

No. 637,330.

Patented Nov. 21, 1899.

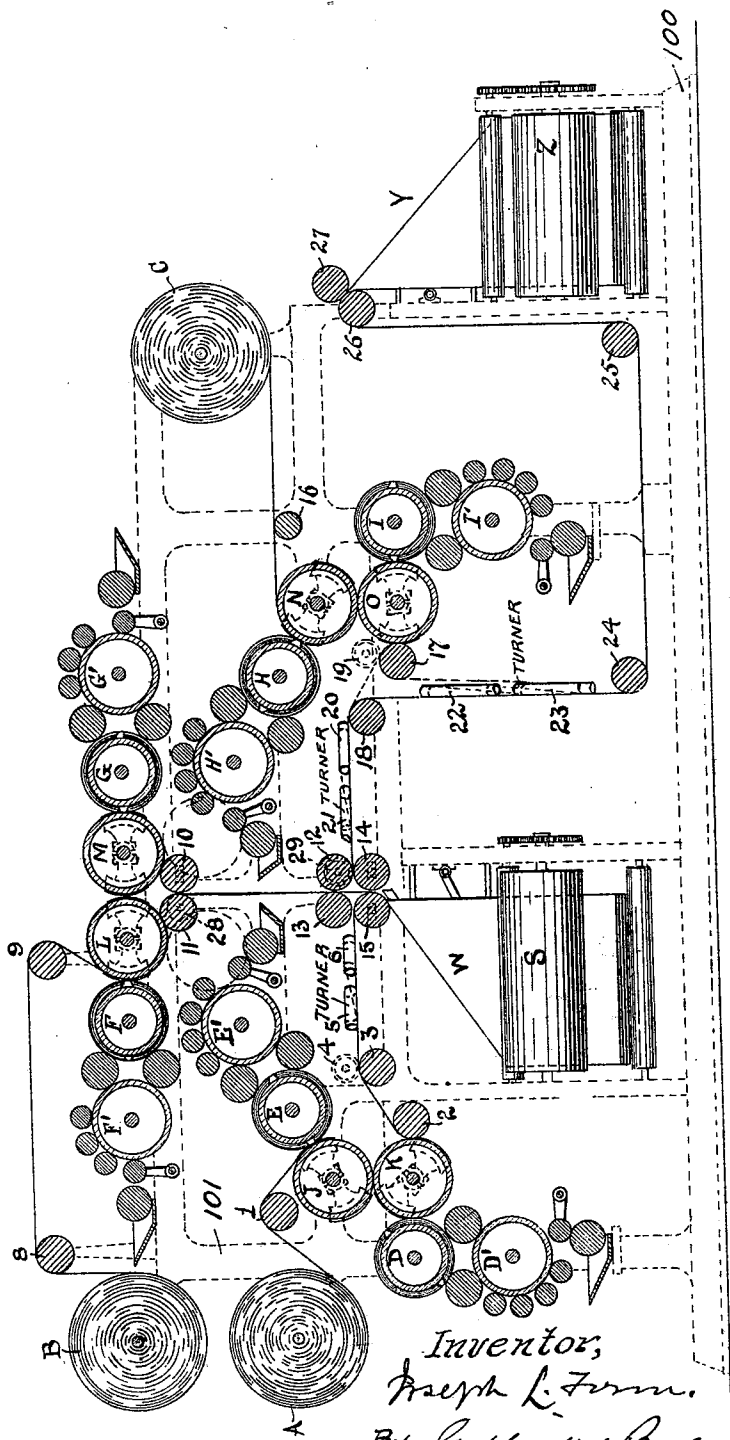
J. L. FIRM.
PRINTING MACHINE.

(Application filed Nov. 5, 1895.)

(No Model.)

6 Sheets—Sheet 1.

Fig. 1.



Witnesses:

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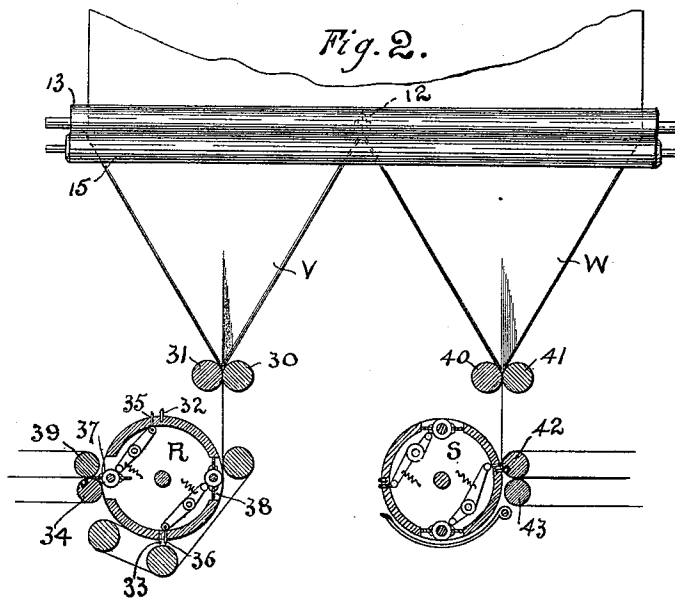
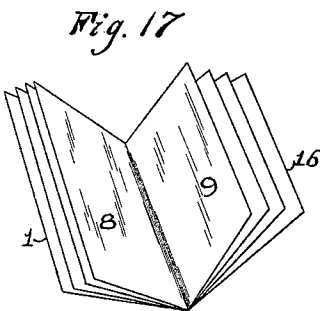
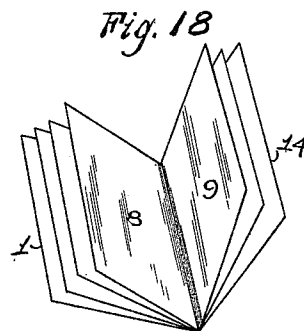
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6 Sheets—Sheet 2.



