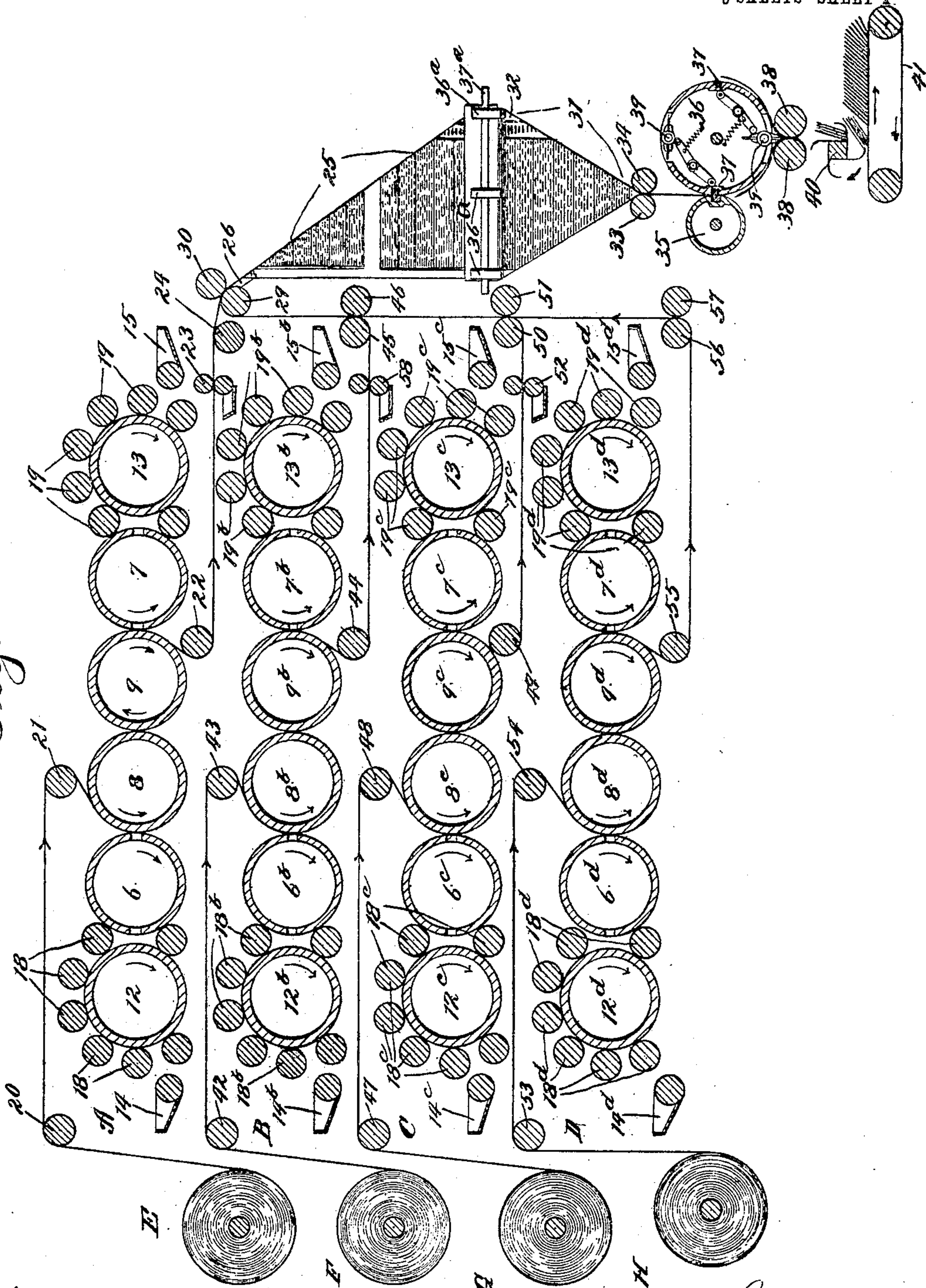


J. L. FIRM.  
PRINTING PRESS.  
APPLICATION FILED APR. 9, 1903

3 SHEETS—SHEET 1

Fig. 1



Witnesses  
J. B. Weir  
J. A. Perry

Inventor  
Joseph L. Firm  
Bond, Adams, Pichard & Gaudin  
Attys.



