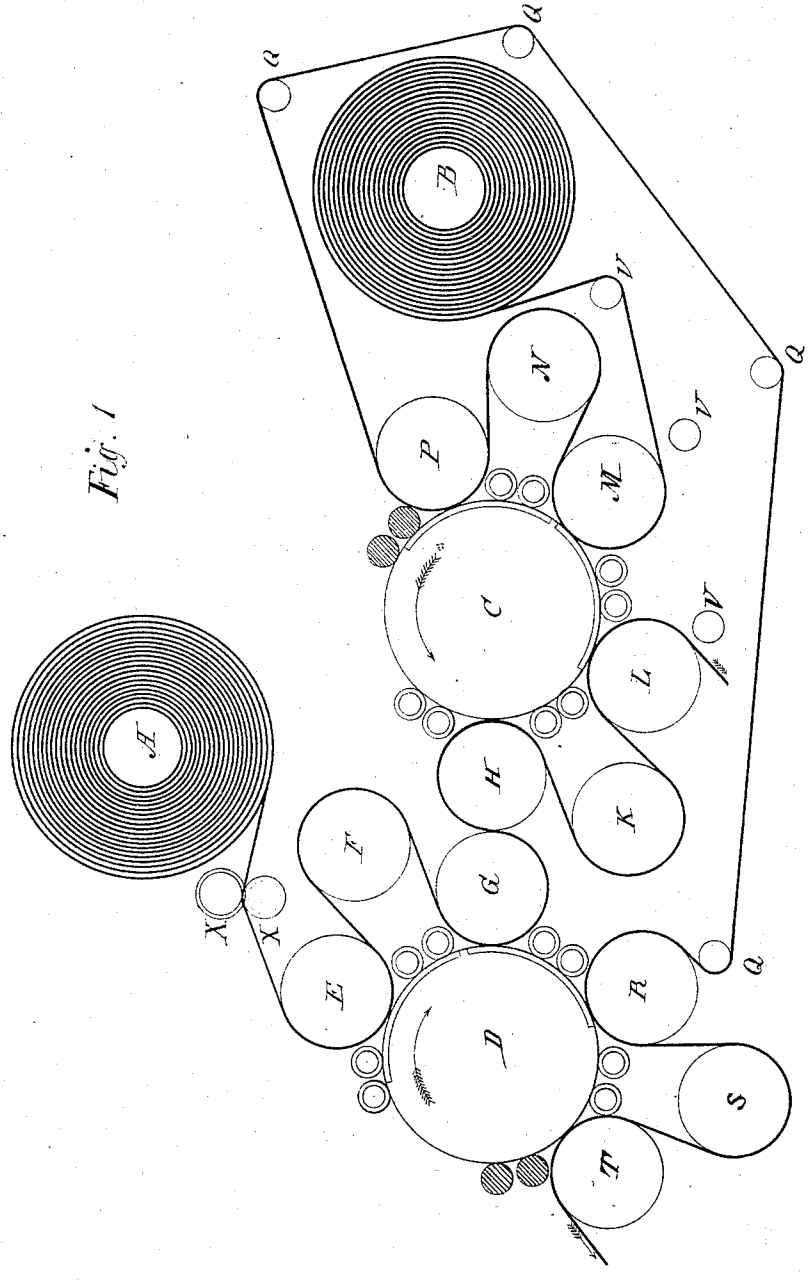
(No Model.) 7 Sheets—Sheet 1.

E. ANTHONY.

PRINTING MACHINE.

No. 314,556. Patented Mar. 31, 1885.

Fig. 1



WITNESSES:

I. N. Seely

F. L. Middleton

INVENTOR

Edwyn Anthony

BY Joyce & Green

ATTORNEY

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 7 Sheets—Sheet 2.

E. ANTHONY.

PRINTING MACHINE.

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Fig. 6.

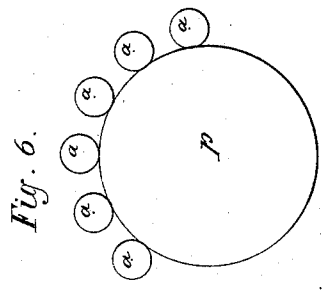


Fig. 2.