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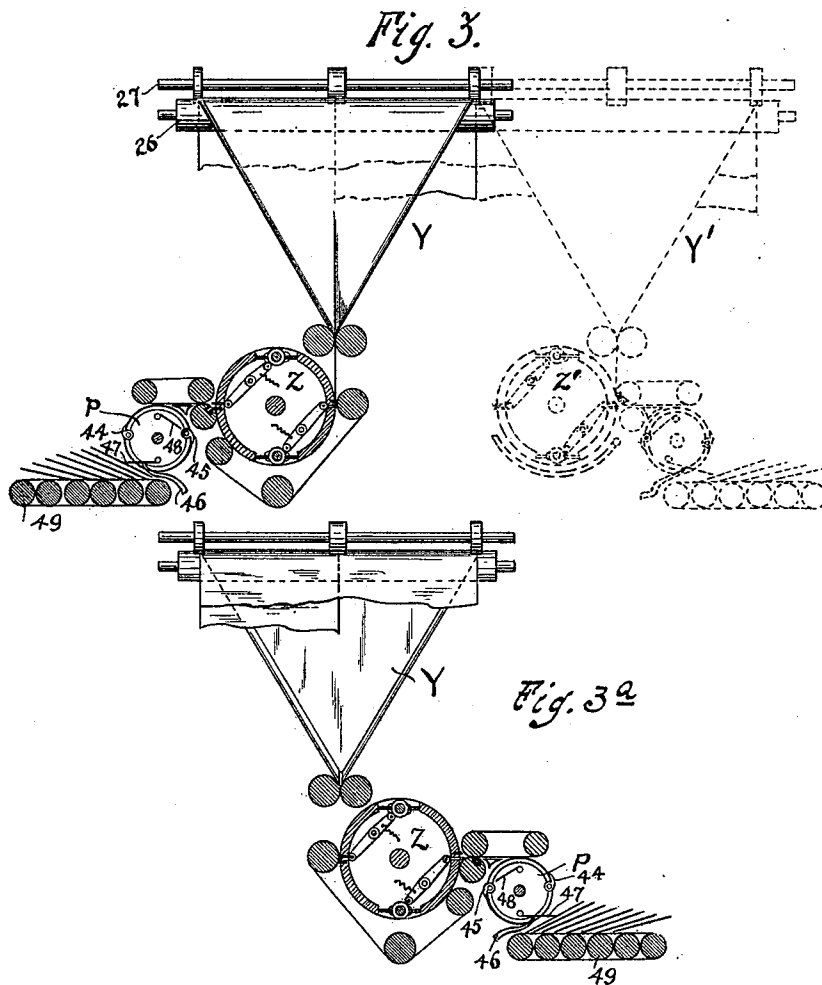
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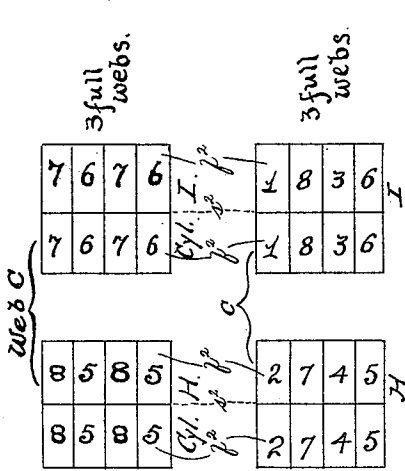
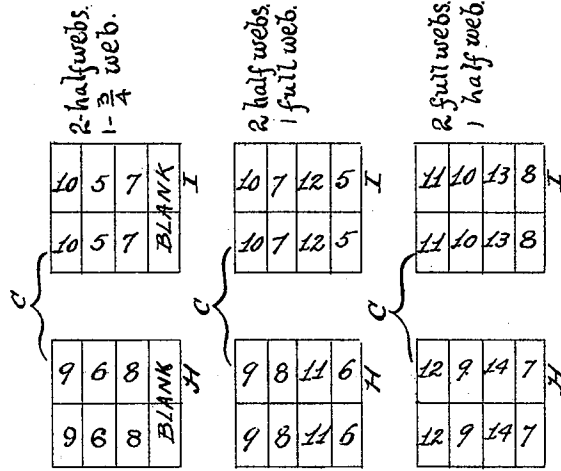
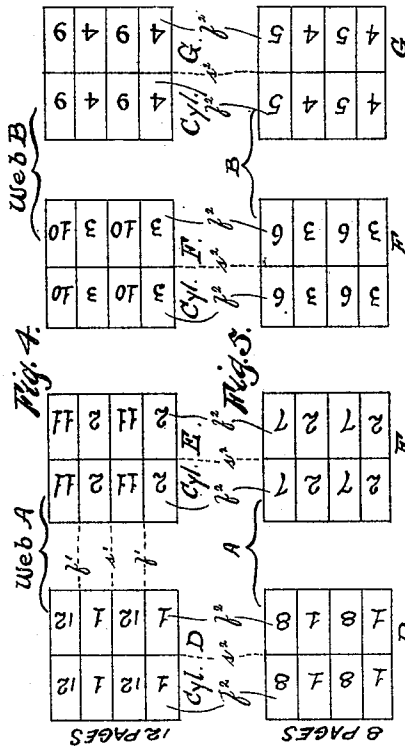
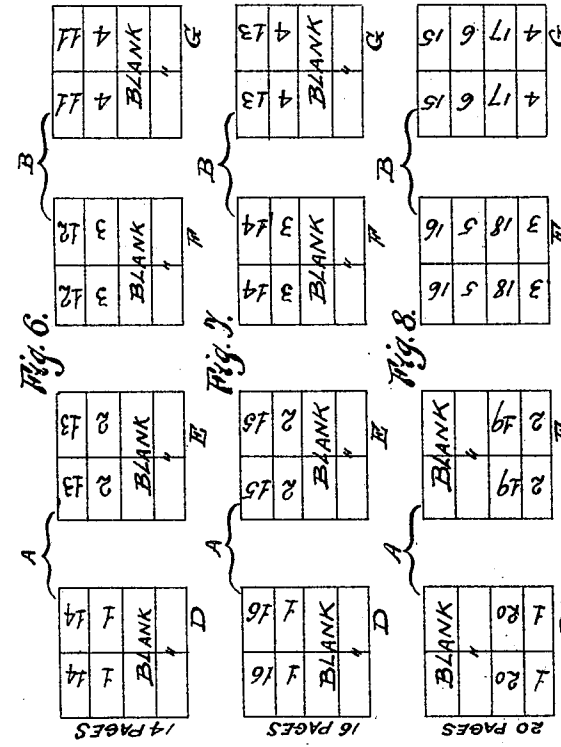
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6 Sheets—Sheet 4.



