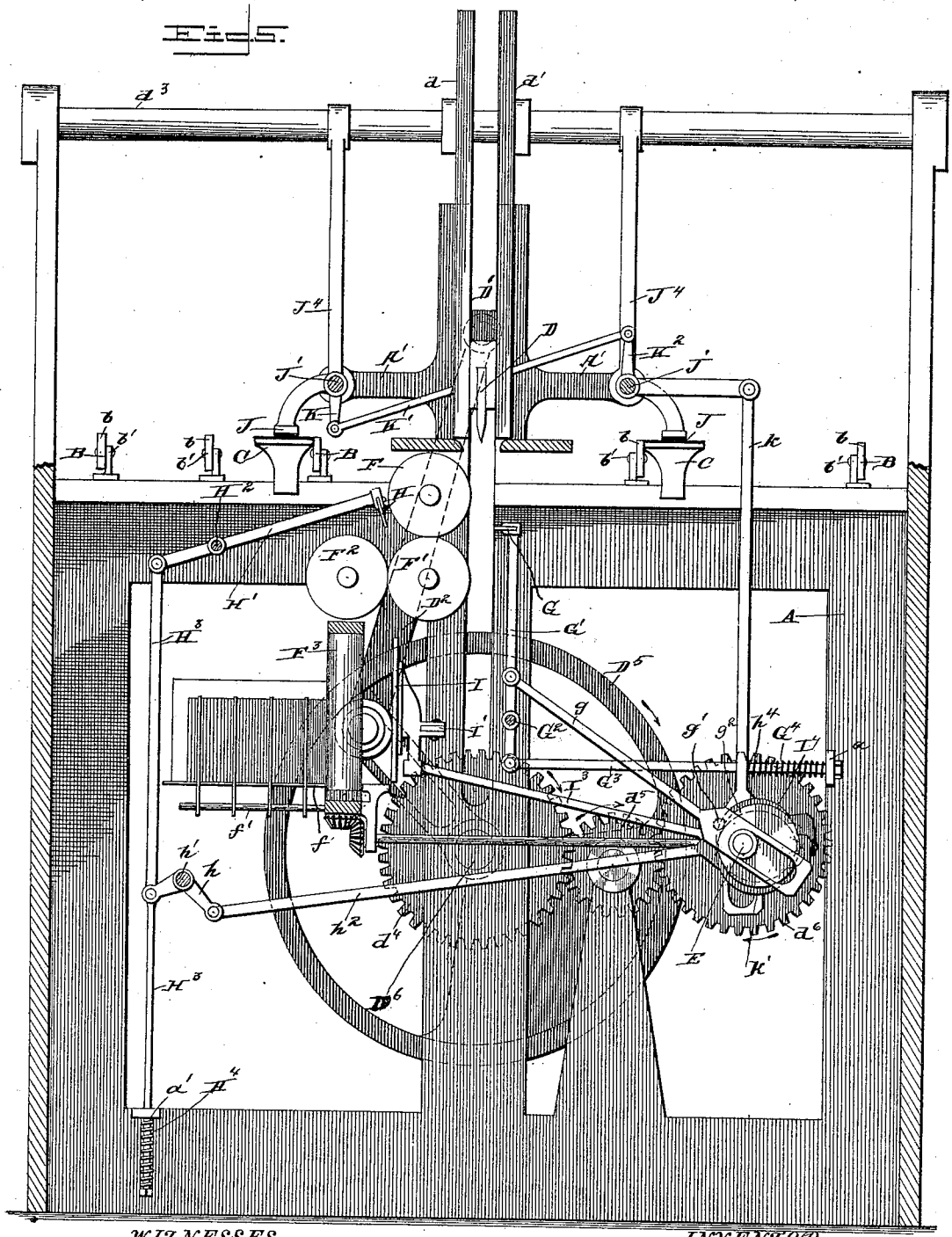
(No Model.) 3 Sheets—Sheet 3.

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Fig. 5.



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UNITED STATES PATENT OFFICE.

JOSEPH L. COX, OF BATTLE CREEK, MICHIGAN, ASSIGNOR TO THE DUPLEX PRINTING PRESS COMPANY, OF SAME PLACE.

PAPER-FOLDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 441,646, dated December 2, 1890.

