C. A. KELLOGG.

PRINTING MACHINE.

APPLICATION FILED APR. 6, 1909.

1,153,315.

Patented Sept. 14, 1915.

9 SHEETS—SHEET 1.

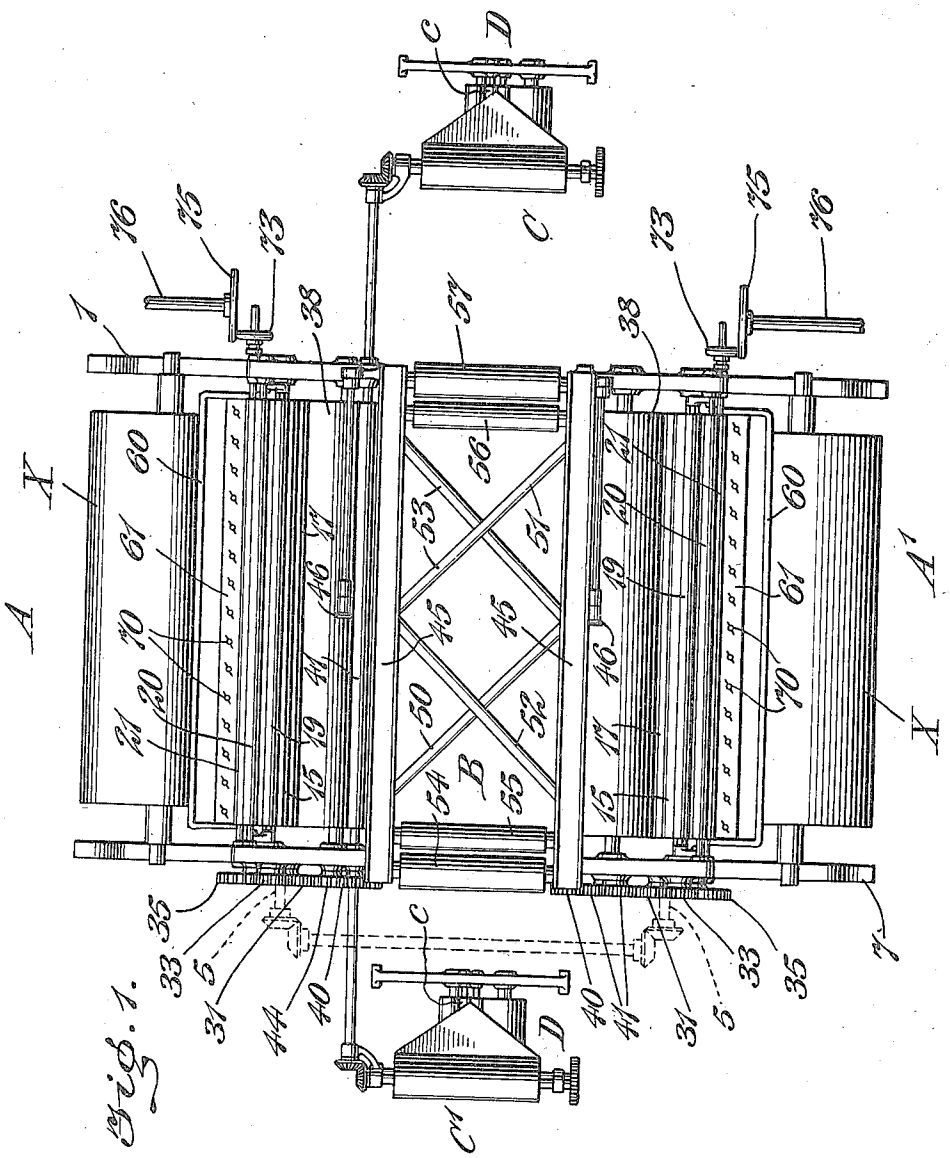


Fig. 1.

WITNESSES

H. C. Abbott

Hay Brunneke.

INVENTOR

Carl A. Kellogg

BY

ATTORNEY

C. A. KELLOGG.

PRINTING MACHINE.

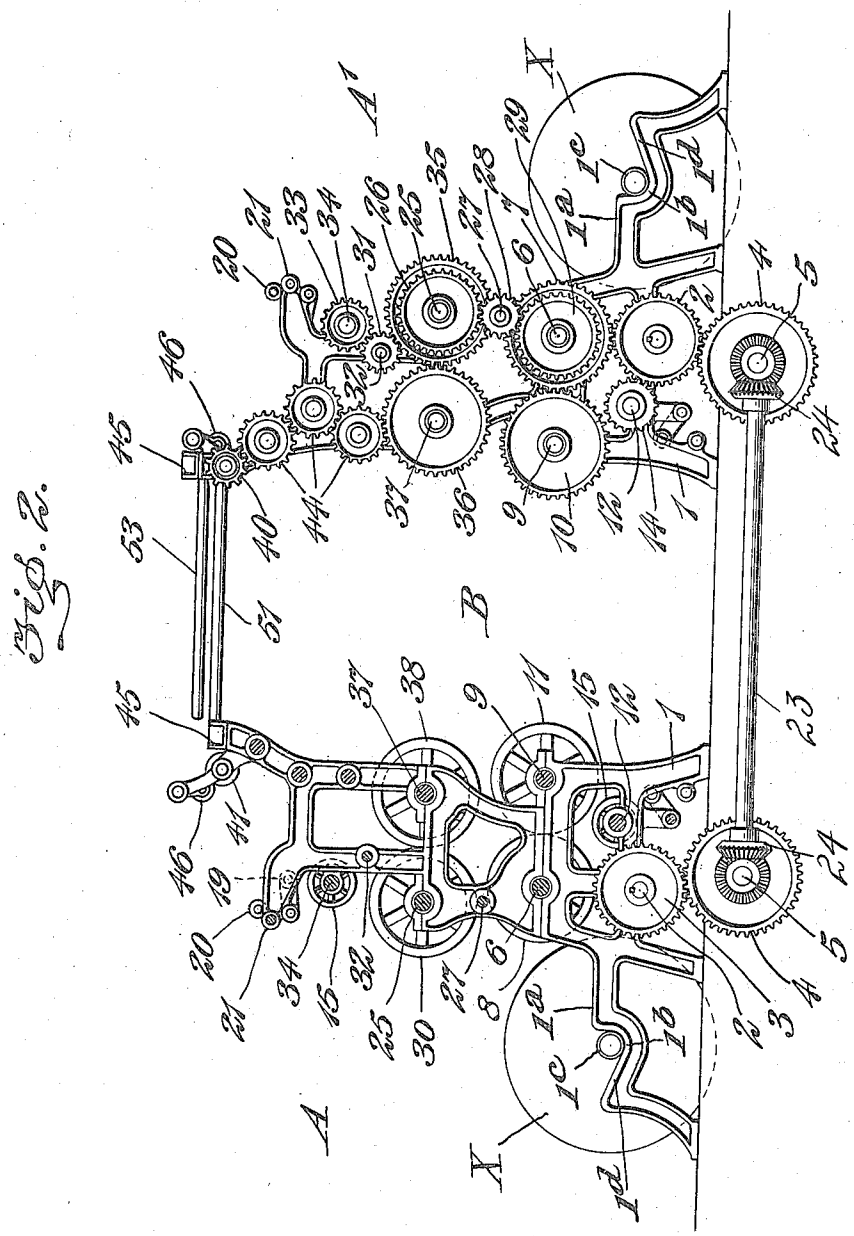
APPLICATION FILED APR. 6, 1909.

1,153,315.

Patented Sept. 14, 1915.

9 SHEETS—SHEET 2.

Fig. 2.



WITNESSES

M. C. Abbott

Kay Kammeke.

INVENTOR

Carl A. Kellogg

BY

ATTORNEY

C. A. KELLOGG.

PRINTING MACHINE.

APPLICATION FILED APR. 6, 1909.

1,153,315.

Patented Sept. 14, 1915.

9 SHEETS—SHEET 3.

Fig. 3.

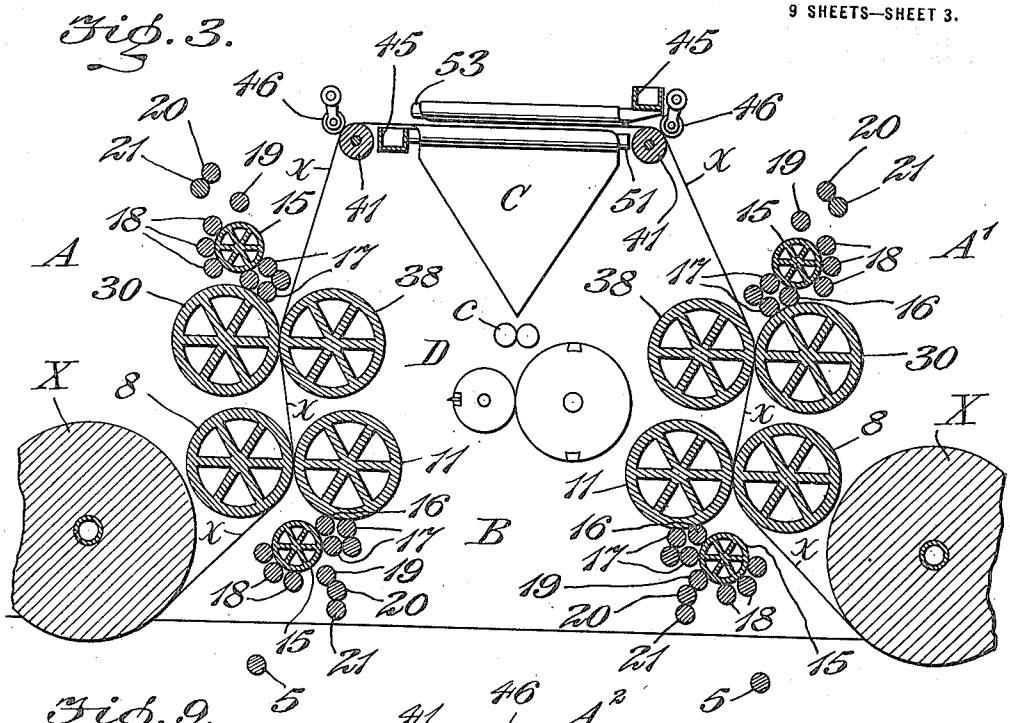


Fig. 9.