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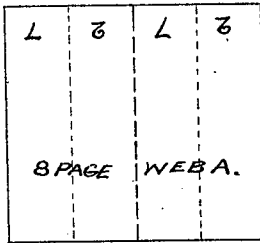
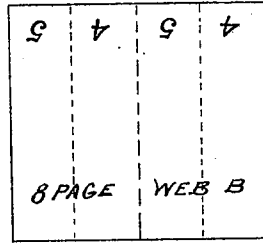
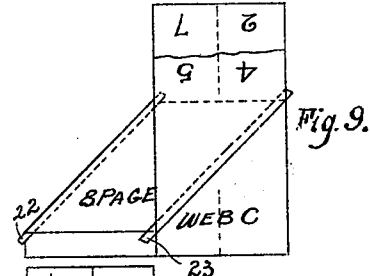
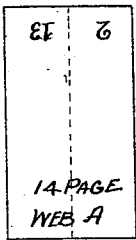
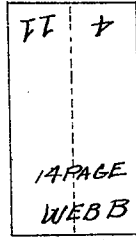
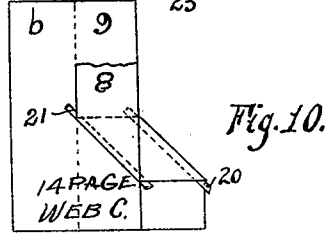
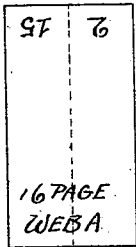
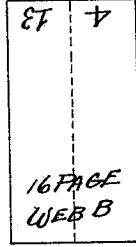
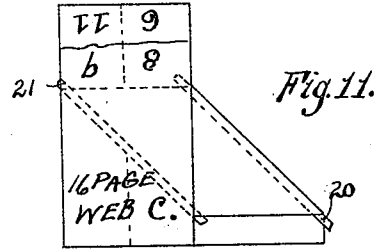
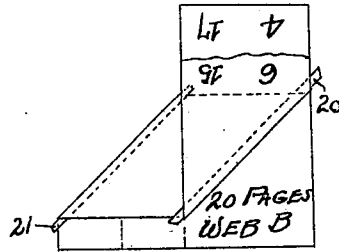
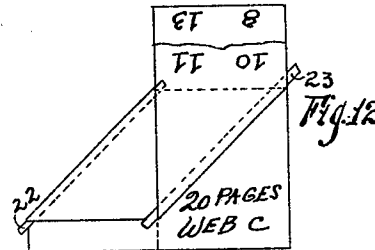
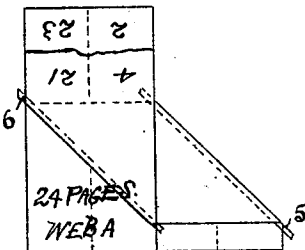
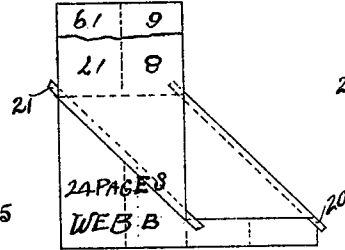
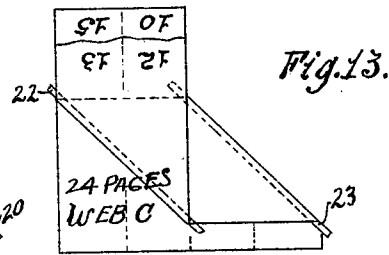
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6 Sheets—Sheet 5.