WITNESSES:

L. W. Seely

F. L. Middleton

INVENTOR

Edwyn Anthony

BY Joyce & Spear

ATTORNEY

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 7 Sheets—Sheet 3.

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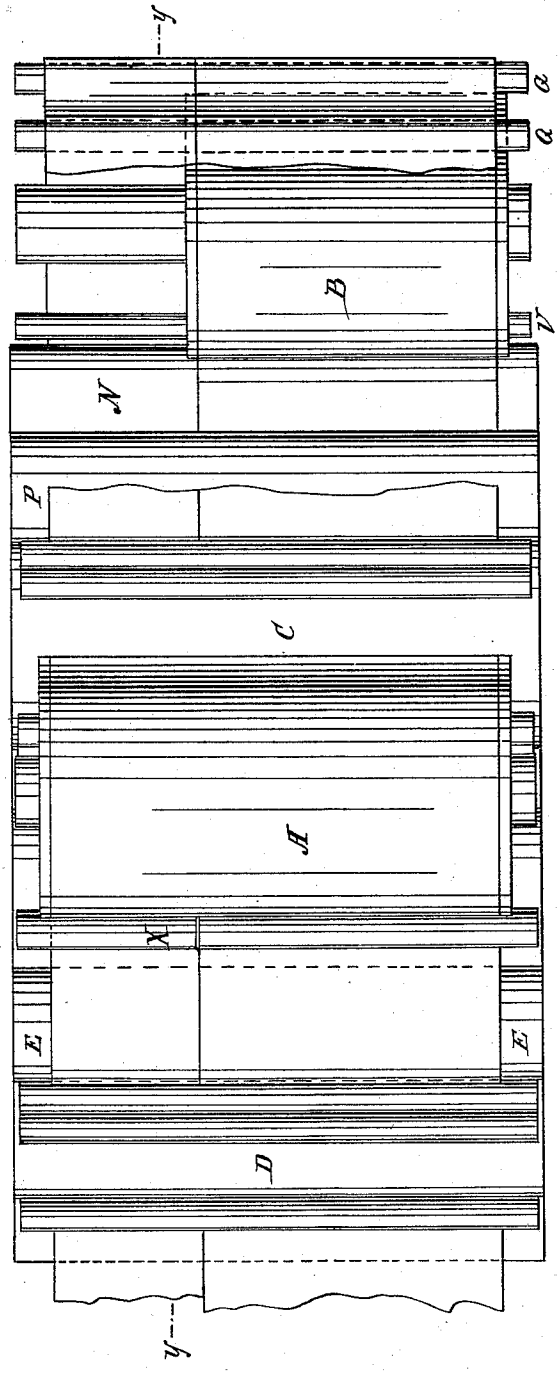


Fig. 3.

WITNESSES:

L. W. Seely

F. L. Middleton

INVENTOR

Edwyn Anthony

BY Joyce & Spear

ATTORNEY

N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.) 7 Sheets—Sheet 4.

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Fig. 4.

