(No Model.)

3 Sheets—Sheet 1.

J. L. FIRM.

PRINTING MACHINE.

No. 582,631. Patented May 18, 1897.

Fig. 1.

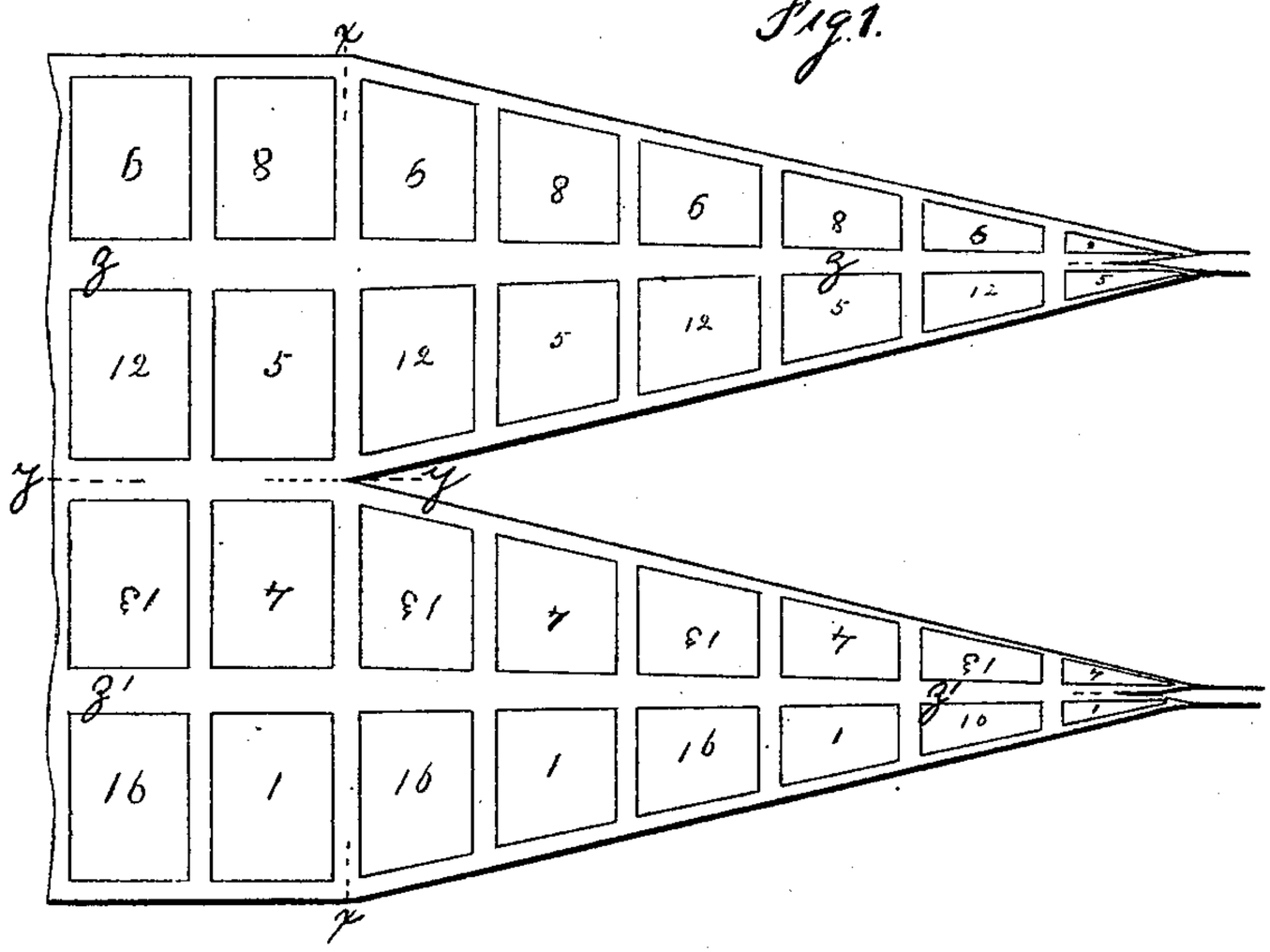


Fig. 2.