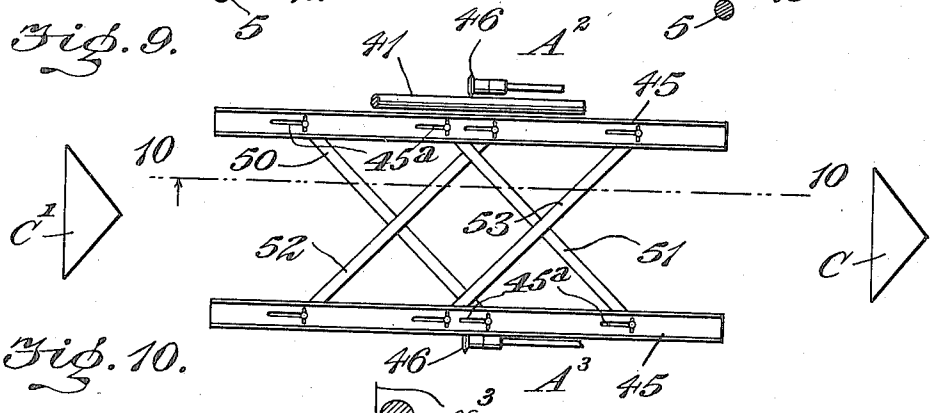
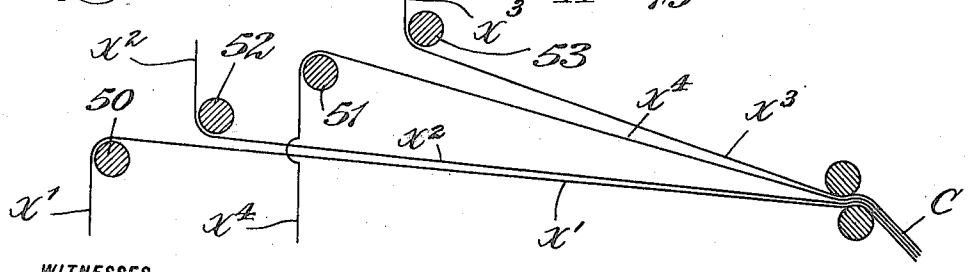


Fig. 10.



WITNESSES

H. C. Talbott

Ray Hammake

INVENTOR

Carl A. Kellogg

BY

ATTORNEY

C. A. KELLOGG.

PRINTING MACHINE.

APPLICATION FILED APR. 6, 1909.

1,153,315.

Patented Sept. 14, 1915.

9 SHEETS—SHEET 4.

Fig. 7.

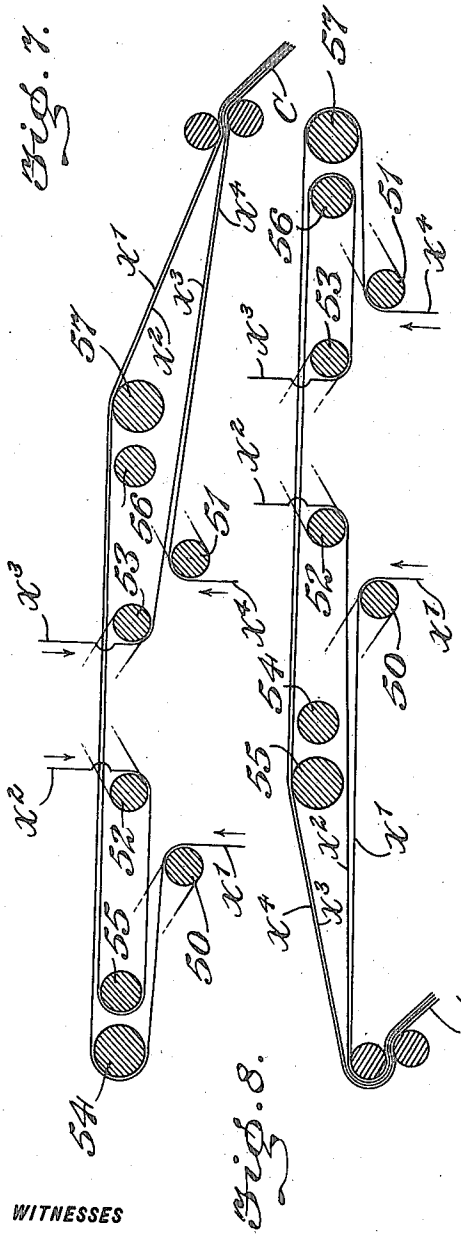


Fig. 8.

Fig. 5.

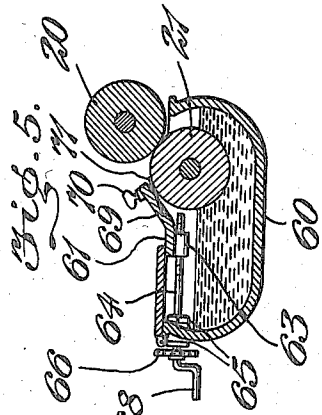
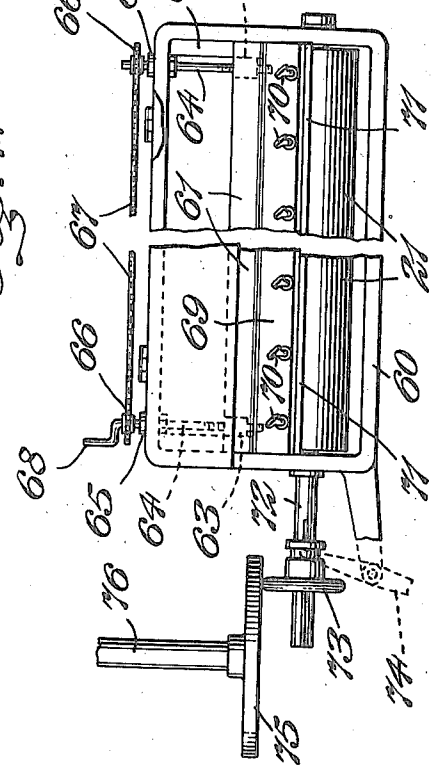


Fig. 4.



WITNESSES

P. C. Abbott

Kay Bannuke

INVENTOR

Carl A. Kellogg

BY

ATTORNEY

C. A. KELLOGG.

PRINTING MACHINE.

APPLICATION FILED APR. 6, 1909.

1,153,315.

Patented Sept. 14, 1915.

9 SHEETS—SHEET 5.

Fig. 21.

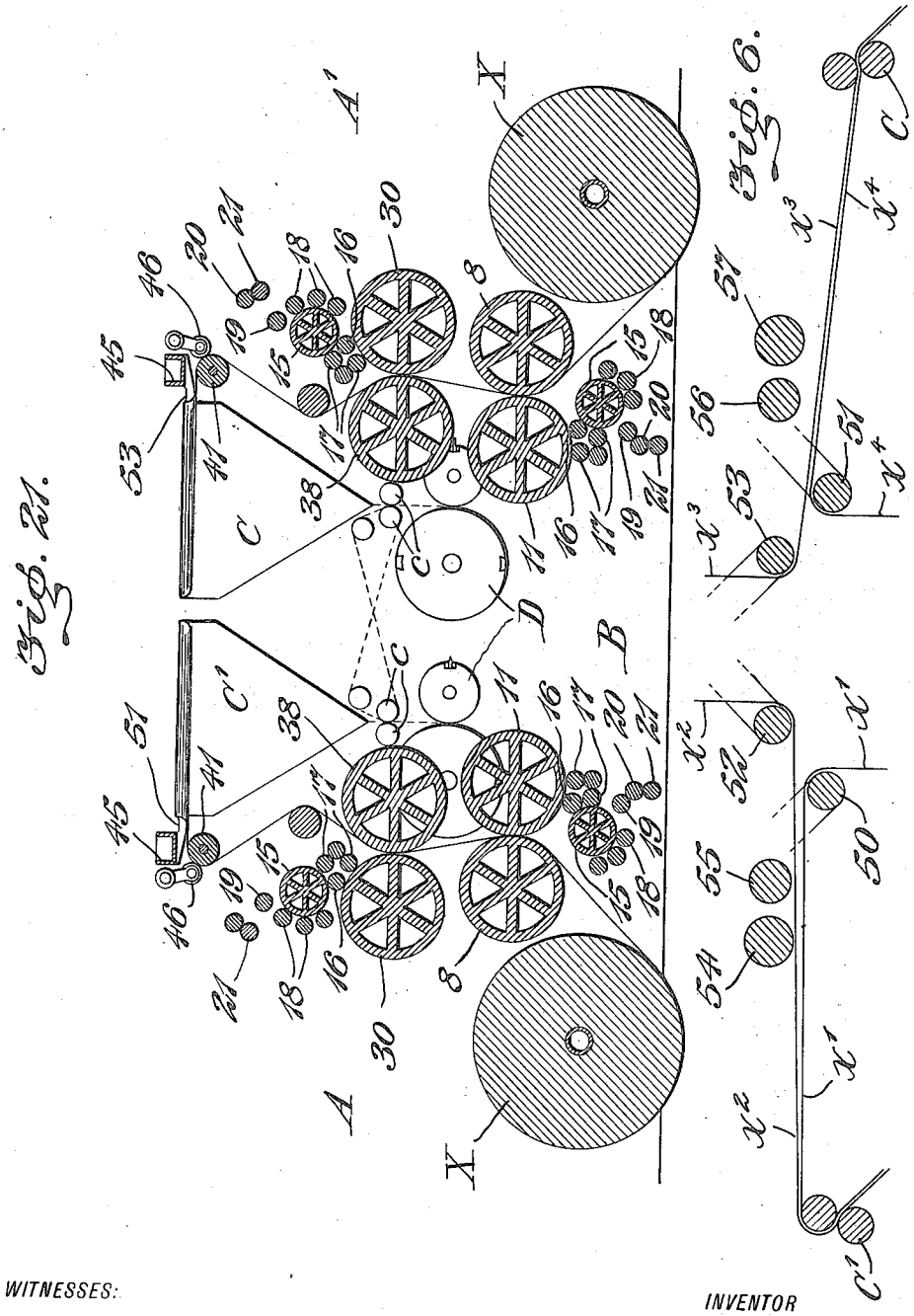


Fig. 6.