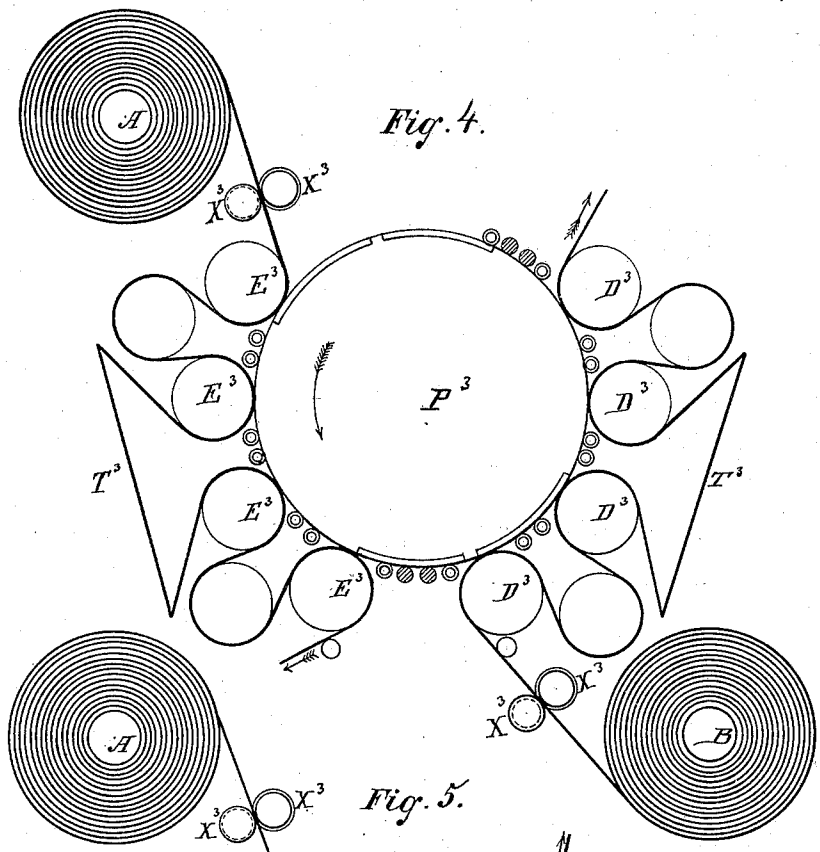
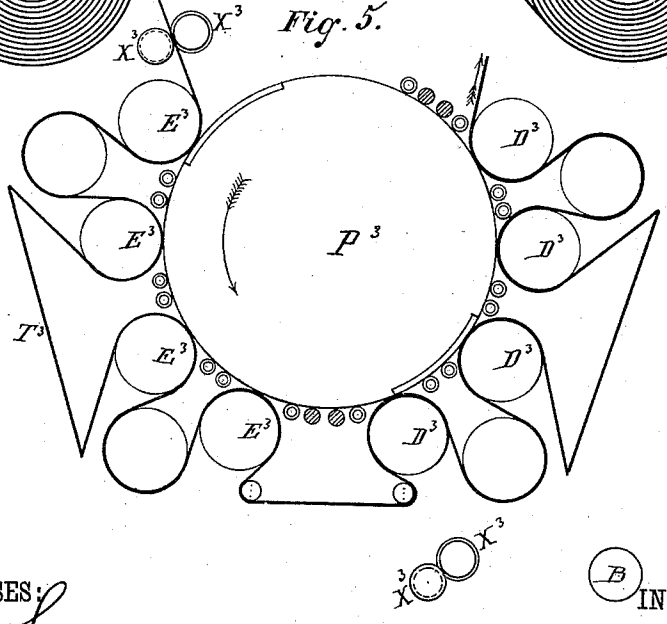


Fig. 5.



WITNESSES:

S. W. Luby

F. L. Middleton

B INVENTOR

Edwyn Anthony

BY Joyce & Spear

ATTORNEY

N. PETERS. Photo-Lithographer. Washington, D. C.

(No Model.) 7 Sheets—Sheet 5.

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Fig. 7.

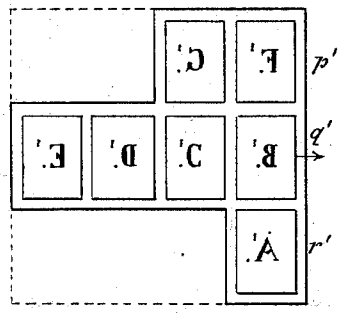


Fig. 15.

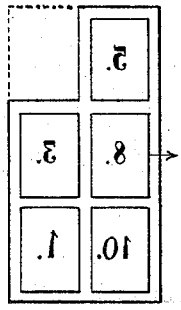


Fig. 8.

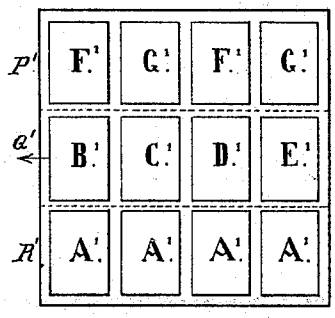


Fig. 9.