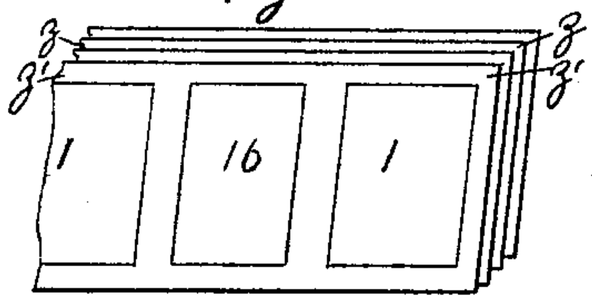


Fig. 3.

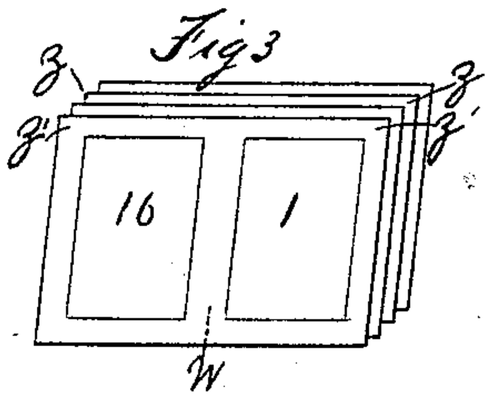


Fig. 4.

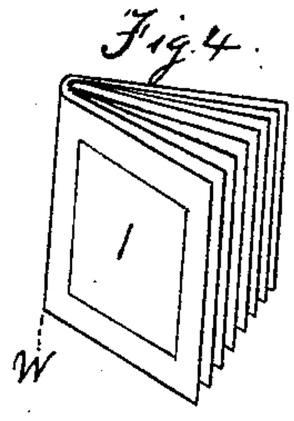
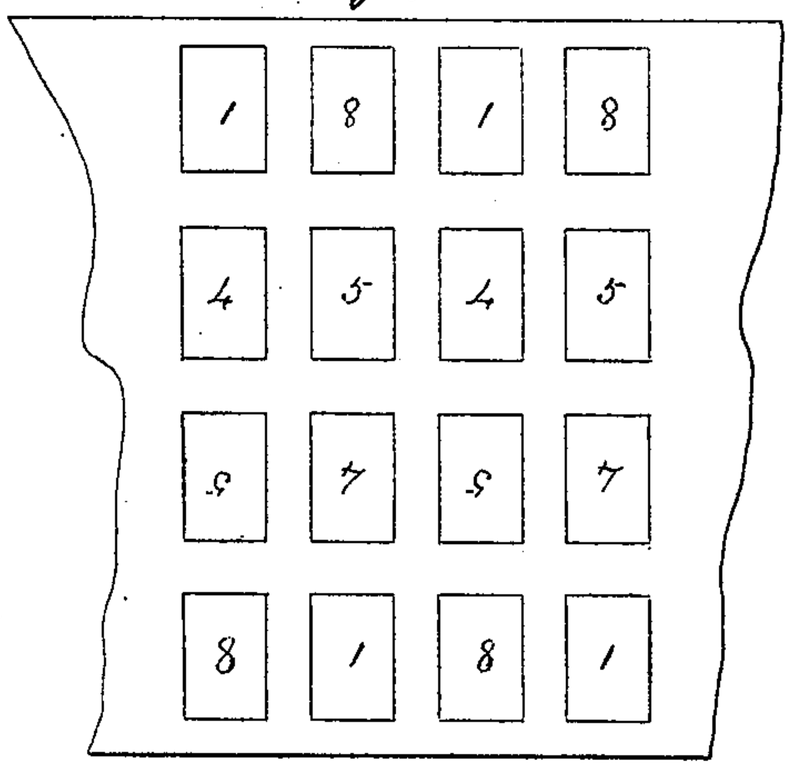


Fig. 7.



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(No Model.) 3 Sheets—Sheet 2.