Application filed November 1, 1889. Serial No. 328,954. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH L. COX, of Battle Creek, in the county of Calhoun and State of Michigan, have invented certain new and useful Improvements in Paper-Folding Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification, in which—

Figure 1 is a top plan view of my improved folding-machine, showing the delivery-tapes and sheets of paper thereon. Fig. 2 is an end view of the folder. Fig. 3 is a diagrammatical sectional view showing the operation of the folding and breaking blade. Fig. 4 is a similar view showing the folding-rolls. Fig. 5 is an enlarged vertical transverse section through the folder, showing the operative parts thereof. Figs. 6 and 7 are details.

This invention is an improvement in paper folding and cutting mechanisms, and it is especially designed for use in connection with printing-presses, and its object is to sever a single sheet of paper and fold it into the form of an eight-page paper, and to fold this paper subsequently into quarter size, ready for delivery to subscribers; and to this end the invention consists in the novel construction, combination, and arrangement of parts hereinafter described and claimed.

Referring to the drawings by letters, A designates the portion of the frame-work of the folder, and B B designate tapes running over pulleys *b b*, mounted on shafts *b'*, journaled in proper bearings on the end and top of the frame A.

C C designate clamping-bars lying parallel with tapes B B and with each other at opposite sides of the center of the press, and hereinafter referred to, the paper being brought directly over said bars by tapes B until stopped by guides C' C', as indicated in the drawings.

D designates a vertically-reciprocating cutter and folder blade, which moves in a vertical guide-slot D' formed in the end of the machine, centrally thereof, and in vertical guides *d d'*, guides *d* being supported above tapes B by a bar d^2, secured to brackets d^3 of frame A, and guides *d'* being supported on the main frame vertically below guides *d* and in line therewith, so that the inner end of blade D is directed by said guides in its vertical movements, and yet no obstruction presented to the advance of a sheet of paper on tapes B B.

Blade D is reciprocated by means of a pitman D^2, attached to a pin D^3, projecting through slot D', the other end of the pitman being connected to a wrist-pin D^4, secured in a slot on a disk D^5, which is mounted on a transverse shaft D^6, journaled in the main frame and rotated by gears d^4 d^5 from a gear d^6 on a shaft E, lying longitudinally of frame A and mounted in proper bearings thereon.

F designates a horizontal roller lying parallel with shaft E and below tapes B, its inner periphery lying nearly in the path of blade D; and F' is a similar roller journaled in proper bearings just below roll F, with which it co-operates, said rolls being driven in opposite directions by any suitable gearing not shown.

F^2 is a third roller lying parallel with and beside roll F' and driven therefrom and co-operating therewith.

F^3 designates a pair of rolls standing vertical to roll F^2 and immediately below the latter, as shown, being driven by suitable gearing from shaft E.

f is a table outside of rolls F^3, and *f'* is a delivery-fly, operated by any suitable means in the ordinary manner.

G designates a tucker-blade opposite rolls F F' and mounted on a vertical lever G', which is fulcrumed on a stud G^2 near its lower end, the lower end of the lever being connected to a rod G^3, which passes through an ear *a* on the main frame; and G^4 is a coiled spring on said rod, bearing against said ear and a collar on the rod, by which the tucker-blade is thrown away from rolls F F'. After operation the blade is thrown forward toward said rolls by means of a pitman-rod *g*, which is connected to lever G' above its fulcrum, and its other end is slotted and rests upon shaft E; and *g'* is a stud projecting laterally from the slotted end of pitman *g*, and which is engaged at the proper moment by a cam-

disk g^2 on shaft E, as shown in Figs. 5 and 7, thus thrusting the blade toward the rolls F F'.

H designates a tucker-blade above rolls F' F^2, mounted on an oscillating lever H', pivoted on a stud H^2, the outer end of said lever being connected to a vertical rod H^3, the lower end of which passes through an ear a' on frame A, and between this ear and the lower end of the rod is a spring H^4, which holds the blade normally suspended above the rolls.

h is a bell-crank lever pivoted on a stud h', and having one of its arms pivotally connected to rod H^3 and its other arm connected to a pitman h^2, the other end of which is supported upon shaft E and operated by a cam-disk h^4, similarly to the pitman g, as indicated, so that at the proper time tucker-blade H is depressed.

I designates a vertical tucker-blade, which is mounted on the end of a horizontal lever I' in front of rolls F^3 F^3, which lever is operated by a pitman I^3 from a cam I^4 on shaft E, similar to pitmen g and h^2.

J designates a pair of movable clamping-bars lying parallel with and above bars C C and above tapes B B, said bars being supported by arms j j on rock-shafts J' J', mounted above tapes B B in brackets A' A', rising on the end of frame A, and in hangers J^4 J^4, depending from rod d^3, as shown.