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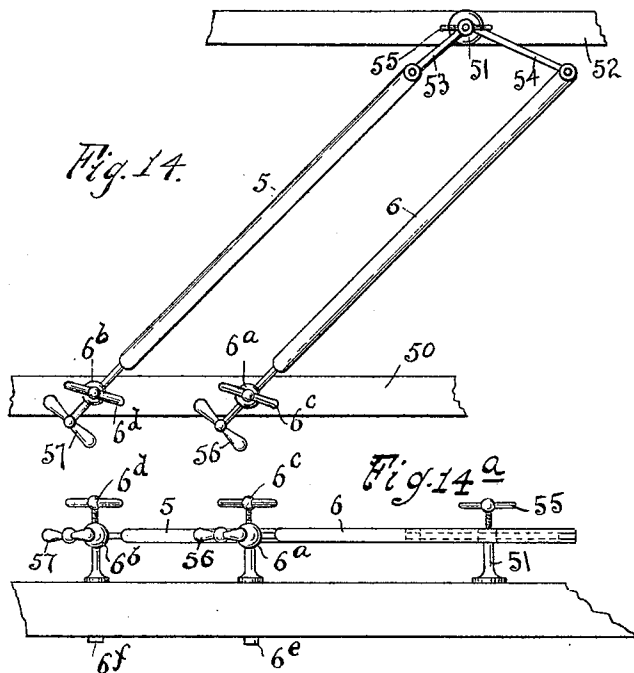
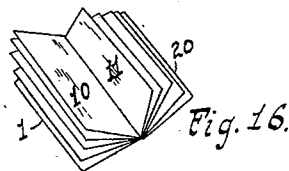
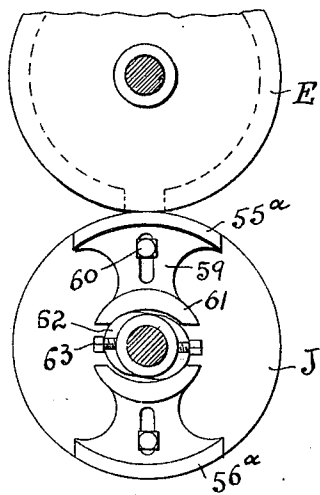
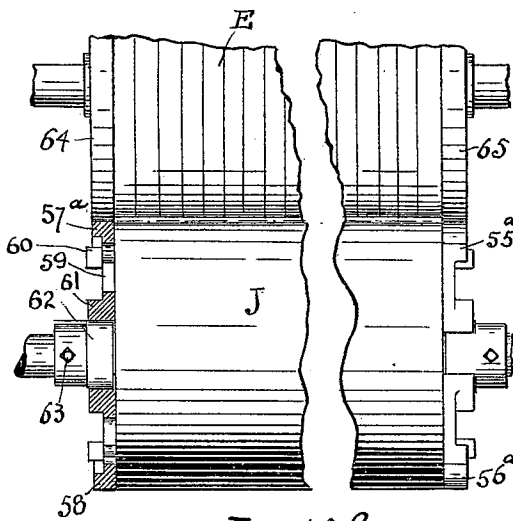
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(No Model.)

6 Sheets—Sheet 6.



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UNITED STATES PATENT OFFICE.

JOSEPH L. FIRM, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO THE GOSS PRINTING PRESS COMPANY, OF CHICAGO, ILLINOIS.

PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 637,330, dated November 21, 1899.

Application filed November 5, 1895. Serial No. 567,996. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH L. FIRM, a citizen of the United States, and a resident of Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Printing-Machines, of which the following is a specification.

In the accompanying drawings, Figure 1 is a longitudinal section of the printing mechanism and a side view of the delivering mechanism. Fig. 2 is an end view of the main delivery mechanism detached and partly in section. Figs. 3 and 3^a are views of a secondary delivery mechanism. Figs. 4, 5, 6, 7, and 8 are developments of the forms on the form-cylinders for printing twelve, eight, fourteen, sixteen, and twenty pages, respectively. Figs. 9, 10, 11, 12, and 13 are diagrams to show the relative handling of the various webs for eight, fourteen, sixteen, twenty, and twenty-four pages, respectively. Figs. 14, 14^a, 15, and 15^a are mechanical details. Figs. 16, 17, and 18 are the completed products.

In dotted lines in Fig. 1 are shown the base-plate at 100 and the upright frame 101, mounted thereon, on which all the parts hereinafter referred to are supported.

I will first describe the arrangement of the printing mechanisms shown in Fig. 1. A, B, and C are three web-rolls suitably mounted and in such position that they may be lifted out of their bearings unobstructed by other parts, thus obviating the necessity of sliding their bearings in endwise. The web B is conducted by the guide-rolls 8 and 9, so that it enters the machine from above. The impression-rolls L M for the web B are arranged side by side at the top of the machine, and on opposite sides of them are their coöperating form-cylinders F G, and on opposite sides of the latter are their coöperating inking mechanisms F' G'. Below the impression-cylinders L M are the guide-rollers 10 11, between which the web B passes after being printed. The cylinders constituting the printing mechanism for the web B therefore are arranged in a line, in which the impression-cylinders occupy the center, and the web enters this line from the guide-roll 9 above and proceeds from it to the guide-rolls 10 11 below. It then proceeds downward and between the guide-

rolls 12 13 and thence between the guide-rolls 14 15.