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PRINTING MACHINE.

No. 582,631. Patented May 18, 1897.

Fig. 6.

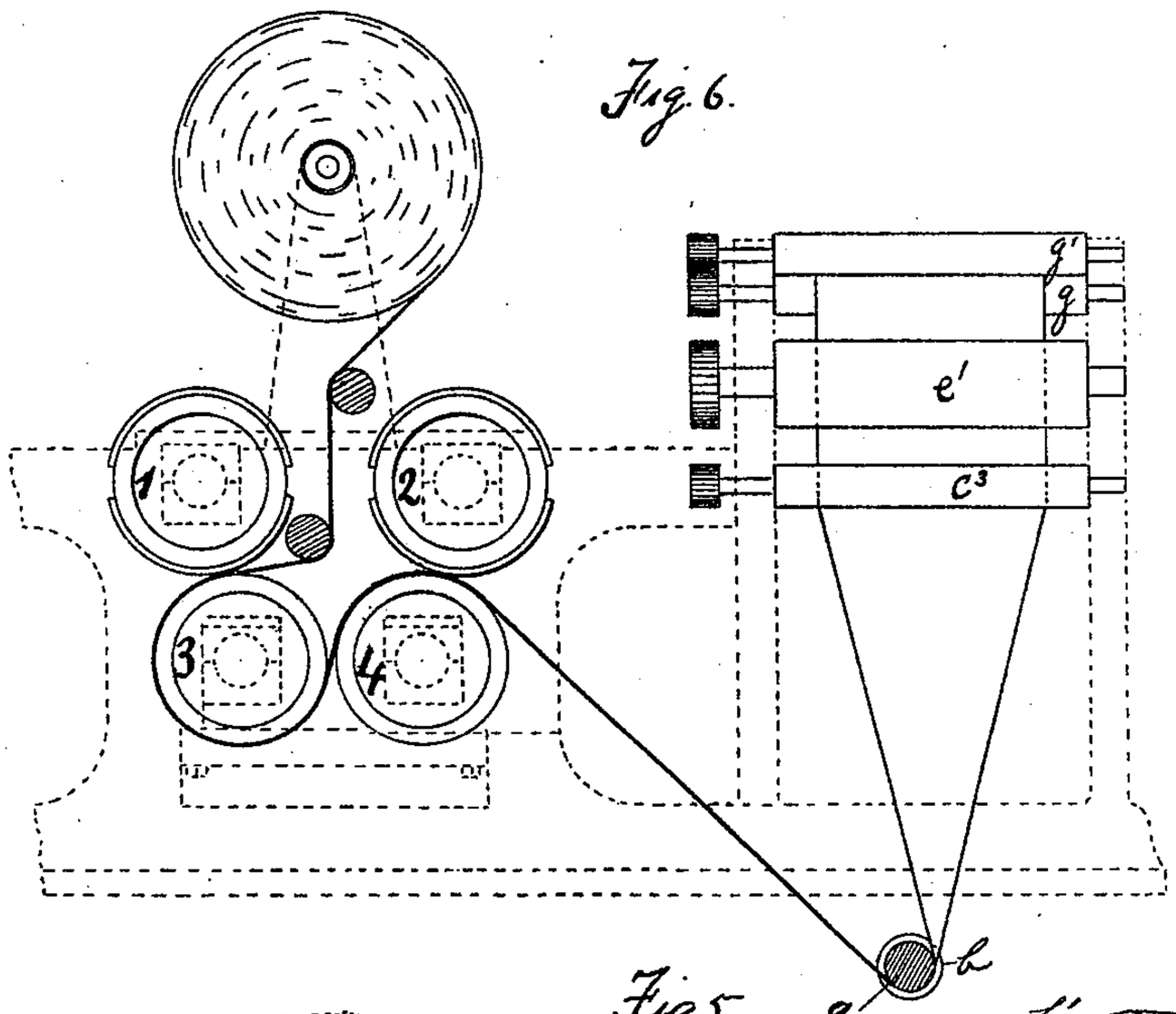
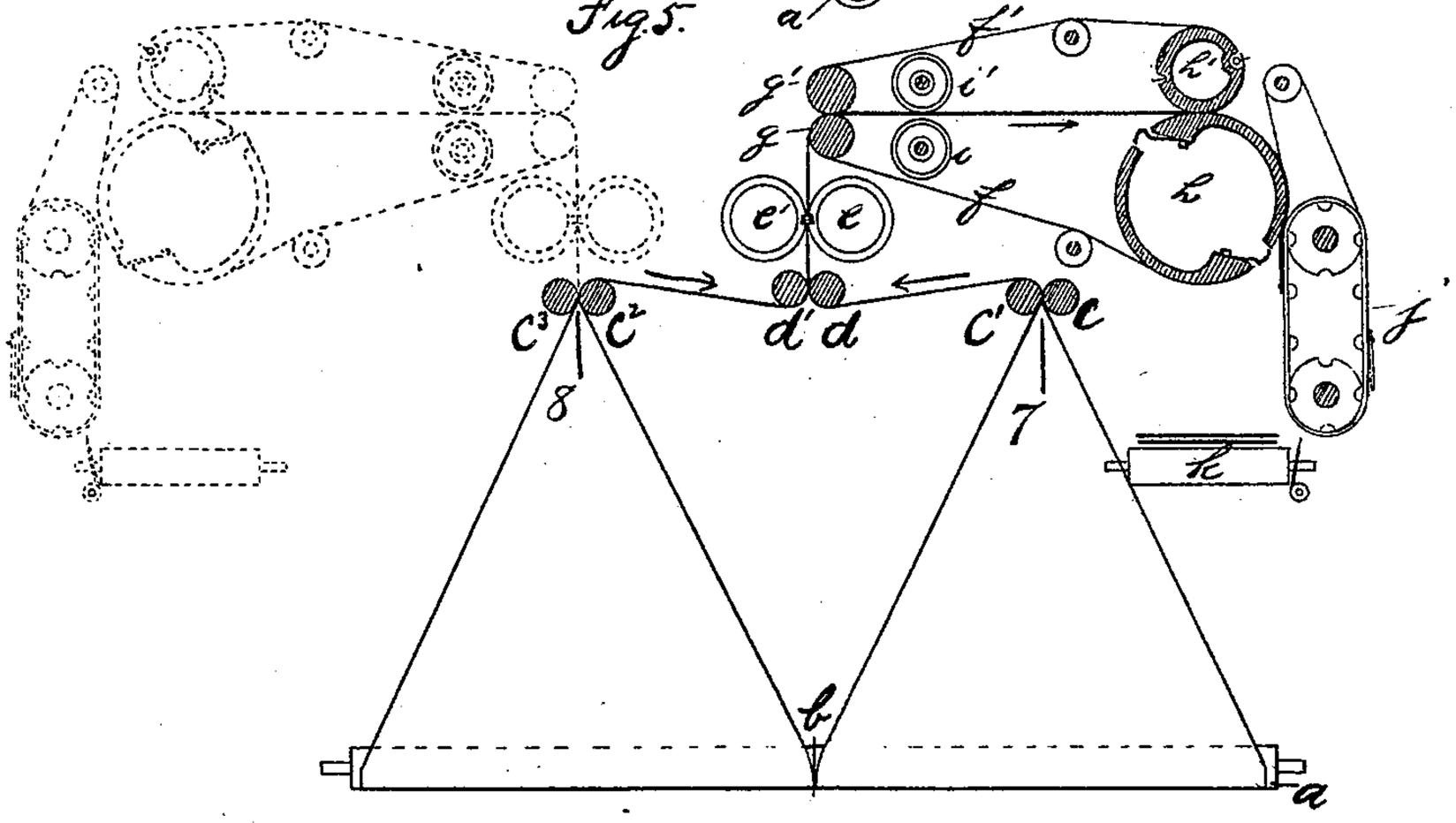