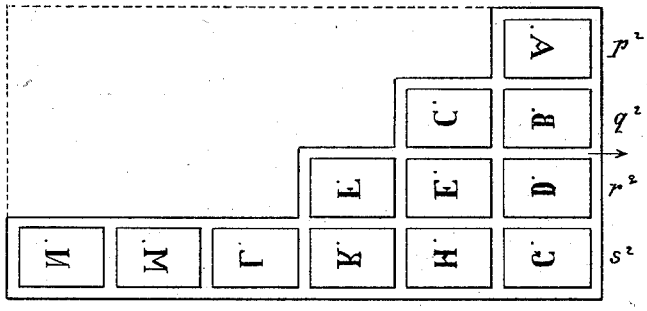
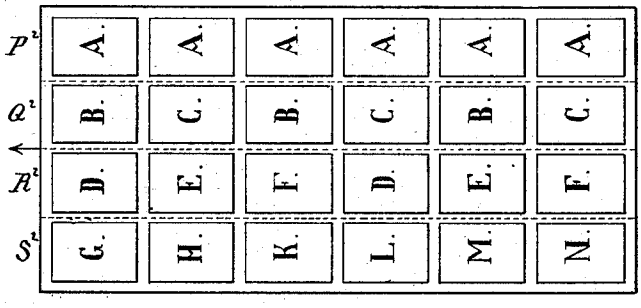


Fig. 10.



WITNESSES:

L. W. Seely

F. L. Middleton

INVENTOR

Edwyn Anthony

BY Joyce & Spear

ATTORNEY

N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.) 7 Sheets—Sheet 6.

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No. 314,556. Patented Mar. 31, 1885.

Fig. 11.

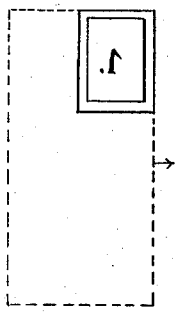


Fig. 12.

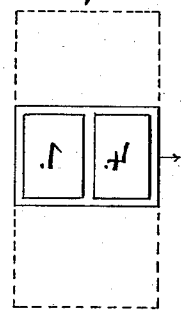


Fig. 13.

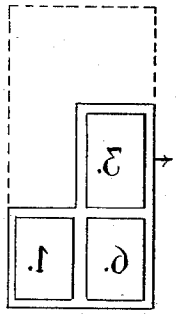


Fig. 14.

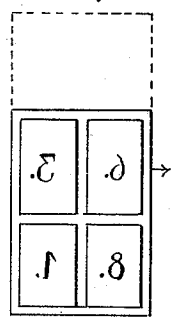


Fig. 16.

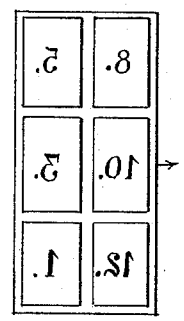
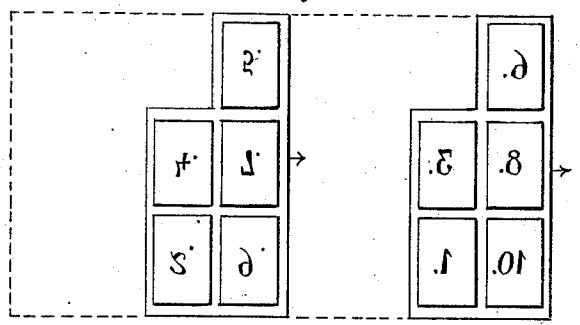


Fig. 17.



WITNESSES:

L. W. Seely

F. L. Middleton.

INVENTOR

Edwyn Anthony

BY Joyce & Green

ATTORNEY

N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.) 7 Sheets—Sheet 7.

E. ANTHONY.

PRINTING MACHINE.

No. 314,556. Patented Mar. 31, 1885.