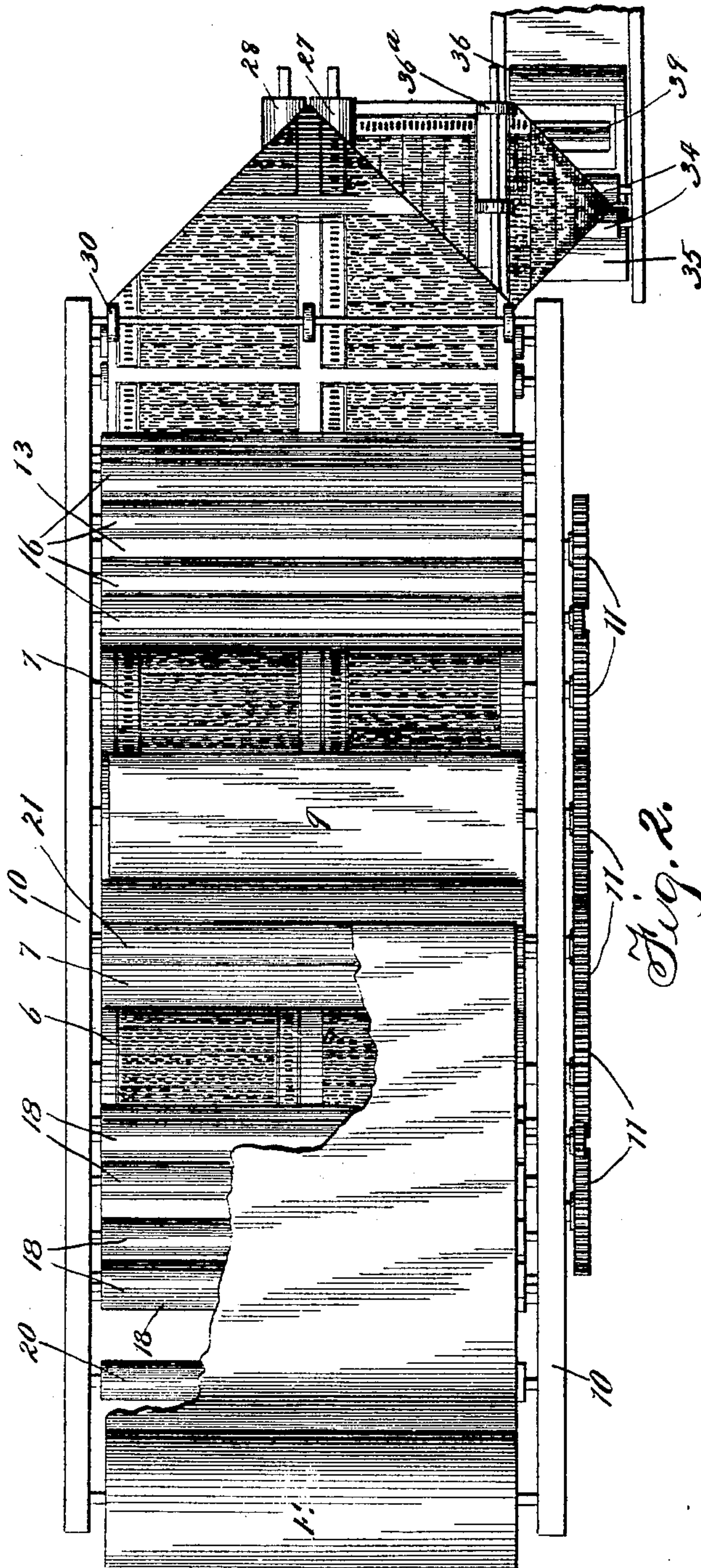
No. 795,274.

PATENTED JULY 25, 1905.