Fig. 5.



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(No Model.)

3 Sheets—Sheet 3.

J. L. FIRM.

PRINTING MACHINE.

No. 582,631. Patented May 18, 1897.

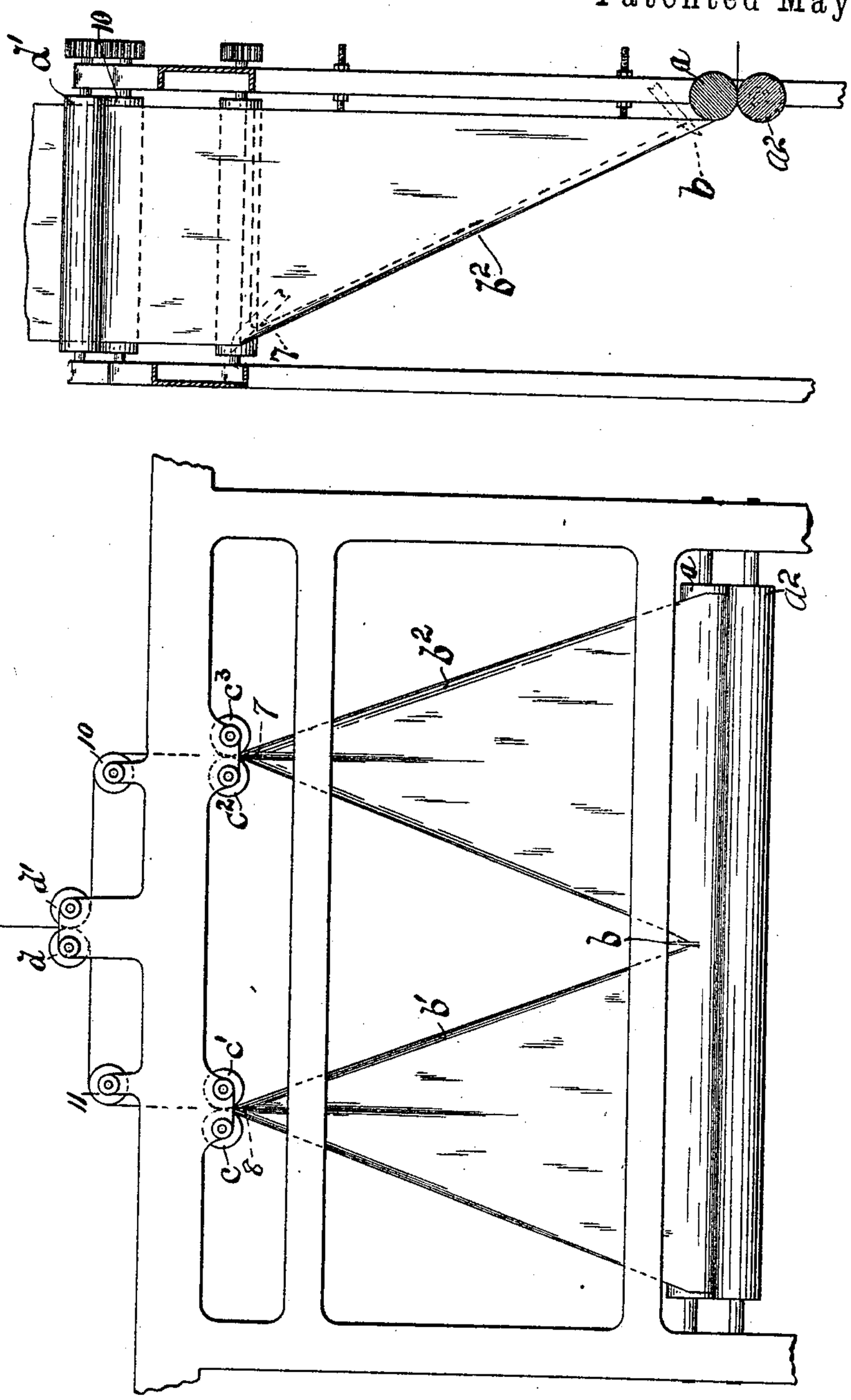

Fig. 9.

Fig. 8.

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UNITED STATES PATENT OFFICE.