WITNESSES:

P. C. Ellett

Hey Hammeke.

INVENTOR

Carl A. Kellogg

BY

ATTORNEY

C. A. KELLOGG.

PRINTING MACHINE.

APPLICATION FILED APR. 6, 1909.

1,153,315.

Patented Sept. 14, 1915.

9 SHEETS—SHEET 6.

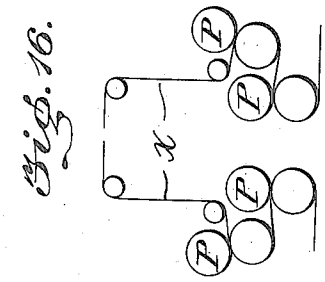


Fig. 16.

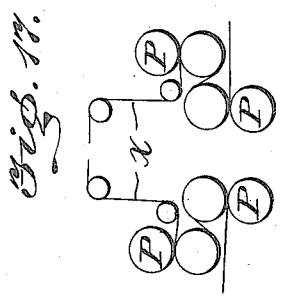


Fig. 17.

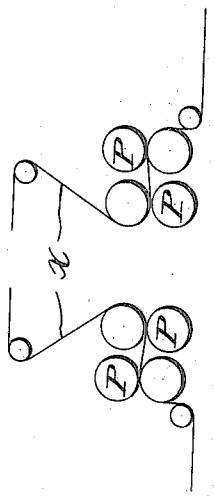


Fig. 13.

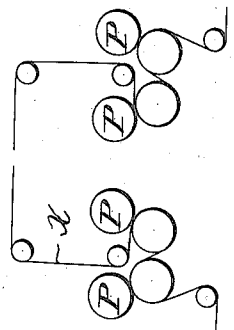


Fig. 14.

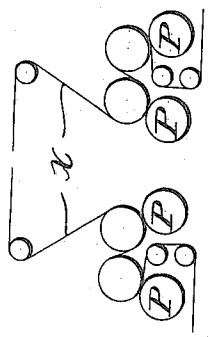


Fig. 15.

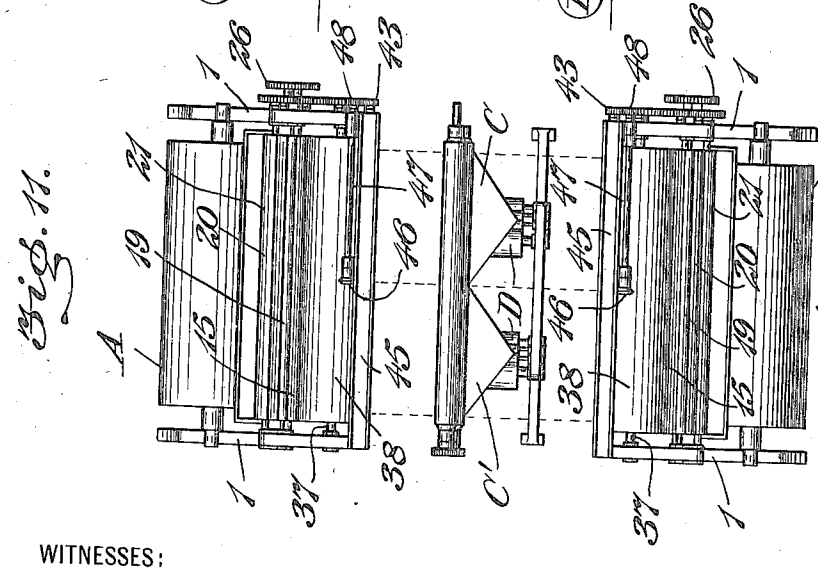


Fig. 11.

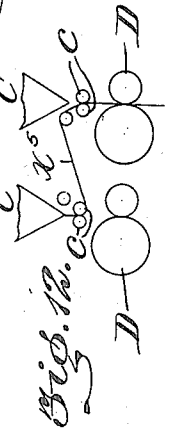


Fig. 12.

WITNESSES:

H. C. Abbott

Kay Hannecke

INVENTOR

Carl A. Kellogg

BY

ATTORNEY

C. A. KELLOGG.

PRINTING MACHINE.

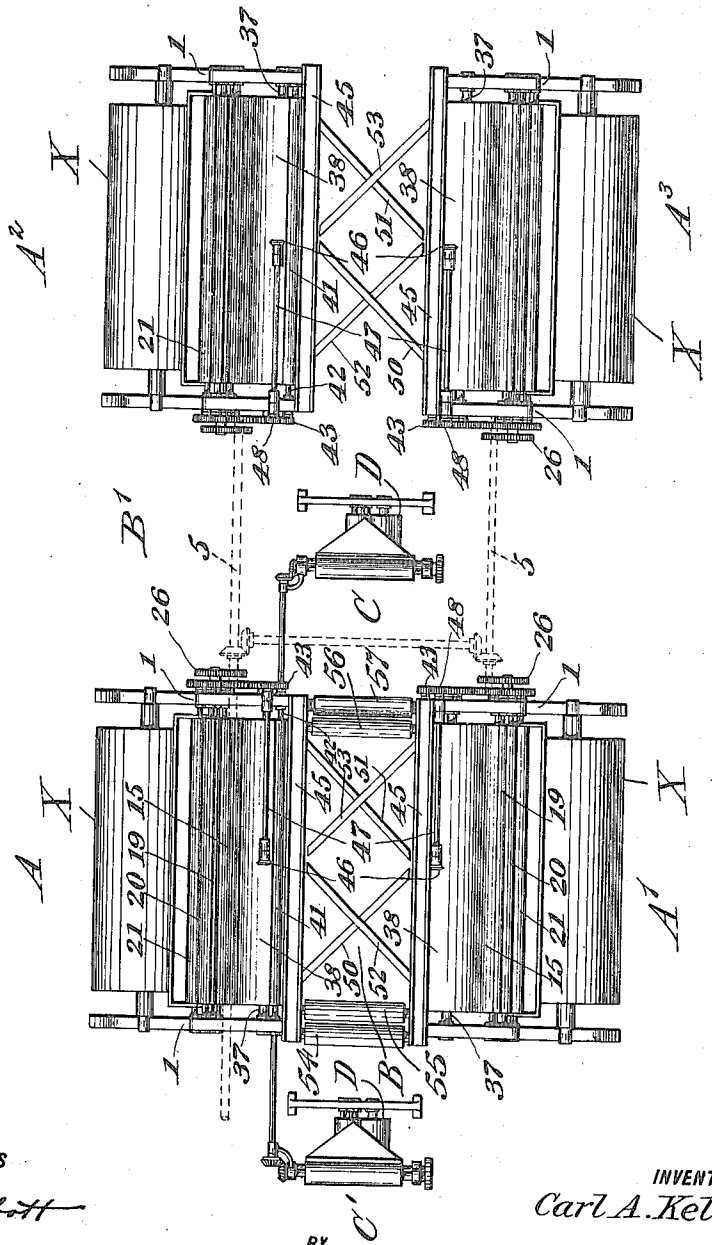
APPLICATION FILED APR. 6, 1909.

1,153,315.

Patented Sept. 14, 1915.

9 SHEETS—SHEET 7.

Fig. 18.



WITNESSES

P. C. Abbott

Kay Hanneke

INVENTOR

Carl A. Kellogg

BY

ATTORNEY

C. A. KELLOGG.

PRINTING MACHINE.

APPLICATION FILED APR. 6, 1909.

1,153,315.

Patented Sept. 14, 1915.

9 SHEETS—SHEET 8.

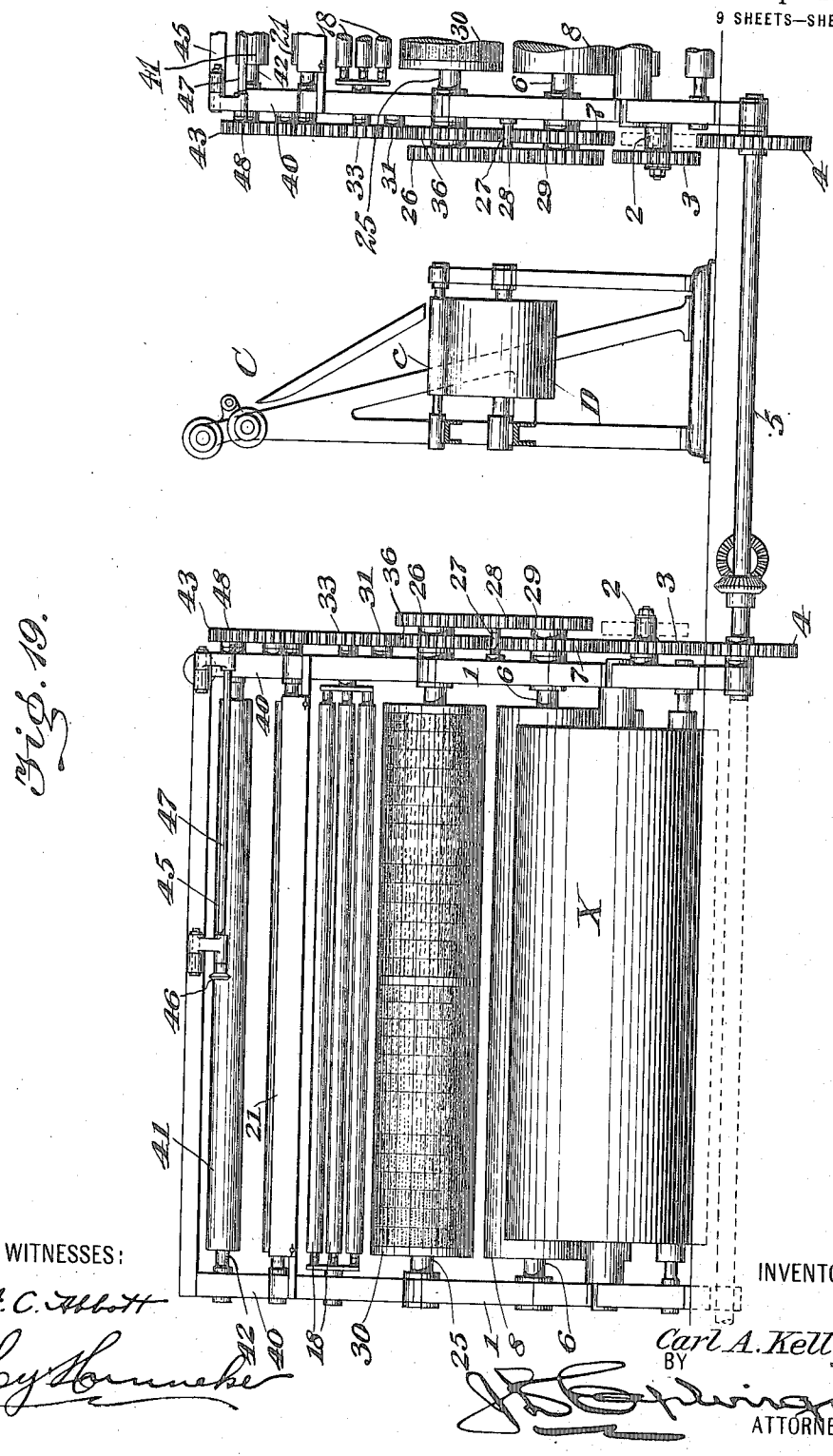


Fig. 19.