The printing mechanisms for the webs A and C are below the level of the printing mechanism for the web B and are arranged, respectively, on opposite sides of the plane of descent of the web B from its printing mechanism to the guides 14 15, being arranged, preferably, in inclined lines diverging downwardly on opposite sides of said plane, as shown.

The web A enters its printing mechanism from the guide 1 outside thereof. It passes between the impression-cylinder J and the form-cylinder E, and thence between the impression-cylinder K and the form-cylinder D, and thence over the guides 2 and 3, where it may or may not be slit longitudinally by the knife 4, as required, and thence past the turners 5 and 6, which may or may not be used, as required, and thence over the guide 15, where it is associated with the web B.

E' is the inking mechanism for the form-cylinder E, and D' is the inking mechanism for the form-cylinder D.

The web C enters from the guide-roll 16 on the outside of its printing mechanism. It passes between the impression-cylinder N and form-cylinder H and between the impression-cylinder O and form-cylinder I, thence over the guide-rolls 17 18, where it may or may not be slit, as required, by the knife 19, thence past the turners 20 and 21, which may or may not be used, as desired, and thence over the guide 14, where it is associated with the webs A and B.

H' is the inking mechanism for the form-cylinder H, and I' is the inking mechanism for the form-cylinder I.

As an alternative path for the webs I provide the turners 22 and 23, the guides 24, 25, 26, and 27, and the delivery mechanism Y Z.

When the webs A B C are associated between the guides 14 and 15, as first described, (the web B coming downward from above between the printing mechanisms for A and C and the webs A and C coming to it from opposite sides,) the three associated webs lying on top of one another, having been slit by the knives 4, 19, 28, or 29, (shown in dotted lines in Fig. 1,) are passed over the longitudinal

folders V W. (See Fig. 2.) Thence one folded strip from the rollers 30 31 passes to the carrier R. This carrier is provided with the transverse cutting-knives 32 33, cooperating with the roller 34, and the holding-pins 35 36, and the folding-blades 37 38, so that the longitudinally-folded strip is folded transversely between the rollers 34 and 39 and cut transversely against the roller 34. The longitudinally-folded strip passing from the folding-rollers 40 41 is treated in like manner by similar devices mounted upon the carrier S, cooperating with the similar folding-rollers 42 43, which, however, are located on opposite sides of the center, so that the two strips are folded to right and left, as shown in Fig. 2.

In Fig. 3 is shown in full lines the single longitudinal folder Y, with a single carrier Z and mechanism connected therewith similar to the folder V and carrier R already described, with an optional folder Y' and Z'. (Shown in dotted lines side by side.) The optional folder Y' and Z' will be used whenever a web containing four pages abreast is run between the rollers 26 and 27.

Fig. 3^a is a back view of the folder Y and carrier Z.

Figs. 3 and 3^a differ from Fig. 2 in that the sheets after being folded and cut transversely are received upon a carrier P, provided with the grippers 44 and 45, the stripper 46, and the delivery-arms 47 48, by which the sheets are delivered off of the carrier P onto a carrier 49. The carriers R, S, Z, and Z' all operate upon substantially the same principle, which in connection with carrier R may be described as follows: As the forward end of the associated and longitudinally-folded webs arrives at the carrier R it is impaled upon the pins 35 or 36—let us say 36. The carrier then revolves until one of the folding-blades—say 38—arrives at the folding-rollers 34 39, whereupon the folding-blade, as described in my Patent No. 556,409, forces the web between the rollers 34 and 39, and as it passes between them off of the carrier R the knife 32 makes the transverse cut against the roller 34, as also described in my said patent. The fold given between the folding-rollers 34 and 39 will in this case be across the middle of the pages, so that when unfolded for reading the completed product will appear as in Fig. 17, for example, in which the fold shown is the longitudinal fold given by the rollers 30 and 31. This operation will be repeated on the next semirotation of the carrier by the pins 35, folding-blade 37, folding-rollers 34 39, and knife 33. Thus for each semirotation of the carrier a product will be made and cut from the preceding and succeeding products with a fold transversely across the middle of the pages as a newspaper is ordinarily delivered.

In Figs. 14 and 14^a are shown the turning-bars 5 and 6. The turning-bars 20 21 and 22 23 may be of similar construction. These bars are secured at one end to the frame 50,

respectively, by extending through holes in the pivotal stands 6^a and 6^b. The set-screws 6^c and 6^d may be set down on the bars to fix their position in the holes and prevent their sliding after the proper adjustment is obtained. The pivoting of the stands may also be stayed by tightening the nuts 6^e and 6^f. The opposite ends of the bars are respectively pivoted to the arms 53 and 54, which are pivoted to the stand 51, fixed to the frame 52. The set-screw 55 enables these arms to be fixed at any desired adjustment. The handles 56 and 57 enable the operator to adjust the bars to any desired angles independently of each other and with the greatest speed. This can be done as the web is passing through the machine, so that the operator can be guided in making his adjustment by the actual requirements or tension of the paper and the position of the margins. The arm 54 is longer than the arm 53, giving one bar a greater change of angle than the other for an equal change of longitudinal adjustment.