Table W

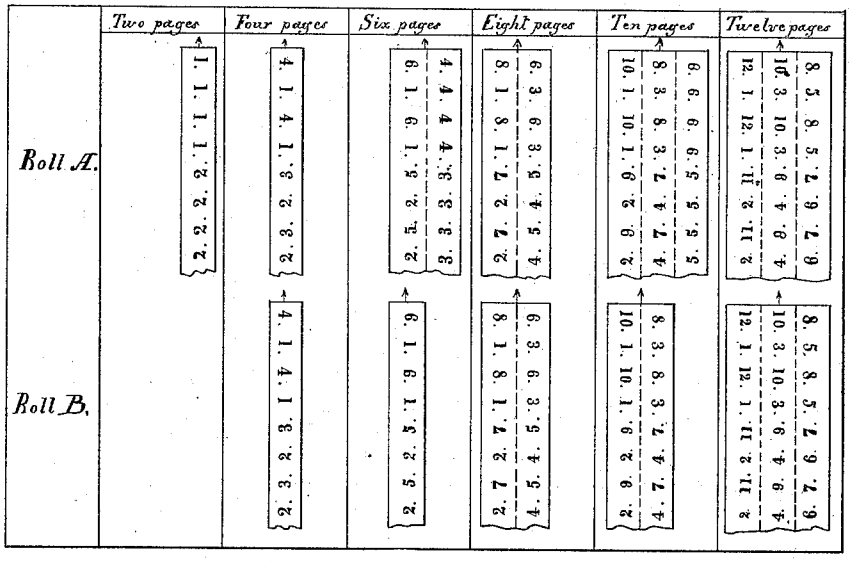


Table Y.

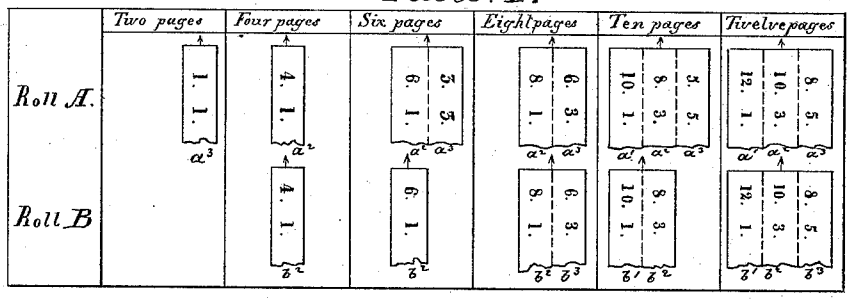
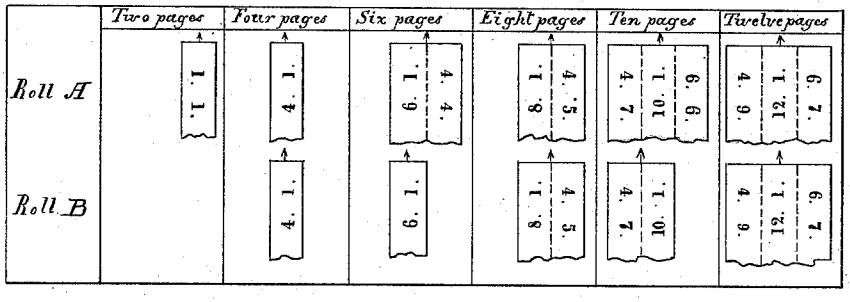


Table Z.



WITNESSES:

L. W. Seely

F. L. Middleton

INVENTOR

Edwyn Anthony

BY Joyce & Green

ATTORNEY

N. PETERS. Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

EDWYN ANTHONY, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO R. HOE & CO., OF NEW YORK, N. Y.

PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 314,556, dated March 31, 1885.

Application filed April 30, 1883. (No model.)

To all whom it may concern:

Be it known that I, EDWYN ANTHONY, a subject of the Queen of Great Britain, residing at Jersey City, county of Hudson, State of New Jersey, have invented a new and useful Improvement in Printing-Machines, of which the following is a specification.

The object of my invention is to print continuously on a web or webs, so that facilities are afforded for printing papers of various numbers of pages, and it can be fully understood from the description thereof hereinafter contained, and the accompanying drawings.

Figure 1 is a side elevation, and Fig. 3 a plan view, of a machine illustrating my invention, Fig. 2 being a sectional elevation on the line *y y* of Fig. 3. Fig. 4 is a side elevation, and Fig. 5 a sectional elevation near one side thereof, of another machine illustrative of this invention. Fig. 6 is a diagram illustrating a form-cylinder provided with six impression-cylinders. Fig. 7 shows an arrangement of the forms adapted to print the web illustrated by Fig. 8. Fig. 9 shows an arrangement of the forms adapted to print the web illustrated by Fig. 10. Figs. 11, 12, 13, 14, 15, and 16 show how the forms are placed on the form-cylinder of the machine illustrated by Figs. 1, 2, and 3. Fig. 17 shows how they may be placed when the machine illustrated by Figs. 4 and 5 is printing a ten-page paper, and Tables W, Y, and Z indicate how the webs issue in the several cases to which they refer.