WITNESSES:

P. C. Abbott

Roy Hammeke

INVENTOR

Carl A. Kellogg

BY

ATTORNEY

C. A. KELLOGG.

PRINTING MACHINE.

APPLICATION FILED APR. 6, 1909.

1,153,315.

Patented Sept. 14, 1915.

9 SHEETS—SHEET 9.

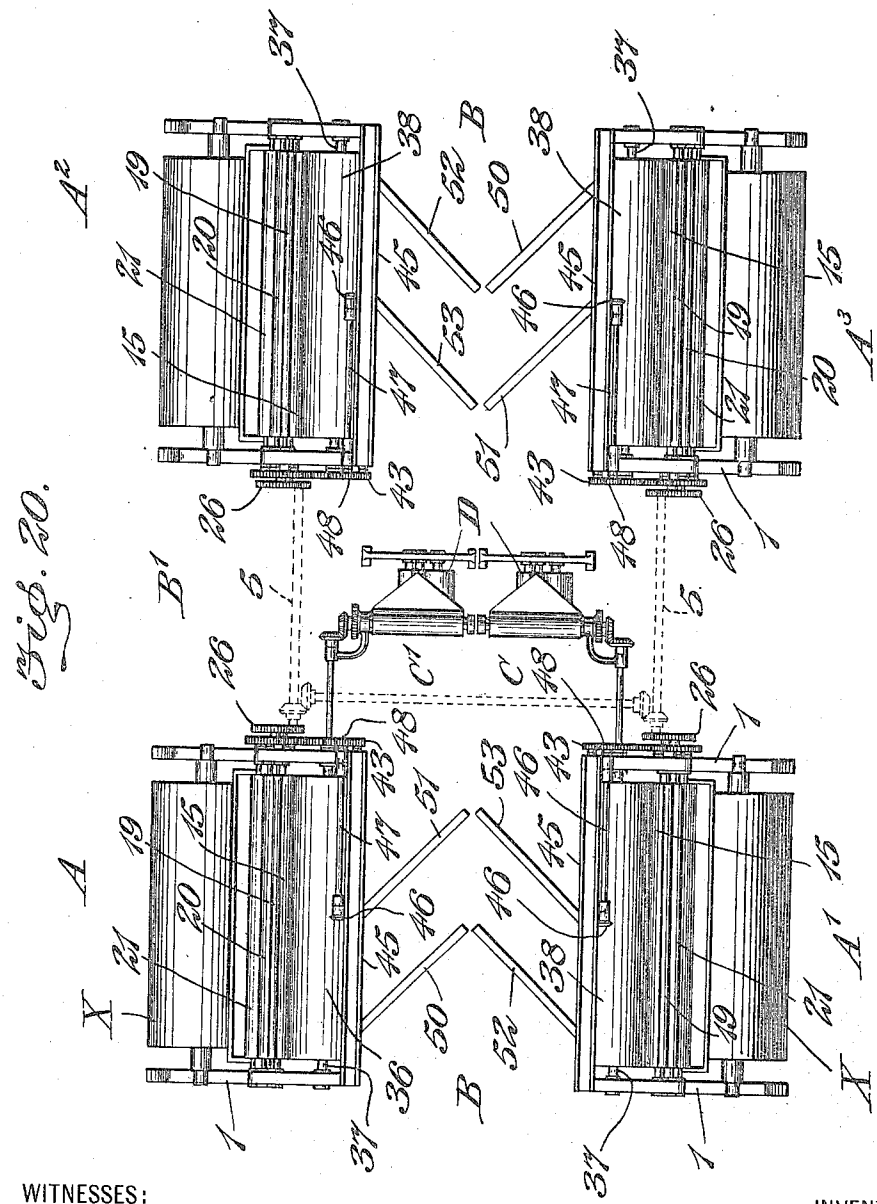


Fig. 20.

WITNESSES:

H. C. Elliott

Hey Hunnicke

INVENTOR

Carl A. Kellogg

BY

ATTORNEY

UNITED STATES PATENT OFFICE.

CARL A. KELLOGG, OF BATTLE CREEK, MICHIGAN.

PRINTING-MACHINE.

1,153,315. Specification of Letters Patent. Patented Sept. 14, 1915.

Application filed April 6, 1909. Serial No. 488,173.

To all whom it may concern:

Be it known that I, CARL A. KELLOGG, a citizen of the United States, and a resident of Battle Creek, in the county of Calhoun and State of Michigan, have invented certain Improvements in Printing-Machines, of which the following is a specification.

This invention relates to certain improvements in rotary printing machines of the web perfecting type, such as are particularly designed and adapted for use in newspaper and magazine printing and the like, and the object of the invention is to provide a machine of this general character of a comparatively simple nature, which shall present certain features of novelty and improvement whereby the parts are rendered more readily accessible, and various other advantages are attained, and wherein the various parts are so compactly arranged and constructed as to occupy comparatively small floor space.

The invention consists, in part, in a printing machine of this general character having two printing couples lapped one over the other and located in parallel planes closely adjacent to each other with their bites opposite and in alinement to permit the passage of the web to be perfected, wherein both cylinders of each couple are extended along and exposed at the sides of the machine, so as to be readily accessible for plating and packing.

The invention also consists in a printing machine having this arrangement of printing couples, wherein the cylinders of one couple are positioned slightly out of alinement with those of the other couple, so as to afford greater contact of the web upon the respective impression cylinders, and wherein the plate cylinders, being positioned at opposite sides of the frame of the machine, are caused to project beyond the impression cylinders to an extent sufficient to permit convenient application of the plates thereto.

The invention also consists, in part, in a printing machine having two units set up side by side and each adapted to perfect a web, a plurality of cutting mechanisms alined with each other and centrally positioned with relation to said units, and means for directing the webs of both units in the same order to each such cutting mechanism.

The invention also consists in a machine of this character wherein the perfecting units are spaced from each other to produce a passage central between the units and affording access to the adjacent sides thereof, said passage being adapted to be traversed by the webs from both machines, and wherein the cutting mechanisms are set up in alinement with said passage in position for receiving the webs traversing the same.

The invention also consists, in part, in a printing machine having two web perfecting units set up side by side, similarly inclined formers arranged at opposite ends of the machine and centrally positioned with relation to the respective web perfecting units, and reversely inclined angle bars extended between said formers and arranged to deflect the webs from both units to each of said similarly inclined formers.

The invention also consists in a printing machine of this general character having two pairs of crossed angle bars between its formers, each pair of angle bars being adapted to direct a web from each perfecting unit to one of said formers, wherein means are provided for reversing the direction of the webs passing each pair of angle bars to permit of directing the webs of both units in the same order to each former.

The invention also consists, in part, in a printing machine having four web perfecting units set up in two pairs, the units of each pair being side by side, and said pairs being set up with their units end to end, a passage extended between the units at the central part of the machine, two cutting mechanisms set up in alinement with said passage, and means for directing the webs from the units of both pairs in the same order to each such cutting mechanism.

The invention also consists in a printing machine having a driven plate cylinder, and inking apparatus for supplying ink to said plate cylinder, and having a fountain, a fountain-roller adapted to be supplied with ink from the fountain, and variable means for controlling the supply of ink from the fountain to the fountain roller.

The invention also consists in certain novel features of the construction, and combinations and arrangements of the several parts of the improved printing machine, whereby certain important advantages are attained, and the machine is rendered sim-

pler, less expensive, and otherwise better adapted, and more convenient for use, all as will be hereinafter fully set forth.

The novel features of the invention will be carefully defined in the claims.

In order that my invention may be the better understood I will now proceed to describe the same with reference to the accompanying drawings, wherein—

Figure 1 is a plan view of a quadruplex printing machine provided with my improvements; Fig. 2 is a sectional end elevation of the machine shown in Fig. 1, illustrating certain features of the driving devices, the folders being omitted, and the gears of one of the web perfecting units being removed to illustrate certain details which would otherwise be hidden; Fig. 3 is a vertical section taken transversely through the machine illustrated in Figs. 1 and 2, showing the relation of the web perfecting units to one of the cutting mechanisms, but with the frame omitted; Fig. 4 is an enlarged fragmentary plan view showing certain features of the inking apparatus comprised in my invention; Fig. 5 is a sectional view taken transversely through one of the ink fountains and showing certain features of improvement to be hereinafter referred to; Fig. 6 is a somewhat diagraphic view showing the arrangement of the angle bars and carrying rolls and their relation to the folding and cutting mechanisms, and illustrating the manner in which one web of each of the perfecting units may be directed to each of the said mechanisms to permit the press to be run at full capacity upon small work; Fig. 7 is a diagraphic view somewhat similar to Fig. 6, but showing the manner in which the webs of both of the perfecting units may be directed to one of the folding and cutting mechanisms; Fig. 8 is a diagraphic view similar to Figs. 6 and 7, but illustrating the manner in which the webs of both the perfecting units may be carried in the same order to the other folding and cutting mechanism; Fig. 9 is a view illustrating certain features of a modified formation of quadruplex printing machine embodying my improvements; Fig. 10 is a diagraphic view somewhat similar to Figs. 6, 7 and 8, but illustrating the course of the web in the machine constructed as shown in Fig. 9; Fig. 11 is a plan view somewhat similar to Figs. 1 and 9, but illustrating a third modified formation of the quadruplex printing machine embodying my invention; Fig. 12 is a somewhat diagraphic view illustrating the path of the web when transferred from one cutting and folding mechanism of the machine shown in Fig. 11 to the other; Figs. 13, 14, 15, 16 and 17 are diagraphic views drawn to a small scale, and illustrating modified arrangements of the printing couples comprised in my present invention; Fig. 18 is a plan view somewhat similar to Figs. 1, 9 and 11, showing the application of my improvements to an octuplex printing machine; Fig. 19 is an enlarged fragmentary side elevation of the octuplex machine shown in Fig. 18; Fig. 20 is a plan view similar to Fig. 18, but illustrating a modified formation of the octuplex printing machine shown in said figure, and Fig. 21 is a diagraphic view illustrating the path of the web when transferred from one cutting and folding mechanism of the machine shown in Fig. 20 to the other.