In Figs. 15 and 15^a I have shown an arrangement for maintaining a positive bearing between the form-cylinder and the impression-cylinder, even at a point where a blank occurs on the surface of the form-cylinder. On opposite ends of the impression-cylinder J are placed the segments 55^a 56^a 57^a 58. These segments are all alike. Each is provided with a slotted inward projection 59, enabling it to be adjustably secured to the end of the cylinder by a bolt 60. On the inner end of the projection 59 is an inwardly-facing bearing 61, which is adjustably distanced from the shaft by bearing against adjusting mechanism of some kind, such as an adjustable cam 62, mounted upon the shaft and held at the adjustment required by a set-screw 63. At opposite ends of the form-cylinder are the circular flanges 64 65, bearing against the segments. Therefore these flanges and the segments constitute a permanent surface bearing between the cylinders, no matter what blanks may be left between the forms on the form-cylinder between the flanges 64 and 65. Even where there are no blanks on the form-cylinder these bearings relieve the outer edges of the forms from undue pressure and equalize the impression-pressure in the middle of the cylinders with that at the ends. Since the flanges 64 and 65 overhang the end of the impression-cylinder J and since each pair of segments, as 55^a and 57^a, are located opposite a gutter or blank between the forms, the flanges 64 and 65 will be inoperative while the body of each form is opposite the impression-cylinder and will only be operative while a gutter and the adjacent form edges are opposite the impression-cylinders.

When the machine above described is employed for printing pamphlets or newspapers of eight pages each, three full-width webs may be used, and the proper arrangement of the forms on the form-cylinders D, E, F, G, H, and I is shown in Fig. 5. Three copies of

each pamphlet may be thus completed simultaneously. In this case the webs A and B will be associated at the guides 14 and 15 and will be treated by the longitudinal folders V and W and by the transverse folders and cutters on the carriers R and S. The web C, however, after being slit by the knife 19 will pass from the roller 17—one half to the turners 22 and 23 and the other half to the guide 24. The turners 22 and 23 serve to direct one half laterally on top of the other half, so that the two halves are associated together and pass one on top of the other to the longitudinal folder Y and transverse folders and cutters on the carrier Z. The straight course of the webs A and B and the turned course of one half the web onto the other half of the web C are indicated in Fig. 9.

In making two copies of a twelve-page pamphlet the course of all the webs is straight, and each of the three webs is full width, and they proceed, as first described, to the rollers 14 15, where they are associated and after which they are folded and cut by the folders V W and the mechanisms on the carriers R and S. In this case the arrangement of the forms on the form-cylinders is shown in Fig. 4.

In printing pamphlets of fourteen pages each (see Fig. 18) two half-webs A B and one three-quarter web C, Fig. 10, are employed. The arrangement of forms is shown in Fig. 6. The half-webs A and B run straight and are associated between the rollers 14 and 15 with a three-quarter web C and are folded and cut transversely by the folder V and the mechanism on the carrier R. One-quarter of the web C is turned by the turners 20 21 onto its half, as shown in Fig. 10, and the web C thus arranged is associated with the webs A and B between the rollers 14 and 15.

In printing pamphlets of sixteen pages each (see Fig. 17) two half-webs A and B and one full web C, Fig. 11, are employed. The arrangement of forms is shown in Fig. 7. The half-webs A and B run straight as before. One half of the web C is turned onto the other half by the turners 20 21, as shown in Fig. 11, and all three of the webs are associated between the rollers 14 and 15 and are folded and cut by the folder V and the mechanism on carrier R.

In making pamphlets of twenty pages each (see Fig. 16) one half-web A is used and two full webs B and C. The arrangement of forms is shown in Fig. 8. The half-web A runs straight as before. The web B runs from the roll 12 to the turners 20 21, by which one half is turned onto the other half, as shown in Fig. 12. Thence web B runs back to roller 14, where it is associated with web A. The web C runs from roller 17 to the turners 22 23, by which one half is turned onto the other half, as shown in Fig. 12. Thence web C runs over roller 18 to roller 14, where it is associated with webs A and B. Thence all three webs are folded and cut by folder W and the mechanism on carrier S.

In printing pamphlets of twenty-four pages each I use three full-width webs. One half of the web A is turned onto the other half, as shown in Fig. 13, by the turners 5 6. One half of the web B is turned onto the other half by the turners 20 21. One half of the web C is turned onto the other half by the turners 22 23. All three webs thus arranged are led to and associated between rollers 14 and 15 and are folded and cut by folder V and the mechanism on carrier R.

In each of the diagrams Figs. 4 to 8, inclusive, a line on which the longitudinal slitting takes place is lettered s' , lines on which the longitudinal folding takes place are lettered f' , a line on which the transverse cutting takes place is lettered s^2 , and lines on which the transverse folding takes place are lettered f^2 .

Obviously in any of the above cases the turners may be arranged so as to run the product either on one side of the central plane to the folder W and carrier S or on the other side of the folder V and carrier R, as the operator may elect.

I have taken pamphlets containing the numbers of pages above mentioned to exemplify the capacity of my invention without intending thereby to limit its application to said numbers of pages only.