K designates a crank-lever secured to one shaft J', its short arm being connected by a link K' with a crank-arm K^2 on the opposite shaft J', by which said shafts can be operated simultaneously to throw bars J J into contact with bars C C to clamp a sheet of paper lying between said bars. The other arm of lever K^2 is connected to the upper end of a pitman-rod k, the lower end of which is engaged and operated by a cam k' on a shaft E, similar to the other pitmen and cams thereon.

The operation of the machine in folding an eight-page paper is as follows: The sheet W of paper is imprinted in the press (not shown) with four-page impressions on each side and parallel with each other, as indicated in Fig. 1. It is brought forward by tapes B B in such position that the blank space between the two inner pages is just below and in line with blade D, this space being in the center of the length of the sheet. The mechanisms are so adjusted that when the sheet has been stopped by the guides blade D is drawn downward, catching the sheet at the center and drawing it down between two parallel bars N N and giving a first fold to the sheet. The lower edge of blade D is preferably serrated, and just as the sheet W has been drawn down so much that its end edges are between bars C and J the latter are actuated and clamp the edges of the paper against bars C. The blade D continuing to descend, its serrated edge first draws the sheet taut and then perforates and breaks through the same in the center line thereof, thus dividing the sheet into two equal halves. Then the tucker-blade G is thrown forward, which catches the halves of the sheet at their centers and tucks them between the rolls F F', as indicated in Fig. 3. Simultaneously with this tucking the bars J J are thrown up, releasing the upper edges of the severed sheet, and the rolls F F' draw the two halves simultaneously through them, folding them into quarter-size of the original sheet, as is evident. The blade G is thrown back as soon as its tucking operation is completed, and as soon as rolls F F' have drawn the halves of the sheet out of the way blade D is thrown upward ready for operation upon the next sheet brought forward by tapes B B. The rolls F F' deliver the folded halves directly over roll F^2, and when the quarter-folded sheet has been paid out from rolls F F' blade H is operated, which in its descent tucks the quarter-folded sheet between rolls F^2 F', which immediately draw the quarter-folded sheet downward and give it another fold, reducing its size to one-eighth the size of the original sheet, as is evident. After passing through roll F' F^2 the eight-folded sheet drops upon a guide-bar O in front of rolls F^3 F^3 and between the same and tucker-blade I, which is then operated and tucks the eight-fold sheet between rolls F^3 F^3, by which it is folded yet again into a sixteenth size of the original sheet. From rolls F^3 F^3 the folded sheet passes out upon the table, where they are laid by the delivery-fly. The several tucker-blades, as soon as they have completed their operation on the one sheet, are drawn back out of the way until another sheet is brought forward for their operation. By this means it will be seen that I take a single sheet, fold it into equal halves, and then cut or sever these halves at one operation by one blade, then by a pair of rolls fold these halves into quarter size, then by a succeeding pair fold these quarter size into eighth size, and then by a final pair fold these eighth size into sixteenth size. In other words, the paper, if an eight-page newspaper, is delivered upon the table properly paged and folded into quarter size of its pages for distribution.

Having now described my invention, what I claim, and desire to secure by Letters Patent thereon, is—

1. In a paper-folding machine, the combination of delivery-tapes for bringing forward a sheet of paper, with a reciprocating blade moving between the tapes and adapted to draw a sheet of paper off the tapes, fold it in halves, and break the halves apart independently of the tapes or feed-rolls, and mechanism for clamping the edges of the sheet as the knife breaks through the same, substantially as specified.

2. In a paper-folding machine, the combination of the delivery-tapes, the vertically-reciprocating blade lying parallel with said tapes, and the clamping-bars at each side of said blade, whereby the sheet is folded in halves and broken in two at one operation of said blade, substantially as and for the purpose described.

3. The combination of the delivery-tapes, the vertically-movable blade adapted to draw the sheet from said tapes and fold it in halves and split the halves apart, and the devices for clamping the edges of the sheet before the knife breaks through, with the paper-folding rolls parallel with said blade, and the tucking-blade adapted to force the halves of the sheet into said rolls, substantially as described.

4. The combination of the frame, the clamping-bars C C, and the vertically-reciprocating blade D, and the mechanism for operating the same, with the movable clamping-bars J J and mechanism for operating the same, for the purpose substantially as described.

5. The combination of the vertically-reciprocating blade D, the clamping-bars C and J, and the horizontal rolls F F′ below the same, with the delivery-tapes and the tucker-blade G, all substantially as specified.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JOSEPH L. COX.

Witnesses:
A. E. DOWELL,
P. T. BROOKS.