In these views I have shown my improvements applied to a variety of printing machines of different capacity, each of which comprises one or more unitary printing machines. Each such unitary machine is, in itself, a complete perfecting press, and its cylinders may have any desirable length, according greater or less capacity. In the drawings I have illustrated these unitary machines made of four plate width, but it will be evident that they may be made two plate, three plate or five plate width when desired. As herein shown, each such unitary machine comprises a frame 1 of suitable construction, at the lower part of one end of which is journaled a stub shaft 2, whereon is mounted a gear wheel 3, capable of movement endwise of said shaft in and out of engagement with a spur gear wheel 4 held upon a driving shaft 5, journaled in suitable bearings in a bed plate (not shown) whereon the press frame 1 is rested in a well known way. Such bed plate will commonly be so arranged that the driving shaft 5 will be sunk below the floor of the press room. The said shaft 5 is extended in the direction of the length of the press frame, and will be driven from any suitable source of power. When in mesh with the spur gear wheel 4, the gear wheel 3 is also adapted for engagement with a spur gear wheel 7, secured upon one of the journals 6 of a lower impression cylinder 8, which is mounted to turn at one side of the press frame 1 and at a suitable elevation from the press room floor, so that access may be conveniently had thereto for arranging the blankets and overlay thereof, and the axis of this cylinder 8 being parallel with those of the shafts 2 and 5, the cylinder will receive rotary movement therefrom when the spur gear 3 is slid lengthwise on shaft 2 to engage it with the wheels 4 and 7, as shown in Fig. 19. Reverse movement of said gear 3 withdraws it from engagement with said wheels 4 and 7, as shown at the right hand side of Fig. 19, and serves to interrupt the driving connection of shaft 5 with the operative parts of the press so that the latter are capable of being conveniently stopped. The pitch line of the gear wheel 7 conforms to the perimetral impression surface of the cylinder 8, and

said wheel 7 is also in mesh with a gear wheel 10, secured upon one of the journals 9 of a plate cylinder 11 which is mounted to turn in the press frame and is extended along the side of the same opposite to the impression cylinder 8 and at a similar elevation above the press room floor, so as to be freely accessible for purposes of plating and removal of plates along the entire side of the machine. The pitch line of the gear wheel 10 conforms to the peripheral printing surface of the plate cylinder 11, so that the plate and impression cylinders are caused to rotate at the same peripheral velocity in order that a web threaded between them may be effectively printed as hereinafter explained. The proportion and arrangement of the parts is such that the plate cylinder is caused to project outside and clear of the press frame 1 throughout a considerable part of its periphery, so that the plates which in the construction herein shown, will be of semi-circular form in profile, may be slid endwise over the projecting perimetral surface of the cylinder 11 from either end of the machine. The spur gear 3 when engaged with the wheels 4 and 7 is also adapted for engagement with a gear wheel 12 carried upon one of the journals 14 of an ink drum 15, which is mounted to turn in the frame 1 beneath the plate cylinder 11 and is adapted to supply the same with ink by means of form rollers 16 and 17 in a well known way. At suitable points around the periphery of the ink drum are arranged distributing rollers 18, and 19 represents a ductor roller movable toward and from the drum in a well known way and adapted for contact upon an ink roller 20 which travels in superficial contact with a fountain roller 21.

The preferred arrangement of the fountain roller 21, and of the means for controlling the supply of ink thereto, is shown in detail in Figs. 4 and 5, wherein 60 represents the fountain across which is extended a supporting slide or member 61, parallel with the fountain roller 21, and having its opposite ends supported upon guides 62, 62, extended transversely across the ends of said fountain. The opposite ends of the slide or member 61 have pendent lugs 63, 63, with which are engaged the inner ends of adjusting screws 64, 64, extended parallel with the guides 62, and having their forward ends collared as shown at 65, 65 at the front of the fountain, and provided, outside said fountain, with sprocket wheels 66, 66, around which is extended a link or chain belt 67, so that both screws may be turned in unison, by means of a handle 68 connected with one of them, to move the slide or member 61 horizontally toward and from the fountain roller 21. The slide or member 61 is provided with an upturned edge portion 69, adjacent to the fountain roller 21, and said edge portion is provided with a plurality of screws 70, 70, placed at intervals along its length, the lower ends of said screws having engagement with a thin metal plate or strip 71, the edge of which contacts upon the peripheral surface of the fountain roller 21. By this construction, the screws 70 may be turned to press the plate or strip 71 more or less closely in contact with the surface of the fountain roller at different points in its length, so that the supply of ink withdrawn from the fountain by means of said roller may be regulated and varied at different points along its length to conform to the requirements of the work in hand, while at the same time, after the ink supply has been varied or adjusted to suit the work, the screws 64, 64, may be turned manually to adjust the strip or plate 71 toward or from the fountain roller so as to vary the ink supply from the fountain to meet the requirements of the machine when operated at different speeds.

In Fig. 4, the shaft 72 for the fountain roller 21 is provided with a friction pinion 73, slidable lengthwise along it and controllable from a lever 74, and said pinion has its perimeter in driving engagement with the face of a friction disk 75 carried upon a shaft 76, driven by suitable gearing from the operative mechanism of the press. This affords an effective means for controlling the supply of ink withdrawn from the fountain by the fountain roller 21, and is capable of convenient use in connection with the controllable devices above described, the friction pinion being adjustable by means of lever 74 across the face of the disk 75, to lessen the speed of the fountain roller and reduce the supply of ink as the speed of the press is increased, and to increase the speed of the fountain roller and thereby amplify the supply of ink as the speed of the machine is reduced.

That journal of the lower impression cylinder 8 whereon the gear wheel 7 is carried, is herein shown as provided with a gear wheel 29 of less diameter than said wheel 7, and meshing with a gear pinion 28, mounted to turn on a stud 27, projecting laterally from the press frame above said impression cylinder 8, and said pinion 28 is in mesh with a gear wheel 26 secured upon one journal 25 of an upper plate cylinder 30, which is mounted to turn in the press frame, and is extended along the side thereof at which the impression cylinder 8 of the lower printing couple is located, so as to be accessible along that entire side of the machine for convenient application and removal of the plates. The gearing for driving said upper plate cylinder 30 from the impression cylinder 8 of the lower printing couple is so proportioned as to cause said cylinders 30 and

8 to travel with the same peripheral velocity so that the least possible strain is imposed upon the web passing through the machine during the operation of the press. That journal 25 of the upper plate cylinder 30 whereon the spur gear wheel 26 is secured, also carries a large gear wheel 35, the pitch line of which conforms to the peripheral printing surface of said cylinder, and is in mesh with a gear wheel 31 journaled on a stud 32 projecting laterally from the press frame, and which is, in turn, in meshing engagement with a gear wheel 33 upon one of the journals 34 of an upper ink drum 15, which is, or may be similar in all respects to the drum 15 for the lower plate cylinder 11, and is adapted to supply the plates of said upper cylinder 30 with ink through form rollers 16 and 17 and is provided with distributing rollers 18 and a ductor roller 19, capable of operation to draw ink from an ink roller 20 traveling in contact with an upper fountain roller 21 driven and supplied with ink from a fountain 60 as described above with reference to the inking apparatus for the lower plate cylinder. The gear wheel 35 is also in mesh with a spur gear wheel 36 secured upon one of the journals 37 of the impression cylinder 38 for the upper printing couple, which impression cylinder is mounted to turn in the press frame alongside of the corresponding upper plate cylinder 30, and is extended along the side of said frame whereat the lower plate cylinder 11 is located, and opposite to the upper plate and lower impression cylinders 30 and 8, so as to be accessible along its entire length at that side of the machine, in order that its blankets and overlay may be conveniently arranged, and that a make ready may be the more conveniently effected when desired. The gear wheels 35 and 36 are, of course, so proportioned that the cylinders of the upper printing couple move with the same peripheral velocity, in order to avoid liability of damage of the web passing between them. The plate cylinder 30 of the upper printing couple is also arranged in such a manner as to cause a considerable part of its perimetral surface to project outside and clear of the frame at the side of the machine whereat said cylinder is journaled, so that the plates for this cylinder may also be slid lengthwise along the same from either end of the machine in applying and removing the said plates. As herein shown both the upper and lower plate cylinders 30 and 11 have considerably more than half their perimeters exposed at the ends of the press, so that the plating may be very conveniently and quickly effected. The exposure of these cylinders at the ends of the machine may, however, be varied without departure from the principles and spirit of the invention.

At one side of the machine, the press frame has upwardly extended parts 40, at the upper ends of which is journaled a shaft 42 carrying a delivery roller 41, over which the perfected web is discharged from the machine. As herein shown, the upwardly directed parts 40, 40 at opposite ends of the frame are connected together by means of a beam or cross bar 45, extended lengthwise of the press, and the shaft 42 is driven by means of gearing, as shown at 44, so as to travel with a peripheral velocity similar to that at which the web is drawn through the machine.

The machine herein illustrated is provided with plate cylinders four plates long, and is adapted to print a web of corresponding width, and opposite the central part of the delivery roller 41 is arranged a slitter 46, carried on a shaft 47, driven by gearing 48 from shaft 42, and adapted to slit the web passing over the delivery roller 41 in a well known way.