The following features may be particularly mentioned as existing in the machine above described. The main delivery mechanism, such as the folder V and the carrier R, is located so as to deliver the product at the floor and so that the printing mechanism is substantially outside of it on three sides. One printing mechanism is at the top above the delivery mechanism and the other two are arranged in general lines diverging downward in front of and behind it. Within the space intermediate the main delivery mechanism and the outlying printing mechanisms are placed the turning-bars and also the guides, whereby the several webs are handled and associated after being printed and preparatory to folding and delivering. By the combination with each of the three web-printing mechanisms of a turning-bar mechanism the machine is capacitated to prepare each web separately, so that when associated between the guides 14 and 15 they are in the proper order for a twenty-four-page pamphlet, or, in other words, when they reach the associating-guides 14 and 15 the first twelve pages of the pamphlet will overlies each other and the second twelve pages of the pamphlet will overlies each other, requiring only a longitudinal fold in the middle without further superposing to complete the pamphlet. The pamphlet will be received on the carrier R, and as it passes off from such carrier between the folding-rollers 34 and 39 will be folded transversely across its pages and cut off from the web. By the arrangement shown the main delivery mechanism and the secondary delivery mechanism are both arranged substantially in line

with the printing mechanism—that is to say, between the boundary planes at opposite ends of the printing-cylinders, or, in other words, the guides 26 27 and 14 15 at the tops of the longitudinal folding-frames in both the main and secondary delivery mechanisms are parallel with the printing-cylinders.

It will be seen from Figs. 4 to 8, inclusive, that each of the form-cylinders has four forms abreast—that is to say, four pages are printed simultaneously by each cylinder, counting transversely across the web—and where the cylinder is large enough, as here shown, to have duplicate forms on opposite semicircumferences two products will be turned out for each revolution of the cylinders. I do not wish to limit myself, however, to having the press four pages wide, as shown.

It will also be observed that the columns of the page-forms run around the cylinders; but I do not wish to limit myself to this feature so long as they be so arranged that when the webs are associated between the rollers 14 and 15 the heads of the pages shall all point in the same direction.

It will be observed that the printing mechanisms for webs A and C are in two planes, between which are the associating-guides 14 15, so that as the webs A and C leave their printing mechanisms they each proceed at an angle with the plane of its printing mechanism toward the other until it reaches such guides.

Although I have shown the general planes of the printing mechanisms for the webs A and C as inclined to the vertical, I do not wish to limit myself to their having such inclination.

The object in placing impression-cylinders of the lower mechanism adjacent to or close up to the upper mechanism is to shorten and equalize the distance through which the three webs have to travel in reaching the combining-rollers 14 and 15.

I claim—

1. In a rotary printing-press in combination, a printing mechanism the cylinders of which are grouped near one end of the machine, a second printing mechanism the cylinders of which are parallel to the cylinders of the first and are grouped near the other end of the machine, a third printing mechanism the cylinders of which are parallel with the cylinders of the other two and extend in a group over said first and second printing mechanisms, a web-folding mechanism near the bottom of the press, between said first and second printing mechanisms and guiding mechanism whereby the web from said third printing mechanism is conducted to said folding mechanism between said first and second printing mechanisms substantially as described.

2. In a rotary printing-press in combination a printing mechanism, the cylinders of which are grouped near one end of the machine, a second printing mechanism the cyl-

inders of which are parallel to the first and are grouped near the other end of the machine, a third printing mechanism the cylinders of which are parallel with the cylinders of the other two and extend in a group over said first and second printing mechanisms, web-folding mechanism near the bottom of the press between said first and second printing mechanisms, other web-folding mechanism at one end of the machine, guiding mechanism whereby the web from said third printing mechanism may be conducted to said first-named folding mechanism and guiding mechanism whereby the web from another of said printing mechanisms is conducted to said last-named folding mechanism, substantially as described.

3. In a rotary printing-press in combination a printing mechanism, the cylinders of which are grouped near one end of the machine, a second printing mechanism the cylinders of which are parallel to the first and are grouped near the other end of the machine, a third printing mechanism the cylinders of which are parallel with the cylinders of the other two and extend in a group over said first and second printing mechanisms, web-folding mechanism near the bottom of the press between said first and second printing mechanisms, other web-folding mechanism at one end of the machine, guiding mechanism whereby the web from said third printing mechanism may be conducted to said first-named folding mechanism and guiding mechanism whereby the web from another of said printing mechanisms is conducted to said last-named folding mechanism and a turner interposed in the path of said last-named web, substantially as described.

4. In a rotary printing-press in combination a printing mechanism the cylinders of which are grouped near one end of the machine, a second printing mechanism the cylinders of which are parallel to the cylinders of the first and are grouped near one end of the machine, a third printing mechanism the cylinders of which are parallel with the cylinders of the other two and extend in a group over said first and second printing mechanisms, web-folding mechanism near the bottom of the press between said first and second printing mechanisms, guiding mechanism whereby the web from said third printing mechanism is conducted to said folding mechanism, guiding mechanism whereby the web from another of said printing mechanisms is conducted to said folding mechanism and a turner in the path of said last-named web, substantially as described.

5. In a rotary printing-press in combination, a first and second printing mechanism the cylinders of which are parallel and are respectively grouped near opposite ends of the machine in groups diverging from the top of the machine downward, a web-folding mechanism near the base of the machine, in the space produced by said divergence, a third

printing mechanism, the cylinders of which are parallel with the others and extend in a group over the first and second printing mechanisms and guiding mechanism whereby the web from said third printing mechanism is conducted to said folding mechanism, substantially as described.

6. In a rotary printing-press in combination, a first and second printing mechanism the cylinders of which are parallel and are respectively grouped near opposite ends of the machine in groups diverging from the top of the machine downward, a web-folding mechanism near the base of the machine in the space produced by said divergence, a third printing mechanism the cylinders of which are parallel with the others and extend in a group over the first and second printing mechanisms and guiding mechanism whereby the web from said third printing mechanism is conducted to said folding mechanism, the two impression-cylinders of said third printing mechanism being placed together and an impression-cylinder of each of the other printing mechanisms being placed on opposite sides of the path of the web from said third printing mechanism to said folding mechanism, substantially as described.