J. L. FIRM.  
PRINTING PRESS.

APPLICATION FILED APR. 9, 1903.

3 SHEETS—SHEET 2.



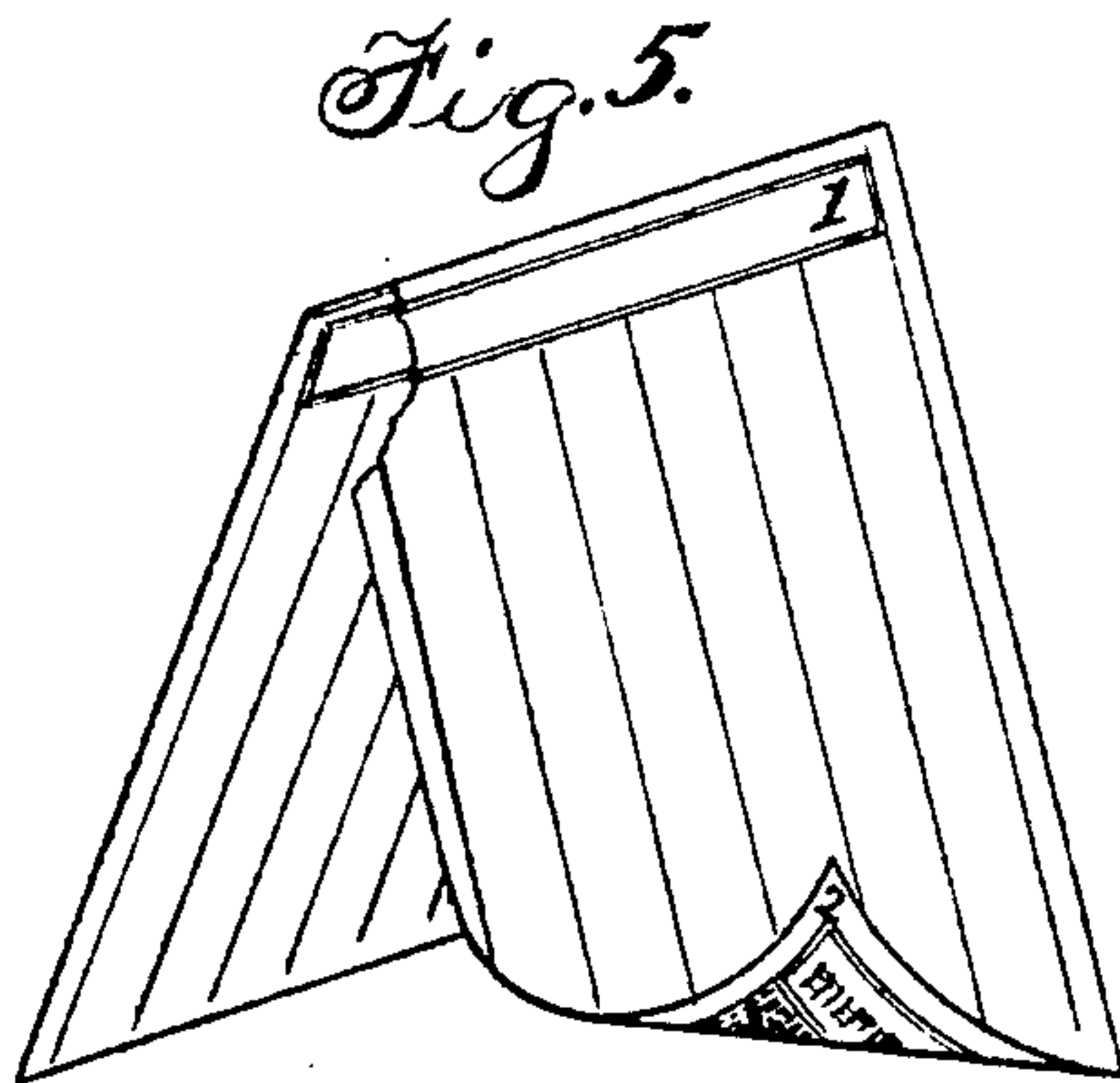
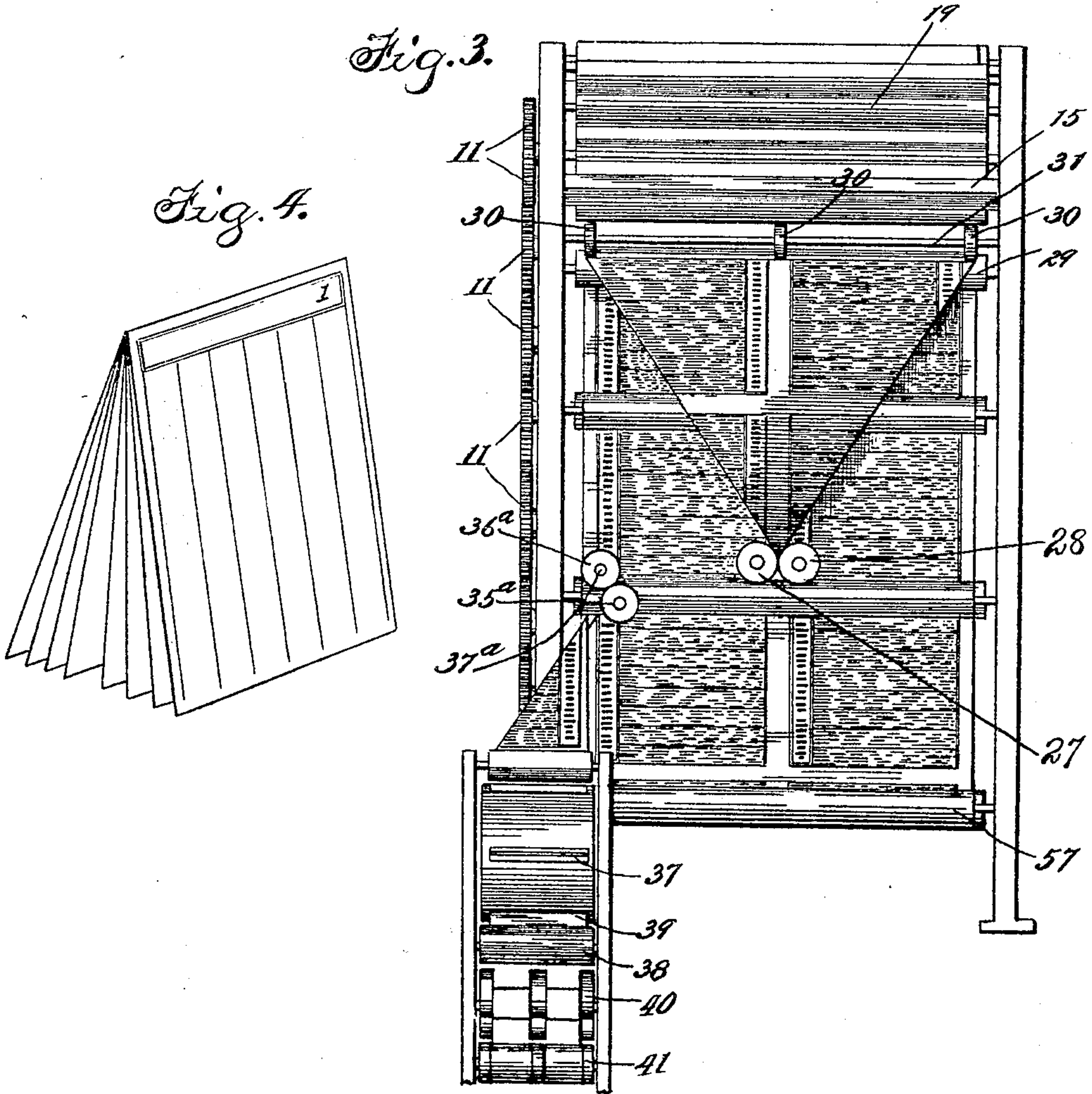
Witnesses:

*J. B. Weir*  
*Chas. D. Perry*

Inventor  
*Joseph L. Firm*  
By *Andrew P. ...*  
*Attys*

J. L. FIRM.  
PRINTING PRESS.  
APPLICATION FILED APR. 9, 1903

3 SHEETS—SHEET 3.



Witnesses:  
J. B. Weir  
Chas. D. Perry

Inventor  
Joseph L. Firm  
By: Adam P. Leonard  
Attys



# UNITED STATES PATENT OFFICE.

JOSEPH L. FIRM, OF BERWYN, ILLINOIS, ASSIGNOR TO THE GOSS PRINTING PRESS COMPANY, OF CHICAGO, ILLINOIS.

## PRINTING-PRESS.

No. 795,274.

Specification of Letters Patent.

Patented July 25, 1905.

Application filed April 9, 1903. Serial No. 151,820.

*To all whom it may concern:*

Be it known that I, JOSEPH L. FIRM, a citizen of the United States, residing at Berwyn, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Printing-Presses, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to rotary printing-machines which are adapted to perfect a plurality of webs, associate the perfected webs together into one product, and fold and deliver it in the form of a newspaper having the desired number of pages; and its object is to provide a new and improved form of printing-machine in which a plurality of webs may be printed upon form and impression cylinders the forms on the said form-cylinders being arranged with the column-rules parallel to the axes of the respective form-cylinders and the several webs thus perfected being brought together in registry, folded longitudinally along the central margin, and severed upon every transverse margin in such a way that a newspaper may be formed whose product is not confined to sizes which are a multiple of four pages. Heretofore in machines of this character—that is to say, printing-machines which were built in such a manner that the forms were placed upon the form-cylinders with their column-rules parallel with the axes of the form-cylinders—it has been necessary whenever a product was desired whose pages should be other than a multiple of four to slow down one or more of the decks of printing-couples to half the normal speed, which, as is well known, diminishes by that amount the productive capacity of the press, and this has been one of the disadvantages of building machines in this way—that is to say, adapted to receive forms with the column-rules parallel with the axes of the cylinders. On the other hand, machines of this character have advantages which are recognized. The form and impression cylinders, for instance, may be made of considerably smaller diameter, as the width of the sheet of the newspaper is in all ordinary forms considerably less than the length. This renders the machine much less heavy and expensive, and there are other advantages which are known and which it is not necessary to detail further here.

It is another one object in my invention to provide a machine which will produce a news-

paper of a form capable of being easily and readily read and whose product may consist of a number of pages other than multiples of four and to produce this upon a machine in which the column-rules of the forms are placed longitudinally of the form-cylinders—that is to say, parallel with their axes—without slowing down any of the decks of printing mechanism. I attain this object as hereinafter described and as illustrated in the accompanying drawings.

In the accompanying drawings, Figure 1 is a diagrammatic side elevation of the printing-press with folding and delivery mechanism. Fig. 2 is a top or plan view of the same. Fig. 3 is an end view of the machine from the folder end. Fig. 4 is an enlarged detail, being a diagram of a newspaper of sixteen pages produced upon the press and showing the position of the column-rules; and Fig. 5 is an enlarged detail, being a sketch of a newspaper of four pages produced on the machine in order to illustrate the positions of the heads of the pages and of the column-rules.

Referring to the drawings, the machine is composed of four decks of printing-couples A, B, C, and D, which are adapted to print, respectively, webs E, F, G, and H.