As is well known, a web may be continuously printed on by a form-cylinder the whole of whose surface is not occupied by forms. The necessary conditions for this to be done (unless the system of oscillating cylinders is adopted which is described in an application filed by me on or about April 26, 1883, for Letters Patent for an improvement in printing-presses,) are, first, that the circumference of the form-cylinder is some multiple of the arc occupied by the forms, and, second, that the web is passed under impression-cylinders equal in number to the said multiple, the distance of travel between successive impression-cylinders being, of course, suitably arranged. Suppose, therefore, that we have (see Fig. 6) a form-cylinder, *p*, round which are placed six impression-cylinders, *a a*, &c. Then if *p* is entirely covered by forms, the web must be passed round only one of the cylinders *a*. If half its surface is so covered, the web must be passed round two of the cylinders *a;* if a third, round three; if a fourth, round four, and so on; and in each case the web will be continuously printed on. Now, suppose we have a web broad enough to have two or more forms abreast printed on it, and that before printing it we longitudinally split it into a corresponding number of narrow webs or strips, then one of the strips may be passed round one only of the impression-cylinders *a*, another round two only, another round three only, and so on, and all the strips will be continuously printed on provided that the section of the form-cylinder which prints the strip which passes under only one cylinder is completely occupied by forms, that the section which prints the strip passing under two impression-cylinders has one-half its surface occupied by forms, the section which prints the strip passing under three one-third of its surface, and so on. For example, suppose that forms are placed lengthwise on a form-cylinder, as indicated by Fig. 7, and that its circumference is such that the section *q'* is entirely occupied by the forms, then the section *p'* necessarily has half its surface and the section *r'* one-fourth of its surface occupied by forms. If, then, we have a three-breadth web and longitudinally split it before printing into three strips along the dotted lines in Fig. 8, and conduct the strip P' round two impression-cylinders, the strip Q' round one, and the strip R' round four impression-cylinders, it will issue continuously printed on, as indicated in Fig. 8. Again, suppose forms are placed lengthwise on a cylinder, as indicated in Fig. 9, the section s^2 being entirely occupied by forms, then one-half, one-third, one-sixth, respectively, of the sections r^2 q^2 p^2, respectively, will be occupied by forms; and if a four-breadth web is split longitudinally before printing into four strips, as indicated by the dotted lines in Fig. 10, and the strip P^2 (which is supposed to be printed by the section p^2) passed round six impression-cylinders, the

strip Q^2 (printed by q^2) round three, the strip R^2 (printed by r^2) round two, and the strip S^2 (printed by s^2) round one impression-cylinder, the webs will issue continuously printed on, as indicated by Fig. 10. It is evident that the circumference of the form-cylinder may be such that the section q', Fig. 7, or s^2, Fig. 9, has only one-half, or one-third, or &c. its surface occupied by forms, provided that the number of impression-cylinders round which the various strips pass are twice or thrice, or &c. times as numerous as when the whole surface is so occupied. Moreover, it is plain that the number of forms on the sections may be interchanged. Thus, in Fig. 9, the section p^2 might have three forms on it, q^2 have one, r^2 six, and s^2 three; and it is also evident that when the surface of any section of the form-cylinder is not wholly occupied by forms the said forms may be placed thereon in two or more distinct portions, instead of all together, as in Figs. 7 and 9.

Figs. 1, 2, and 3 illustrate the application of the foregoing considerations to a machine for printing a two, four, six, eight, ten, or twelve page paper, the forms being placed lengthwise on the machine, and no one of them being duplicated.

A B indicate two rolls of paper; C D, the form-cylinders; P M L H, impression-cylinders in connection with form-cylinder C; and T R G E, similar impression-cylinders in connection with form-cylinder D.

F S K N designate large carrier-cylinders, and Q V smaller ones.

X X mark a slitting mechanism for longitudinally dividing or splitting the web A, the structure being a lower cylinder having a cutting-groove, and an upper cylinder carrying a co-operating circular knife. The longitudinal dividing or splitting must take place along a line distant from one edge of the web by a third of its breadth. Of course, if desired, the slitting mechanism X X may be adapted to also split or divide the web along the line distant from the same edge by two-thirds of the web's breadth.

Figs. 11 to 16 show arrangements of the forms on one of the form-cylinders (the corresponding forms being, of course, similarly placed on the other) according as a two, four, six, eight, ten, or twelve page paper is being printed.