At the side of the frame whereat the lower impression cylinder 8 is located, the said frame has a lateral extension 1^a adjacent to the lower part of the machine, and this extension has alined bearings 1^b adapted to receive a spindle 1^c, whereon the paper roll X is mounted, said bearings having inclined bottoms 1^d, the outer ends of which are at such a level above the press room floor as to permit the roll X to be rolled along said floor until its spindle 1^c is engaged above said inclined outer ends 1^d of said bearings. The floor is recessed within the extensions 1^a, so that further rolling movement of said paper roll X will cause it to drop from the press room floor until it is supported by the engagement of the ends of its spindle 1^c upon the bearings 1^b of the frame extensions, as shown in Figs. 2 and 3. From the roll X the web is drawn upwardly as shown at x in an inclined direction around the underside of the adjacent impression cylinder of the lower printing couple, and is thence passed up through the bite of the lower printing couple, so as to be printed upon one surface thereby. The inclination of the web from one side of the machine toward the underside of the lower impression cylinder 8 affords a sufficient contact of said cylinder upon the web to insure draft of the web through the bite of the lower couple, and avoids blurring or tearing of the web from contact upon the lower plate cylinder 11. The upper plate and impression cylinders are not in exact vertical alinement with the respective lower impression and plate cylinders, but are shifted slightly out of such alinement in a direction toward that side of the machine whereat the paper roll X is supported, so that the respective upper and lower plate cylinders are caused to project beyond the sides of the machine, and beyond

the correspondingly located impression cylinders, so as to permit more convenient access thereto. This lateral shifting of the cylinders of the upper couple also serves to throw the bite of the upper couple out of exact vertical alinement with the bite of the lower couple, as clearly shown in Fig. 3, whereby the web x after emerging from between said lower cylinders is again deflected toward the side of the machine at which it is primarily led from the roll X and is caused to travel in a direction inclined upwardly away from the lower plate cylinder and toward the upper impression cylinder in order that further contact thereof upon the impression cylinder, such as is desirable to lessen the strain upon the web, is afforded, while at the same time the liability of tearing of the web or blurring of the imprint from contact upon the plates is avoided. The upper printing couple being reversely arranged with relation to the lower couple, serves to perfect the web during its passage therebetween, and the delivery roller 41 being located along the side of the machine at which the upper impression cylinder is arranged, serves to again deflect the web, as shown in Fig. 3, away from the upper plate cylinder, thereby affording increased contact of the upper impression cylinder thereon and lessening the liability of tearing or blurring of the imprint from contact upon the plates, and affording space wherein the inking apparatus for the upper plate cylinder may be located so as to be readily accessible along the side of the machine without interfering with the free accessibility of the said upper plate cylinder which is desirable for the application and removal of the plates. Furthermore, the structure is such as to afford a comparatively short run of web in passing from the roll X to the delivery roller 41, so that the liability of breakage of the web, and consequent stopping of the press to permit of again threading the web through the machine, is reduced to a minimum, and each impression cylinder has a comparatively large portion of its perimeter exposed along the side of the press throughout the operation of the machine, so that a make-ready, such as is desirable for magazine work, may be conveniently effected after the machine has been threaded up and without necessitating the removal of the web from the impression cylinders.

From the above description, it will be seen that the printing machine constructed according to my invention is of an extremely simple and comparatively inexpensive nature, and is particularly well adapted for use by reason of the accessibility of its parts, and of the compactness of its construction, which permits of settiing up the press for use within a comparatively small floor space, and it will also be obvious that some modification is possible without material departure from the principles and spirit of the invention, in the arrangement of the printing couples and the direction in which the web traverses the same, and for this reason I do not desire to be understood as confining my invention, in these particulars, to the structure herein set forth. For example the respective printing couples may be extended in parallel vertical planes, as shown in Fig. 13, instead of in horizontal planes, as shown in the preceding views, or they may be set in planes upwardly inclined to each other, as shown in Fig. 14, or downwardly inclined from one another as shown in Fig. 15. Or, when desired, they may be in substantially parallel vertical planes, with their cylinders, shifted relatively to each other to such an extent as will render the machine three cylinders high, as shown in Figs. 16 and 17.

Where a quadruplex printing machine is desired, the construction shown in Figs. 1 to 8 may be adopted with good results. In this construction two of the unitary machines, constructed as above described, are set up side by side as shown at A, A′ with their cylinders parallel. The two unitary machines are spaced apart and separated by an alley or passage B, extended between them so that the pressman may enter between them and have convenient access to each side of each machine for plating and packing the cylinders, making ready, and adjusting the inking apparatus or other parts requiring attention from time to time, and I prefer, in so arranging such unitary machines, to position them with their sides at which the delivery rollers 41, 41 are located adjacent to each other so that the printed webs delivered from said rollers may be collected at the alley or passage B between the machines, and their sides, whereat the rolls X, X are located, outermost, so that the rolls may be conveniently applied to the press during use. Where this construction is adopted, it will usually be found desirable to mount the machines A, A′ upon the same bed plate, and in the drawings I have shown a cross shaft 23 extended across beneath the bed plate and provided at its ends with gearing, as shown at 24, 24, whereby it serves to communicate the movement of the driving shaft 5 of one of the unitary machines to the corresponding shaft of the other unitary machine comprised in the press, in such a manner that when the gears 3 of each unitary machine are slid into mesh with the related gears 4 and 7, both units A and A′ will be driven in unison, while at the same time the gear 3 of either unit is capable of being slid along shaft 2 out of mesh with the corresponding gears 4 and 7, so as to terminate the operation of such unit. In a quadruplex printing machine of this general character the construc-

tion and arrangement of the parts shown in Figs. 1 to 8 inclusive, will be found advantageous. In this form of the press, I provide two folders C, C′ positioned in alinement with the opposite ends of the alley or passage B, and preferably at such a distance from the ends of the press units as will permit free access to each end of said passage or alley, so that the pressman may freely enter the same. Where this arrangement is employed, angle bars 50, 51, 52 and 53 are extended across the alley or passage B, preferably at such an elevation as will permit the pressman to lead the webs over the angle bars from the floor. As herein shown, these angle bars are arranged in pairs and are attached at their ends to the beams or cross bars 45, 45, and the bars of the respective pairs are crossed in XX formation, so that two of said angle-bars are crossed over each other adjacent to each end of the machine. As shown in the drawing the angle bars 50 and 52 of one pair are crossed one over the other at one end of the machine so as to receive the oppositely traveling webs x', x^2, emerging from the delivery rollers 41, 41 at one side of the alined slitters 46, 46, and the angle bars 51 and 53 of the other pair are similarly crossed one over the other at the opposite end of the machine, so as to receive the oppositely traveling webs x^3, x^4, emerging from said delivery rollers at that side of the said slitters 46, 46, and the respective bars 50 and 53, which receive the webs x' and x^4 from opposite ends of one delivery roller 41 are set at substantially right angles to each other and to the respective angle bars 51 and 52 which receive the webs x^2 and x^3 from opposite ends of the other delivery roller 41, and are positioned sufficiently below said last-named bars 51 and 52, as represented upon the diagraphic views, Figs. 6, 7, and 8, to permit free travel of the webs between them without binding or blurring the fresh impressions thereon. Adjacent to each end of the machine constructed as above described is arranged a pair of carrying rolls 54, 55 and 56, 57, the rolls of each such pair being extended between the beams or cross bars 45, 45, and the innermost roll of each pair being of smaller diameter than the outermost, as represented at 55 and 56 in the diagraphic views, Figs. 6, 7, and 8. As herein shown, each of said oppositely arranged pairs of carrying rolls 54, 55 and 56, 57, is extended above the alley or passage B at such an elevation as to permit the webs from the adjacent pair of angle bars, 50, 51 or 52, 53, to be passed beneath it to the former C or C′ adjacent to that end of the press without contact upon such carrying rolls, and each pair of carrying rolls 54, 55, and 56, 57, is arranged beyond the outer edges of the adjacent webs x', x^2, or x^3 or x^4, so as to permit the said webs to be properly turned at right angles by the corresponding angle bars, so that the webs passing over each of said pairs of angle bars 50, 51 or 52, 53 may be led either directly to the former C adjacent to that end of the press, or may be carried upwardly around the carrying rolls 54, 55 or 56, 57 of the adjacent pair, and directed reversely above the press toward the former C′ at the opposite end of the machine. By this construction it will be seen that if desired the webs from one pair of angle bars may be extended directly to the former C at the adjacent end of the press, while the webs from the other pair of angle bars may be led directly to the former C′ at the opposite end of the machine, as shown in Fig. 6, thereby permitting full use of the press upon small work when desired, and when the webs are to be collected, the webs from one pair of angle bars, as shown at the left-hand side of Fig. 7, may be disengaged from the adjacent former C and be led up over and around the adjacent carrying rolls, so as to be deflected to the former at the opposite end of the machine, and it will also be evident that should the cutting mechanism of one former as, for example, that shown in Figs. 7 and 8, at the right hand end of the press, break down, the webs may be quickly withdrawn therefrom and carried in the same order to the former at the opposite end of the press, in which case the webs which had previously been deflected by the carrying rolls will be led direct to the former, while the webs which had previously been led direct to the former will be deflected by the corresponding carrying rolls as above described. By this construction and arrangement of the parts important advantages and increased convenience are attained by reason of the fact that but a comparatively short run of the webs from the press to the folder is required, and also on account of the readiness with which the webs may be withdrawn from one folder in case of a break down, and directed in the same order to the other former, and since said folders are set at similar inclinations, it is evident that such substitution may be effected without changing the arrangement of the plates upon the several plate cylinders, thereby affording a material saving of time in practical use of the machine. It will also be evident that this arrangement of the parts affords a comparatively short and equal run of the webs from each pair of angle bars 50, 51 and 52, 53 to the folder. This is particularly true when the folders C and C′ are used simultaneously, and the webs from each pair of angle bars are carried directly to one of said folders, as indicated in Fig. 6, and even when the several webs are assembled upon the same folders, as shown in Figs. 7 and 8, those which are

deflected around the carrying rolls 54, 55, 56 and 57 are still effectively supported so as to be relieved from undue strain, and are prevented from sagging to an excessive extent.