Deck A consists of two sets of printing-couples, each composed of one form and one impression cylinder. 6 7 indicate form-cylinders, and 8 9 impression-cylinders, coacting, respectively, with the printing-cylinders 6 and 7, all mounted in the framework 10 and driven by gearing 11 in any well-known and ordinary manner. 12 13 indicate ink-drums supplied, respectively, with ink from ink-fountains 14 15 and provided with the usual inking-rolls 18 19. As is best shown in Fig. 2, the form-cylinders 6 7 are of such size as to receive upon each semicircumference two forms of one page each. The forms, as is best shown in Fig. 2, are placed with their column-rules parallel with the axes of the respective form-cylinders and are placed so that the forms on each semicircumference of the same form-cylinder have their heads pointing in the same direction. For instance, as is shown in Fig. 2, form-cylinder 6, which in the arrangement shown in Fig. 1 prints the second and the next to the last page of the paper, has the forms so placed upon each semicircumference that the column-rules run parallel with the axes of the form-cylinders, with the page-heads both



pointing toward the gearing side of the press, while form-cylinder 7, which in the arrangement shown in Fig. 1 prints the first and the last page of the paper, has the forms so placed upon each semicircumference that their column-rules are parallel with the axes of the cylinder, with the page-heads pointing away from the gearing side of the press. This arrangement of the forms produces, as I will hereinafter more fully describe, a paper in "legal-cap" form—that is to say, one which will be read down the first page from the central margin to the bottom, and, the leaf being turned in the manner of legal-cap, the second page will be read from the edge of the sheet down toward the central margin, and so on. All this, however, will be more fully described hereinafter. 20 21 22 indicate guide-rollers; 23, a pasting mechanism adapted to supply a line of paste longitudinally along the central margin of the web E upon its under side. 24 indicates a guide-roller. 25 indicates a longitudinal-folding mechanism consisting of an internal guide or V-shaped former 26 and a pair of cooperating external turners or folding-rolls 27 28. 29 indicates a driven roller at the base of the V-shaped former 26. The pulleys 30, of the usual form and construction, cooperate in the usual manner with the roller 29 to feed the paper to the longitudinal-folding mechanism 25. 31 indicates a second longitudinal-folding mechanism consisting of an internal guide or V-shaped former 32 and external turners or folding-rolls 33 34. 35<sup>a</sup> indicates a driven roller placed at the base of the longitudinal folder 32. 36<sup>a</sup> indicates pulleys mounted on a shaft 37<sup>a</sup> and of the usual form and construction and adapted to cooperate with the roller 35<sup>a</sup> in feeding the paper to the longitudinal-folding mechanism 31. The roller 35<sup>a</sup> is parallel with the external turners 27 28, and the V-shaped former 32 points at right angles with the V-shaped former 26. 35 indicates a cutting-cylinder, and 36 a combined cutting and folding cylinder. 37 indicates cutter-blades of any well-known form and description operating in any well-known way and cooperating with the cutting-cylinder 35, so as to sever the webs of paper delivered to the cylinders 35 and 36 by the longitudinal-folding mechanism 31 upon every transverse margin. 38 indicates a pair of folding-rollers placed near the cutting and folding cylinder 36. 39 indicates folding-blades mounted in the cutting and folding cylinder 36 and operated in any well-known way to fold the paper transversely of its run. As the cutting and folding cylinders 35 and 36 may be of any well-known form and description and form no part as such of my present invention, it is believed it is not necessary to describe them more fully here. 40 indicates an S-fly of the well-known form and description which rotates in the direction indicated by the arrow on Fig. 1 and operates to deliver the folded papers produced

as hereinafter described to slow-moving tapes 41, also of any well-known and approved form and description.

Referring to deck B, 6<sup>b</sup> and 7<sup>b</sup> are form-cylinders adapted to receive plates or forms of one page each, two on each semicircumference, and placed in the same manner as above described when describing deck A. 8<sup>b</sup> and 9<sup>b</sup> indicate impression-cylinders which cooperate, respectively, with the form-cylinders 6<sup>b</sup> and 7<sup>b</sup>. 12<sup>b</sup> and 13<sup>b</sup> indicate ink-drums which are supplied with the usual ink-fountains 14<sup>b</sup> and 15<sup>b</sup> and ink-rolls 18<sup>b</sup> and 19<sup>b</sup>. 42, 43, 44, 45, and 46 indicate guide-rollers. 58 indicates a paster adapted to supply a longitudinal line of paste to the central longitudinal margin of the web F.