7. In combination, a web-printing mechanism, a main delivery mechanism located beneath the same, two other printing mechanisms extending downward from said first-named printing mechanism front and rear of said main delivery mechanism and a secondary delivery mechanism at the rear of one of said downwardly-extending printing mechanisms whereby said printing mechanisms and both of said delivery mechanisms may be located substantially in the same line, as set forth.

8. The combination with two web-printing mechanisms arranged in lines with their cylinders parallel, a third web-printing mechanism above and extending over the space between said two first-mentioned printing mechanisms with its cylinders parallel with the cylinders of said mechanisms and a main delivery mechanism located within said space, substantially as described.

9. The combination with two web-printing mechanisms arranged in lines with their cylinders parallel, of a third web-printing mechanism above and extending over the space between said two first-mentioned printing mechanisms with its cylinders parallel with the cylinders of said mechanisms, a main delivery mechanism within said space and a secondary delivery mechanism at one end of the press substantially in line with the main delivery mechanism, substantially as described.

10. The combination with two web-printing mechanisms arranged in lines with their cylinders parallel, of a third web-printing mechanism arranged above said two first-mentioned printing mechanisms, turning-bars and

a delivery mechanism arranged within the space between said two first-mentioned printing mechanisms, substantially as described.

11. In combination with the frame of a web-printing machine and turning-bars as 5 and 6, pivoted arms as 53 and 54 whereby said turning-bars are supported at one end, supports at the opposite ends for the same affording freedom for longitudinal movement and means for staying such longitudinal movement, substantially as described.

12. In a rotary printing-press, in combination, the frame, a printing mechanism for the web B the cylinders of which are grouped at the top of the machine, guides 10, 14 and 15 whereby said web B is led downward toward the base of the machine, a longitudinal folder W having its base adjacent to the exit from said guides 14 and 15, a transverse folder S below the same, a printing mechanism for the web A the cylinders of which are grouped near one end of the machine, a printing mechanism for the web C the cylinders of which are grouped near the other end of the machine, the cylinders of one printing mechanism being parallel to those of the others, guides 3 and 18 whereby the webs A and C are respectively guided to the guides 14 and 15 above the space before and behind said longitudinal and transverse folders; whereby said webs A, B and C are led from each end and from above and are collected and folded in the midst of said printing mechanisms, substantially as described.

13. In a rotary printing-press, in combination, the frame, the collecting-guides 14 and 15 located approximately in the middle of the press, printing mechanisms for the webs A and C having cylinders respectively grouped on opposite sides of the vertical plane past, through or between said collecting-rollers, a printing mechanism for the web B having cylinders grouped on opposite sides of said plane and the longitudinal folder W having its base below said collecting-guides and in or adjacent to said plane, the cylinders of one printing mechanism being parallel to those of the others, substantially as described.

14. In a rotary printing-press, in combination, the frame, a printing mechanism for the web B the cylinders of which are grouped at the top of the machine, guides 10, 14 and 15 whereby said web B is led downward toward the base of the machine, a longitudinal folder W having its base adjacent to the exit from said guides 14 and 15, a transverse folder S below the same, a printing mechanism for the web A the cylinders of which are grouped near one end of the machine, a printing mechanism for the web C the cylinders of which are grouped near the other end of the machine, the cylinders of one printing mechanism being parallel to those of the others, guides 3 and 18 whereby the webs A and C are respectively guided to the guides 14 and 15 above

the space before and behind said longitudinal and transverse folders, a turner intermediate said guides 18 and 14; whereby said webs A, B and C are led from each end and from above and are collected and folded in the midst of said printing mechanisms, substantially as described.

15. In a rotary printing-press, in combination, the frame, a printing mechanism for the web B the cylinders of which are grouped at the top of the machine, guides 10, 14 and 15 whereby said web B is led downward toward the base of the machine, a longitudinal folder W having its base adjacent to the exit from said guides 14 and 15, a transverse folder S below the same, a printing mechanism for the web A the cylinders of which are grouped near one end of the machine, a printing mechanism for the web C the cylinders of which are grouped near the other end of the machine, the cylinders of one printing mechanism being parallel to those of the others, guides 3 and 18 whereby the webs A and C are respectively guided to the guides 14 and 15 above the space before and behind said longitudinal and transverse folders, a turner between said guides 18 and 14, a turner between said guides 3 and 15; whereby said webs A, B and C are led from each end and from above and are

collected and folded in the midst of said printing mechanisms, substantially as described.

16. In a rotary printing-press, in combination, the frame, a printing mechanism for the web B, the cylinders of which are grouped at the top of the machine, guides whereby said web B is led downward toward the base of the machine, a longitudinal folder W having its base in or adjacent to the plane of descent of said web, a printing mechanism for the web A the cylinders of which are grouped near one end of the machine, a printing mechanism for the web C the cylinders of which are grouped near the other end of the machine, the cylinders of one printing mechanism being parallel to those of the others, a folding mechanism outside of one of said printing mechanisms at the end of the machine and guiding mechanism whereby one or more of said webs may be conducted to said first-named folding mechanism and guiding mechanism whereby one or more of said webs may be conducted underneath one of said printing mechanisms to said last-named folding mechanism, substantially as described.

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Witnesses:

JAMES T. LAW,
M. WILSON.