If desired the construction shown in Figs. 9 and 10 may also be employed with good results. This form of the quadruplex machine is substantially similar to that above described excepting that the carrying rolls 54, 55, 56 and 57 are omitted, and the webs x', x^2, x^3, and x^4, after being deflected over the angle bars are extended in the same direction along the alley or passage B between the unitary machines A^2, A^3 to one or the other of the folders C or C'. The webs of one pair, as x' and x^2, are led from the respective units A^2, A^3, between one pair of angle bars, as 50 and 52, and the webs of the other pair, as x^4 and x^3, are similarly led from said respective units, between the other pair of angle bars, as 51 and 53, and the webs of each such pair, after having been entered between the corresponding angle bars, are led around the latter in opposite directions, one such web being passed upwardly around and above the upper angle bar, and directed to the folder C or C' then in use, while the other web of that pair is passed downwardly around and under the lower angle bar, and is similarly directed to the folder C or C' then in use. Should it be desired to change the webs of either or both pairs from the folder C to the folder C', or vice versa, it is only necessary to reverse the directions in which the webs of one or both pairs are passed around the angle bars, the web or webs which had previously been passed upwardly around and over the upper engle bars being then passed downwardly around and under the lower angle bars while the webs which have previously been passed downward around and under the lower angle bars are now passed upwardly around and over the upper angle bars, so as to insure the reversal of the direction of travel of the webs along the alley or passage B toward that folder C or C' which it is desired to use. The folders, as herein shown, are alined with each other, and since when directed to one such folder, the webs traverse the sides of the angle bars opposite to the sides which they traverse when directed to the other folder, I have shown said angle bars adjustably supported at 45^a so that they may be shifted to the extent of their thickness in order to preserve the alinement of the webs with the folders when they are changed from one folder to the other. But it will be obvious that such adjustment of the angle bars may be avoided, if desired, by positioning the formers slightly out of line with each other. In this construction a material advantage is attained by reason of the fact that a single set of angle bars suffices for deflecting the webs to either of the folders, and the run of web is maintained uniform during the use of either of the folders.

In other cases, the quadruplex printing machine embodying my improvements may be constructed as shown in Figs. 11 and 12, wherein the unitary machines A, A' are set up side by side, as in the preceding construction, but at an increased distance apart so that the alley or passage B is of sufficient width to permit the formers C^2, C^3 to be set up therein, central between the machines A, A' and in alinement with each other. Where this construction is adopted, the angle bars are dispensed with and the two webs passing over the delivery rollers 41, 41 at one side of the slitters 46, 46 are extended in alinement with each other across the alley or passage B to one of the formers, as C^2, while the two webs passing over said delivery rollers at the opposite side of the slitters 46, 46, are similarly extended in alinement with each other across the alley or passage B to the other former, as C^3, so that when desired the press may be run at full capacity upon small work, the formers C^2, C^3, together with their appropriate cutting mechanism, being simultaneously employed. Since the formers C^2, C^3 in this construction of the press, are alined with each other, the folding rolls c, c interposed above the carrying cylinders d of their appropriate cutting and folding mechanisms D, will be side by side as shown in the diagraphic view, Fig. 12, so that when desired the webs from one former as C^2, may be disconnected from the corresponding carrying cylinder d, and may be extended across to the folding rolls c of the former C^3 as shown at x^5 in said figure, so that all of the webs may be collected and led through a single cutting and folding mechanism D. When this is done, a break down of one of the cutting and folding mechanisms during use may be quickly and conveniently remedied by reversing the direction of that portion x^5 of the webs which traverse the space between the formers, so as to permit of collecting the webs at the other cutting and folding mechanism until the necessary repairs can be made. This arrangement of the formers with relation to the printing mechanism insures a comparatively short and equal run of the webs from the delivery rollers 41, 41, to the formers, so that the pull imposed upon the webs is equalized and when all of the webs are collected at one cutting and folding mechanism D, as indicated in Fig. 12, it will be seen that should a break down of such cutting and folding mechanism occur during use, requiring substitution of the other cutting and folding mechanism, the similar arrangement of the formers C C' and their cutting and

folding mechanism insure the passage of the pages through the substituted cutting and folding mechanism, in an order similar to that in which they had previously been passing through the cutting and folding mechanism first in use, whereby the rearrangement of the plates at the several plate cylinders is avoided, and a material advantage and convenience is attained in the operation of the press.

In Figs. 18 and 19 I have shown my improvements embodied in an octuplex printing machine, comprising four of the unitary machines A, A′, A^2 and A^3, which are arranged in pairs separated by a transverse alley or passage B′ of such width as to permit the pressman to have convenient access to the adjoining ends of the unitary machines of the respective pairs. The unitary machines of each pair are also spaced to produce alleys or passages B B between them, similar to the alleys of the quadruplex machines above described, and the respective unitary machines and alley B of one pair are alined at the ends of the respective unitary machines and alley B of the other pair, so that the parallel driving shafts 5, 5 may be extended the full length of the machine to drive all of the unitary machines in unison. As herein shown, the pair of unitary machines A, A′ comprised in this form of the press, are substantially similar in construction and operation to the machines A, A′ above described as comprised in the quadruplex press shown in Figs. 1 to 8, and formers C, C′ with appropriate cutting and folding mechanism D, D are comprised in the octuplex machine, being as to their construction operation and arrangement with relation to the unitary machines A, A′, substantially similar to the formers comprised in the machine illustrated in Figs. 1 to 8, so that further detailed description of these parts may be dispensed with. The other pair of unitary machines A^2 A^3, comprised in this octuplex construction, are also substantially similar in construction and arrangement to the unitary machines A^2, A^3 comprised in that form of quadruplex press illustrated in Figs. 9 and 10, so that further detailed description of these parts may also be dispensed with. The two pairs of unitary machines A, A′, and A^2, A^3, are so arranged that the former C at one end of the alley between the units A, A′ is positioned at the juncture of said alley with the transverse alley or passage B′, and the other former C′ is positioned at that end of the units A, A′ which is opposite to and most distant from the units A^2, A^3 of the other pair, both said formers C, C′ being, however, in alinement with the alleys B, B of each pair of units A, A′ and A^2, A^3. The four webs from the units A, A′, may be passed from the angle bars and carrying rolls appropriate to that pair of units, to either one of the formers C or C′ as above described with reference to Figs. 7 and 8, and the four webs from the units A^2, A^3 of the other pair are directed around the appropriate angle bars and thence extended along the alley or passage B, in the direction indicated by arrow x^6, either to the former C, as indicated in Fig. 10, or if desired are passed over said former and above the carrying rolls 54, 55, 56, 57 of the other pair of units A, A′, to the other former C′, being effectively supported at suitable points so as to lessen the strain imposed upon them and prevent excessive sagging. By this construction and arrangement of the parts, it will be seen that when desired, all of the webs may be collected to a single folder, and if that break down may be withdrawn and carried in the same order to the other former, so that the operation of the machine may proceed without the delay ordinarily required for rearrangement of the plates upon the plate cylinders, and when desired, some of said webs may be collected upon one former while others may be collected at another former, so that the machine may be employed at full capacity in printing different work or different sections of the same work.

In Figs. 20 and 21 I have shown another form of octuplex printing machine comprised in my present invention, wherein the unitary machines of each pair A, A′ and A^2, A^3 are spaced at greater distances apart. The angle bars 50, 51, 52, 53 of each pair of unitary machines are not crossed over each other, but are arranged to deflect the webs in two parallel sets traveling side by side along the alined alleys or passages B, B. The formers C, C′, with their appropriate cutting and folding mechanisms D, D are arranged side by side in the transverse alley or passage B′, so that one such former is alined with each set of angle bars, and in position to receive the set of webs deflected thereby. By this arrangement, the several unitary machines may be used for different work or different sections of the same work, and the formers C, C′ being similarly inclined, and the folding rolls c, c above their appropriate cutting and folding mechanisms D, D, being opposite each other, and closely adjacent, permits of transferring the webs from one former across to the cutting and folding mechanism of the other former, so that all of the webs may be collected at the same cutting and folding mechanism, and if that break down, may be removed therefrom and collected at the cutting and folding mechanism appropriate to the other former, without requiring the rearrangement of the plates at the plate cylinders.

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

1. A web perfecting printing machine having in combination, a frame, two printing couples having their cylinders parallel, the cylinders of each couple being substantially horizontally disposed with relation to each other, each cylinder of each printing couple having substantially more than one-half of its peripheral surface exposed throughout its length at the sides of the machine, and freely accessible when the web is passing through the machine, and the plate cylinders of the respective couples being at opposite sides of the machine, means for supplying a web to one of said printing couples, and means for delivering a perfected web from the other printing couple.

2. A printing machine comprising a frame and two printing couples, the cylinders of each couple being disposed in a substantially horizontal plane, said couples having their cylinders parallel with each other and adapted for perfecting contact with a web having a continuous upward movement, the plate cylinder of one couple being closely adjacent the impression cylinder of the other couple, and all of the plate and impression cylinders of the two couples being fully exposed for inspection and manipulation at the sides of the machine and no substantial portion of any cylinder being disposed beneath said web or rendered inaccessible thereby.

3. A web printing machine having a frame and provided with two printing couples having cylinders parallel with each other and adapted for perfecting contact with a web, the respective cylinders of each printing couple being extended along opposite sides of the machine, and the impression cylinder of each printing couple being adjacent to the plate cylinder of the other printing couple and exposed throughout its length at the side of the machine to facilitate packing or make ready, means for supplying a web to one printing couple, means for delivering a perfected web from the other printing couple, positioned above said couple, and web directing means, including a turning device above the plane of said last-named printing couple, operable to deflect the perfected web received from said delivery means along a path parallel with the length of the cylinders and extended beyond the end of said cylinders, whereby interference of the perfected web with free access to said cylinders is avoided.

4. A web printing machine provided with two printing couples having their cylinders parallel and adapted for perfecting contact with a double-width web, means for supplying web to one of the printing couples, means for delivering the perfected web from the other printing couple, positioned above said couple, a web directing means including two sets of oppositely inclined turning rods disposed above the plane of the last-named printing couple and operable to deflect the perfected web received from said delivery means in two streams oppositely directed along paths parallel with the length of the cylinders and extended beyond opposite ends thereof and interchangeably operable to reverse the direction of the stream of web passing toward one end of the machine and to direct the same along a path parallel with the length of the cylinders and extended beyond the opposite end of the machine.