Referring to deck C, 6<sup>c</sup> and 7<sup>c</sup> indicate form-cylinders, and 8<sup>c</sup> and 9<sup>c</sup> impression-cylinders adapted to cooperate, respectively, with form-cylinders 6<sup>c</sup> and 7<sup>c</sup>. 12<sup>c</sup> and 13<sup>c</sup> indicate ink-drums which are supplied with ink through ink-fountains 14<sup>c</sup> and 15<sup>c</sup> and ink-rolls 18<sup>c</sup> and 19<sup>c</sup>. The form-cylinders 6<sup>c</sup> and 7<sup>c</sup> are like the form-cylinders 6 and 7 and receive forms in the same way as above described. 47, 48, 49, 50, and 51 indicate guide-rollers. 52 indicates a paster adapted to supply a longitudinal line of paste to the central longitudinal margin of the web G on its under side.

Referring to deck D, 6<sup>d</sup> and 7<sup>d</sup> indicate form-cylinders, and 8<sup>d</sup> and 9<sup>d</sup> impression-cylinders adapted to cooperate, respectively, with form-cylinders 6<sup>d</sup> and 7<sup>d</sup>. 12<sup>d</sup> and 13<sup>d</sup> indicate ink-drums supplied with ink through ink-fountains 14<sup>d</sup> and 15<sup>d</sup> and ink-rollers 18<sup>d</sup> and 19<sup>d</sup>. 53, 54, 55, 56, and 57 indicate guide-rollers.

When running to the full capacity—that is to say, running to produce a paper of sixteen pages—in the embodiment of my invention shown in the drawings the forms upon one semicircumference of each form-cylinder will be duplicates of the forms upon the opposite semicircumference of the same form-cylinder. Web E, passing over rollers 20 21, passes downward between form-cylinder 6 and impression-cylinder 8, where it is printed upon its under side with pages 2 and 15. The web then passing partially around impression-cylinder 8 and over and partially around impression-cylinder 9 passes between impression-cylinder 9 and form-cylinder 7, where it is printed upon the other side with pages 1 and 16. The web then passes partially under and around the roller 22, over paster 23, where it receives a line of paste upon its under side along the central longitudinal margin, over guide-rollers 24 to roller 29 and pulleys 30 at the base of the former 26. Web F, passing over guide-rollers 42 43, passes downward between form-cylinder 6<sup>b</sup> and impression-cylinder 8<sup>b</sup>, where it is printed upon the under side of the web with pages 4 and 13. Passing partially around and under impression-cylinder 9<sup>b</sup>, upward, over and partially around



impression-cylinder 9<sup>b</sup>, it passes downward between impression-cylinder 9<sup>b</sup> and form-cylinder 7<sup>b</sup>, where it is printed upon its other upper side with pages 3 and 14, the web thence passing downward under guide-roller 44, over pasters 58, where it receives a line of paste on its under side upon its central longitudinal margin, upward between rollers 45 46, over roller 29, to meet web E in register. Web G passes over rollers 47 48, downward between form-cylinder 6<sup>c</sup> and impression-cylinder 8<sup>c</sup>, where it is printed upon its under side with pages 6 and 11. Passing thence under and partially around impression-cylinder 8<sup>c</sup>, over and partially around impression-cylinder 9<sup>c</sup>, the web passes between impression-cylinder 9<sup>c</sup> and form-cylinder 7<sup>c</sup>, where it is printed upon its other or upper side with pages 7 and 12. Passing thence under roller 49, through pasting mechanism 52, where it receives a line of paste upon its central longitudinal margin, web G passes between guide-rollers 50 51 to meet the other webs in registry at the roller 29. Web H passes over rollers 53 54, upward between form-cylinder 6<sup>d</sup> and impression-cylinder 8<sup>d</sup>, where it is printed upon its under side with pages 8 and 9. Passing thence under and upward around impression-cylinder 8<sup>d</sup>, over and partially around impression-cylinder 9<sup>d</sup>, it passes between impression-cylinder 9<sup>d</sup> and form-cylinder 7<sup>d</sup>, where it is printed upon its upper side with pages 8 and 10. Passing thence downward and under roller 55, under roller 56, and between rollers 56 and 57, web H passes upward to meet the other webs in registry at roller 29. All four webs thus associated in registry pass downward over the former 26 and between folding-rolls 27 28, where the webs are folded longitudinally of their run, and along the central longitudinal margin of the web, which, however, forms the margin between the top and bottom of the pages, as hereinafter described. The webs thus folded once longitudinally of their run are led, as is best shown in Fig. 3, between the roller 35<sup>a</sup> and pulleys 36<sup>a</sup> to the second longitudinal-folding mechanism 31, and passing downward over the V-shaped former 32 and between the external turners or rollers 33 34 the webs are folded a second time longitudinally. Thence folded twice longitudinally the webs pass between the cutting-cylinder 35 and cutting and folding cylinder 36, where they are severed transversely upon every transverse margin and are thence folded by the folding-blades 39 at right angles to the two longitudinal folds between the folding-rollers 38 and delivered to the S-fly 40 and by it to the slow-moving tapes 41. The paper thus produced when all the folds except the first are opened out will be in the form shown in Fig. 4, which, as said above, is in legal-cap form—that is to say, page 1 will be read down from the folded margin to the edge of the sheet. The paper