To print a twelve, eight, or four page paper, the webs are passed through the machine in the way shown by Fig. 1, the webs being three, two, or one breadth webs according as a twelve, eight, or four page paper is being printed.

To print a ten-page paper, the web B is a two-breadth web, (see Fig. 3,) and is passed through the machine as shown in Fig. 1. The web A is a three-breadth web, and having been longitudinally split by the slitting mechanism X X the two-breadth portion is conducted through the machine as shown in Fig. 1, while the one-breadth portion passes through it as shown by Fig. 2—*i. e.*, it passes round all the eight impression-cylinders.

Fig. 3 is a plan view of the machine when thus printing a ten-page paper.

To print a six-page paper, the web B is a one-breadth web, and is conducted as in Fig. 1. The web A is a two-breadth one, and having been longitudinally severed down its central line, one part is conducted as in Fig. 1, and the other as in Fig. 2.

To print a two-page paper, one single-breadth web is employed, and it is passed through the machine as in Fig. 2.

The number, breadth, and relative positions of the webs in the six different cases are exhibited in Table Y; and if the numbers of the forms correspond with the numbers in Figs. 11 to 16 the pages will be imprinted in the order exhibited by Table Y. By varying the positions of the numbers in Figs. 11 to 16 the order of the pages on the webs may of course be varied, and different arrangements will be suitable for different folding mechanisms.

As the folding of the webs forms no part of this invention, it is unnecessary to enter upon that subject. It may, however, be well to briefly point out that the webs in Table Y may be easily brought into four-page form. Mechanism should be provided for longitudinally slitting the webs into one-breadth strips, as indicated by the dotted lines in the table. There should be a pair of transverse-cutting cylinders capable of severing the web into sheets two pages broad (measured in the direction of the motion) and long enough to cut a two-breadth web, and in connection therewith a folding mechanism capable of folding two side-by-side streams in four-page form, the pages lying the same way up in each stream. There should be another pair of transverse-cutting cylinders capable of severing the web into sheets one page broad (measured in the direction of the motion) and long enough to cut a one-breadth web. After cutting, one sheet should go direct to the before-mentioned folding mechanism, and the succeeding one pass first through any suitable device which will transfer it laterally (without reversing it) by just its breadth, and then go to the before-mentioned folding mechanism, and so on with succeeding sheets. Now, the strip b^2, Table Y, must be conducted direct to the aforesaid large pair of cutting-cylinders. The strip b' must be transferred laterally by any suitable device, so as to come on the top of the strip b^2, and then pass to the large pair of cutting-cylinders. The strip b^3 should be transferred laterally underneath the strip b^2, and then pass to the large pair of cutting-cylinders. The strip a^2 should be transferred laterally onto the top of the strip a^3, and then pass to the large pair of cutting-cylinders. The strip a' should be transferred laterally onto the strip a^3, (the strip a^2 being between them,) and then pass to the large pair of cutting-cyl-

inders; and, lastly, the strip a^3 must be at pleasure able to be conducted to the large pair of cutting-cylinders or to the smaller pair.

By the above method the webs may be folded without any adjustment for different numbers of pages, further than when an eight or twelve page paper is being printed the strip a^3 must be conducted to the large pair of cutting-cylinders, and when a two, six, or ten page paper is being printed it must be conducted to the small pair of cutting-cylinders.

Table Z exhibits a different order of the pages on the web, and would require different and in general more complicated manipulation to that indicated above. It is evident that the circumference of either of the form-cylinders C D may be three, or four, or &c. times the breadth of two forms instead of, as in the figures, twice the said breadth, the number of impression-cylinders being correspondingly increased; or, instead, the circumference of either form-cylinder C or D, or both, may be exactly the breadth of two forms, when only half the number of impression-cylinders would be required to what are shown in the figures. It is also clear that the axes of the cylinders, instead of being parallel, might be inclined at an angle to one another, (the webs of course being suitably conducted from one to the other)—for example, as in Patent No. 265,233, dated October 3, 1882; or, again, the forms may be distributed among three cylinders—for example, as shown in Patent No. 267,313, dated November 7, 1882. Thus, referring to Figs. 2 and 5 of the last-mentioned patent, to print a ten-page paper the web No. 1 must be a two-breadth web, and conducted as shown in Fig. 2 of the said specification, and the web No. 2 be a three-breadth web, which, after longitudinally slitting, must be conducted two breadths of it as shown in Fig. 2, and one breadth of it as shown in Fig. 5 of the said specification, and of course the lengths of the circumferences of the form-cylinders A B C may be other than is there shown. Thus C may be once, or twice, or four times, or &c. times the breadth of two pages, instead of three times.