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PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 582,631, dated May 18, 1897.

Application filed June 6, 1889. Serial No. 313,341. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH L. FIRM, of Jersey City, New Jersey, have invented a new and useful Improvement in Machines for Printing and Assembling Newspapers or Books, of which the following is a specification.

By my machine I may print and assemble the pages of a book-section with the final fold at the back ready for binding by a straight forward progression without the use of collectors or diagonal turners and without the delay and risk of accident due to frequent reversals and changes of direction.

I will first describe the order of operations employed for manufacturing a book of sixteen pages and then describe the mechanism by which these operations are accomplished to enable a person skilled in the art to make and use the same.

Figures 1, 2, 3, and 4 show the paper in various stages. Fig. 5 is a diagram showing the arrangement of rolls, &c., for collecting, folding, and cutting the paper in the manner required. Fig. 6 is another view of the same thing. Fig. 7 shows a modification of the arrangement of pages employed in printing eight pages. Fig. 8 is an elevation of a portion of the slitting and folding mechanism, and Fig. 9 a view of the same at right angles to Fig. 8 with parts in section.

I take a single web of paper wide enough to receive the impression of four pages abreast arranged with their heads pointing transversely across the web. Upon this web I print sixteen pages, those upon one surface of the web being arranged, as shown in Fig. 1, to the left of the line $x\,x$. On the opposite face of the web the pages are arranged as follows: page 2 opposite page 1, page 3 opposite page 4, page 6 opposite page 5, page 7 opposite page 8, page 10 opposite page 9, page 11 opposite page 12, page 14 opposite page 13, and page 15 opposite page 16. The two pages abreast on each side of the center line of the web are arranged with their heads pointing toward each other, as indicated in Fig. 1. The arrangement of pages above described is repeated over and over again on the web.

I next split the web along the central line $y\,y$, Fig. 1, then fold each half longitudinally along the margins $z\,z$ and $z'\,z'$ and then split in the latter folds, as indicated in Fig. 1, after which the two halves thus folded and cut are brought together, so as to occupy the relative position shown at Fig. 2. Thereupon a transverse cut is made on the margin between every two series of sixteen pages, so that each section cut from the web will be represented by Fig. 3. Next a fold is made on the line w of Fig. 3, resulting in the arrangement of Fig. 4, when the book or newspaper is complete, with the pages all properly arranged to read from "1" to "16," consecutively.

In order to handle the paper as above described, I provide the following mechanism:

The pages are printed, as above described, by the form-cylinders 1 2 and the impression-cylinders 3 4. Then the web passes around the roller a, which bears a radial knife b, Fig. 5, by which the web is split on the central margin.

c, c', c^2, and c^3 are rollers at right angles with the roller a, each pair of which is to receive one half of the split web; but between the roller a and each pair of the other rollers $c\,c'$ and $c^2\,c^3$ is arranged a guide, each of which guides receives its half of the split web without folding. The sides of each guide, however, gradually fold together, so as to fold each half of the split web, as indicated in Fig. 1, preparatory to its passage between the rollers $c\,c'$ and $c^2\,c^3$.

It will be seen from the drawings that the lines of crease or fold of the two strips are parallel and in substantially the same plane, so that when they are brought together side by side, as shown in Fig. 5, the lines of crease or fold may travel forward still in the same plane until on coming together they register without turning or edgewise movement, the direction of travel of the paper from beginning to end being thus confined substantially to two planes, the first plane being perpendicular to the cylinders 1, 2, 3, and 4 and guide a and the second plane being perpendicular to the rollers $c\ c'\ c^2\ c^3$ and succeeding rollers, in the latter of which planes the longitudinal fold is formed and travels. A stationary knife or other suitable device is arranged to split each half of the web in the crease made by the last-named rollers, so that the web is now divided into four longitudinal