will then be turned over in the same way in which legal-cap paper is turned, and page 2 upon the opposite side of the leaf from page 1 will be read downward from the edge toward the central margin, and the page-heading of page 1 will be at the central margin, the page-heading of page 2 at the edge, as shown at Fig. 5, and so on through the paper—that is to say, the odd-numbered pages will all have their heads at the central margin—that is, at the longitudinal fold first produced in the webs—and the even-numbered pages will have their heads at the edge of the sheets and will read downward toward the central margins, exactly as documents written upon both sides of legal-cap paper are read.

In case it is desired to produce a fourteen-page paper three of the webs will be run two pages wide, and the fourth web, preferably the bottom one, will be of half-width—that is to say, will be as wide as the page is long—and printed upon one end of the form-cylinders, the forms, of course, being omitted from the other end. In case a twelve-page paper is desired three only of the decks will be used; but they will be used upon paper two pages wide, as above described. In case a ten-page paper is desired three decks will be used, two of them printing from two-page-wide webs and the other, preferably the lower one of the three, employed from a half-width web.

It will be obvious from the above description that the press as embodied in the drawings will print four-page, six-page, eight-page, ten-page, twelve-page, fourteen-page, and sixteen-page papers, as may be desired.

I have shown and described my invention as embodied in a four-deck press. It is of course obvious that the number of decks might be varied and might be either more or less than four without departing from the object of my invention.

That which I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination with a plurality of printing mechanisms each adapted to perfect a web of paper, and each composed of coating form-cylinders and impression-cylinders, the said form-cylinders being adapted to receive on each semicircumference page-forms whose column-rules run parallel with the axis of the form-cylinder, and whose page-heads point in the same direction on the same cylinder, of mechanism adapted to bring the several webs together and associate them in register, a longitudinal-folding mechanism adapted to fold the associated webs longitudinally of the run of the webs between the pages and cutting mechanism adapted to sever the associated webs on every margin transverse the webs, substantially as described.

2. The combination with a plurality of printing mechanisms each adapted to perfect a web of paper, and each composed of coating form-



cylinders and impression-cylinders, the said form-cylinders being adapted to receive on each semicircumference page-forms whose column-rules run parallel to the axes of the form-cylinders, and with those page-heads on the form-cylinder which prints one side of its web pointing in one direction across the web, and with those page-heads on the form-cylinder which prints the other side of the web pointing in the opposite direction across the web, of mechanism adapted to bring

the several webs together and associate them in register, a longitudinal-folding mechanism adapted to fold the associated webs longitudinally of the run of the webs between the pages, and cutting mechanism adapted to sever the associated webs on every margin transverse the webs, substantially as described.

JOSEPH L. FIRM.

Witnesses:

C. E. PICKARD,

MINNIE A. HUNTER.