My invention is also applicable when the forms are all placed in one cylinder, as in Patent No. 212,880, dated March 4, 1879. Figs. 4 and 5 illustrate an application of it to this case.

P^3 indicates the form-cylinder, D^3 the impression-cylinders on one side the machine, and E^3 those on the other, T^3 indicating the turning apparatus.

X^3 X^3 designate the splitting mechanism for splitting the webs longitudinally, each web being divided into three one-breadth webs. Each of the turners T^3 must not be (as in the aforesaid patent) a single turner adapted to reverse one broad web, but must be what may be called a kind of "triplicate" turner, (such as are described in an application for Letters Patent for an improvement in printing-presses, filed May 18, 1883,) which will reverse without lateral transfer each of the three strips.

Table W exhibits the number, breadths, and relative positions of the webs for printing any paper from two to twelve pages, inclusive, and by suitably arranging the forms on the form-cylinder the pages may appear on the webs in the order indicated by the table. Thus, if the forms are arranged on the form-cylinder as in Fig. 17, the webs will be printed as Table W indicates for a ten-page paper. The course of the webs in the various cases is easily understood.

For a four, an eight, or a twelve page paper, two webs are employed, each being a one, a two, or a three breadth web, according as a four, an eight, or a twelve page paper is being printed; and the webs pass through the machine as indicated by Fig. 4. For a two-page paper, one one-breadth web is employed, and it passes through the machine as shown in Fig. 5. For a six-page paper, the web B is a one-breadth web and its course as indicated in Fig. 4. The web A is a two-breadth web, one strip of which passes through the machine as in Fig. 4, and the other as in Fig. 5. For a ten-page paper, the web B is a two-breadth web, and each strip goes through the machine, as indicated in Fig. 4. The web A is a three-breadth one, two of the strips going as indicated in Fig. 4, and one of them as in Fig. 5. After printing, the webs may be brought into folding form by any suitable devices. As before remarked, it is needless to enter on that subject, as the present invention does not relate thereto. By modifying the turners T^3 so that each strip is not separately reversed, and correspondingly changing the order of the forms on the form-cylinder, the order of the pages on the web may be caused to differ from that shown in Table Z, and possibly an order may be obtained more convenient for after-folding processes than the one here shown. The circumference of the form-cylinder P^3 may of course be twice, or six times, or &c. times the breadth of two forms, instead of four times, as in the figures.

It is evident that the longitudinal splitting must be made before the web is completely printed on, but that the mechanism for the purpose may be situated anywhere so long as the web reaches it before the course of different portions becomes different. Thus, in Figs. 4 and 5, the splitting mechanism X^3 X^3 may be placed at any convenient point of the web's traverse so long as the splitting of the webs is accomplished before the second printing is effected, as during that operation the several strips or webs take different courses. Again, in Figs. 1 and 2, the web A may be longitudinally split anywhere between the roll A and the carrier-cylinder H. It is also obvious that all the foregoing applies when the webs are transversely severed before printing, the sheets being suitably conducted between tapes.

What I claim herein as my invention is—

1. In a printing-press, a plurality of impression and carrier cylinders and a form-cylinder (long enough to receive two or more forms abreast) on which a plurality of forms are fixed in such a way that the number of them in the direction of the cylinder's motion is not the same for each section of the cylinder, all substantially as described.

2. In a printing-press, the combination of a cylinder (long enough to receive two or more forms abreast) on which a plurality of forms are fixed in such a way that the number of them in the direction of the cylinder's motion is not the same for each section of the cylinder, with mechanism for longitudinally severing a web (or sheets in tapes) before it has been completely printed on, and impression and carrier cylinders whereby the severed strips are continuously printed on but do not all pass round the same number of impression-cylinders and do not all receive impressions from the same number of forms, all substantially as described.

EDWYN ANTHONY.

Witnesses:
CHAS. RAETTIG,
G. C. R. DROEGE.