strips. The web of paper passes over roller a and is slit on line $y\ y$ by a slitter b. It then passes up the longitudinal folders b' and b^2, and each half is folded longitudinally by the rollers $c\ c'$ and $c^2\ c^3$. One half is slit on line $z\ z$ by the knife 7 and the other half on the line $z'\ z'$ by the knife 8. The halves of the web pass over rollers 10 11 and come together between rollers $d\ d'$ to be carried onto the deliverers. Each half of the web, folded and split, as shown in Fig. 1, now pursues the course indicated by the arrows, Fig. 5, until they together pass between the rollers d and d', occupying the relative position shown in Fig. 2. Next they pass between the rollers e and e', which are provided with a knife of well-known construction adapted to sever the web transversely on every other margin, so as to divide it into separate sections, each one of which contains sixteen pages. The cut, however, is only partial, requiring a slight pull to separate one section completely from the other. The web next passes between the tapes f and f', which run over the rollers $g\ g'$ and $h\ h'$. As it passes along between these tapes in the direction of the arrow each section is completely torn from the succeeding one by the action of the rollers i and i', which run faster than the tape and are so operated as to grip the web at the proper moment to tear each section properly from the succeeding one. The sections, though completely separated, are still carried by the tapes f and f' to the rollers h and h', which have the construction and mode of operation described in my application, Serial No. 289,298, filed October 27, 1888, to fold each section, as shown in Fig. 4, and deliver it to the gripping-tape j, from which it falls upon the receiver k.

To the left of Fig. 5 I have shown in dotted lines a duplicate of the mechanism shown on the opposite side of the figure. Both the mechanism shown in dotted lines and that shown in full lines may be employed in case it is desired to treat each half of the split web separately instead of bringing them together between the rolls $d\ d'$, as already described. Their separate treatments would be employed in case the machine should be used for printing two books or newspapers of eight pages instead of one of sixteen. In the case of printing two books or newspapers of eight pages each the pages will be arranged as shown in Fig. 7.

In case a single book or newspaper of sixteen pages is to be printed of course it will be understood that each half of the split web must travel an equal distance to the rolls $d\ d'$, so that the proper pages will be brought opposite to each other when the two halves of the web run together.

I claim—

1. In a printing-press, in combination, a web-printing mechanism adapted to perfect a web containing a plurality of pages abreast having the heads of adjoining pages in each transverse row pointing inversely to each other and transversely of the web, longitudinally-splitting mechanism, a longitudinally-folding mechanism for each strip of the split web, guides whereby the said longitudinally-folded strips are associated together and caused to travel in the same direction, mechanism whereby said strips are cut transversely into sections at the sides of the pages on every other transverse margin, and mechanism for folding said sections on the intermediate transverse margin, substantially as described, whereby the parts of said web receive their primary fold separately at the ends of the pages and their final fold inside of each other on every other transverse margin at the sides of the pages and in position to form the back of the book.

2. In a printing-press, in combination, a web-printing mechanism adapted to print simultaneously four pages with the heads of adjoining pages in each row of simultaneously-printed pages pointing inversely to each other and parallel to the axes of the cylinders, a longitudinally-folding mechanism for each strip of paper, guides whereby said longitudinally-folded strips are associated together and caused to travel in the same direction, mechanism whereby said strips are cut transversely into sections at the sides of the pages on every other transverse margin, and mechanism for folding said sections on the intermediate transverse margin, substantially as described; whereby said strips receive their primary fold separately at the ends of the pages and their final fold inside of each other on every other transverse margin at the side of the pages and in position to form the back of the book.

3. In a printing-press, in combination, a web-printing mechanism adapted to print simultaneously four pages with the heads of adjoining pages in each row of simultaneously-printed pages pointing inversely to each other and parallel to the axes of the cylinders, a longitudinally-folding mechanism for each strip of paper, mechanism whereby said longitudinally-folded strips are associated together and caused to travel in the same direction, mechanism whereby said strips are cut transversely into sections at the sides of the pages on every other transverse margin, and mechanism for folding said sections on the intermediate transverse margin, substantially as described; whereby said strips receive their primary fold separately at the ends of the pages and their final fold inside of each other on every other transverse margin at the side of the pages and in position to form the back of the book.

JOSEPH L. FIRM.

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J. E. GREER.