5. A printing machine having two units each adapted to perfect a web and arranged side by side and affording a passage therebetween, the cylinders of one unit being parallel with those of the other, and web directing means including turning bars operable for directing the web along the passage between the units from each of the respective units in reverse directions parallel with the length of the cylinders.

6. A printing machine having two units each adapted to perfect a web and arranged side by side and spaced apart to produce between them a passage parallel with the length of their cylinders, and web directing means including turning bars operable for directing the web from each of the respective units in reverse directions along said passage.

7. A printing machine having two units each adapted to perfect a web and arranged side by side and affording a passage therebetween, the cylinders of one unit being parallel with those of the other, alined folders positioned centrally with relation to the respective units at opposite ends thereof, and means for directing the web from each of the respective units along the passage therebetween to each folder.

8. A printing machine having two units each adapted to perfect a web and spaced apart to afford a passage between them, means for directing a web from each of the respective units in reverse directions along said passage, and a plurality of folders at opposite ends of the machine and alined with the path of said web when directed to said passage and adapted to receive said web.

9. A printing machine having two units each adapted to perfect a web and spaced apart to afford a passage between them, means for directing a web from the respective units along said passage, and a plurality of horizontal alined folders alined with the path of said web when directed along said passage and adapted to receive said web.

10. A printing machine having two units each adapted to perfect a web and arranged

side by side, the cylinders of one unit being parallel with those of the other horizontally, alined folders at opposite ends of the machine and each positioned centrally with relation to the respective units, and means for directing a web from the respective units to each folder.

11. A printing machine having two units each adapted to perfect a web and arranged side by side, the cylinders of one unit being parallel with those of the other and being spaced apart therefrom to afford a passage between them parallel with the length of the cylinders, folders at opposite ends of the machine alined with said passage, and means for directing the web from each of the respective units along said passage to each of said folders.

12. A printing machine having two units each adapted to perfect a web and spaced apart to afford a passage between them, delivery rolls adapted to direct the web from the respective units to said passage, and a plurality of folders at opposite ends of the units, and each adapted to receive the web directed to said passage from each unit.

13. A printing machine having a plurality of units adapted to perfect a plurality of webs, folders adjacent to opposite ends of the machine, and means for directing a plurality of webs from said units and between such units to each folder.

14. A printing machine comprising a plurality of perfecting presses arranged in pairs on opposite sides of a central passage and having their cylinders parallel, alined folders at the ends of said pairs of presses, and a plurality of oppositely-inclined turning bars mounted on said machine and adjustable longitudinally of said cylinders into position to direct a web from any press to the folder at either end of said pairs of presses.

15. A printing machine having, in combination, horizontally alined web perfecting units arranged side by side with their cylinders parallel but spaced to afford an unobstructed passage between said units, alined folders positioned at separated points in said machine, and a plurality of turning bars arranged in oppositely-inclined series in adjacent horizontal elevated planes, said bars being positioned to leave said passage unobstructed and being effective to receive a web from either unit and to direct it along a path parallel to the axes of the cylinders to either one of said folders.

16. A printing machine having two web perfecting units arranged side by side, alined folders at opposite ends of the machine, and angle bars adapted to receive a plurality of webs from the respective units and operable to direct said webs between the units to the respective folders.

17. A printing machine having two units each adapted to perfect a web, and arranged side by side but spaced from each other to afford a passage between them, alined folders at opposite ends of the passage, and adjustably supported angle bars each adapted to receive a web from each unit and operable in reverse directions along said passage to direct such web lengthwise of said passage to each folder.

18. A web printing machine having two units each adapted to perfect a web, and arranged side by side, horizontally, but spaced apart to afford a passage between them, alined folders at the opposite ends of the passage, and angle bars between the alined folders adapted to receive webs from the units and arranged to direct said webs in reverse directions along said passage to the respective folders.

19. A printing machine having two web perfecting units arranged side by side but spaced apart to afford a passage between them, alined folders at opposite ends of the passage, and angle bars at said passage between said folders and adapted to receive webs from each of the respective units and arranged to direct said webs along the passageway to each of the respective folders.

20. A printing machine having two units each adapted to perfect a web and arranged side by side, alined folders at opposite ends of the machine and positioned centrally with respect to the units thereof, and angle bars between the alined folders and each adapted to receive a web from one unit and to direct the same between the units to one folder and also operable to receive a web from the other unit and to direct the same to the other folder.

21. A printing machine having two units each adapted to perfect a web and arranged side by side but spaced apart to afford a passage between them, alined folders at opposite ends of the passage, and adjustably supported angle bars at said passage between said folders and each adapted to receive a web from one unit and to direct the same in one direction along said passage to one folder and also operable, when adjusted, to receive a web from the other unit and to direct the same in an opposite direction along said passage to the other folder.

22. A printing machine having two units each adapted to perfect a web and arranged side by side but spaced apart to afford a passage between them, alined folders at opposite ends of said passage and spaced from the machine to afford access to such passage, parallel delivery rolls adapted to direct the webs from the respective units to said passage, and angle bars at said passage and adapted to receive the webs from the respective delivery rolls and to direct the same along the passage to the respective folders.

23. A printing machine having two units

each adapted to perfect a web and arranged side by side but spaced apart to afford a passage between them, alined folders at opposite ends of said passage and spaced from the machine to afford access to said passage, parallel delivery rolls adapted to direct the webs from the respective units to said passage, and angle bars adjustably supported at said passage and each adapted to receive a web from each delivery roll and to direct the same along said passage to each folder.

24. A printing machine having two units each adapted to perfect a web and arranged side by side but spaced apart to afford a passage between them, each unit comprising a frame and two printing couples each cylinder of which is exposed throughout its length at the side of such unit, the adjacent cylinders in the respective units being accessible from said passage, alined folders at opposite ends of the passage, and spaced from the machine to afford access to said passage, means for directing the webs of the respective units to said passage, and angle bars at the passage and adapted to receive the webs from the respective units and to direct the same along said passage to the respective folders.

25. A printing machine having two units each adapted to perfect a web and arranged side by side but spaced apart to afford a passage between them, each unit comprising a frame, two printing couples the cylinders of which are parallel with said passage and are exposed throughout their entire lengths at the sides of such unit, the adjacent cylinders in the respective units being accessible from said passage, and inking apparatus at opposite sides of the unit and vertically alined with the plate cylinders of the respective printing couples, alined folders at opposite ends of the passage, means for directing the webs of the respective units to said passage, and angle bars at the passage and adapted to receive the webs from the respective units and to direct the same along said passage to either of the respective folders.

26. A printing machine having two units each adapted to perfect a web and arranged side by side but spaced apart to afford a passage between them, each unit comprising a frame, and two printing couples the cylinders of which are parallel with said passage and are exposed throughout their lengths at the sides of such unit, the adjacent cylinders in the respective units being accessible from said passage, means for directing the webs of the respective units to said passage, alined folders at opposite ends of said passage, and bars adjustably supported at the passage and each adapted to receive a web from each unit and to direct the same along said passage to each folder.

27. A printing machine having two web perfecting units arranged side by side but spaced apart to afford a passage between them, each unit comprising a frame, two printing couples the cylinders of which are parallel with said passage and are exposed throughout their lengths at the side of such unit, the adjacent cylinders in the respective units being accessible from said passage, and inking apparatus at opposite sides of the unit and vertically alined with the plate cylinders of the respective couples, alined folders at opposite ends of said passage, means for directing the webs from the respective units to said passage, and angle bars adjustably supported at said passage and each adapted to receive a web from either unit and to direct the same to either folder.

28. A web printing machine having two web perfecting units arranged side by side, but spaced apart to afford a passage between them, alined folders centrally positioned with respect to said units, and each located at an end of said passage, means for directing the webs from the respective units to said passage, and angle bars at said passage, each arranged to receive a web from one of the respective units and to direct the same along said passage to one folder, and also operable to receive a web from the other unit and to direct the same along said passage to the other folder.

29. A printing machine having two web perfecting units arranged side by side but spaced apart to afford a passage between them, alined folders centrally positioned with respect to said units, and each arranged at an end of said passage, delivery rolls parallel with each other and adapted to direct the webs from the respective units to said passage, and angle bars at said passage each arranged to receive a web from one of the respective delivery rolls and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage in a reverse direction to the other folder.

30. A printing machine having two web perfecting units arranged side by side but spaced apart to afford a passage between them, each unit comprising a frame, and two printing couples the cylinders of which are parallel with said passage and are exposed throughout their lengths at the sides of such unit, means for directing the webs of the respective units to said passage, alined folders centrally positioned with respect to said units and each located at an end of said passage, and angle bars at said passage each arranged to receive a web from one of the respective units, and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said

passage in a reverse direction to the other folder.

31. A printing machine having two web printing units arranged side by side but spaced apart to afford a passage between them, each unit comprising a frame, two printing couples the cylinders of which are parallel with said passage and are exposed throughout their lengths at the side of such unit, and inking apparatus at opposite sides of the unit and vertically alined with the plate cylinders of the respective couples, alined folders centrally positioned with respect to said units and each located at an end of said passage, and angle bars at said passage each arranged to receive a web from one of the respective units, and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage in a reverse direction to the other folder.

32. A printing machine having two units each adapted to print a web and arranged side by side but spaced apart to afford a passage between them, each unit comprising a frame, and two printing couples the cylinders of which are parallel with said passage and are exposed throughout their lengths at the sides of such unit, means comprising parallel delivery rolls at opposite sides of the passage between the units for directing the webs of the respective units to said passage, alined folders at opposite ends of said passage, and spaced from the machine to afford access to said passage, and angle bars adjustably supported at the passage and each adapted to receive a web from one unit and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage in a reverse direction to the other folder.

33. A printing machine having two units each adapted to print a web and arranged side by side but spaced apart to afford a passage between them, each unit comprising a frame, two printing couples the cylinders of which are parallel with said passage and are exposed throughout their lengths at the side of such unit, and inking apparatus at opposite sides of the unit and vertically alined with the plate cylinders of the respective couples, alined folders at opposite ends of said passage and spaced from the machine to afford access to said passage, means comprising parallel delivery rolls at opposite sides of the passage between the units for directing the webs from the respective units to said passage, and angle bars adjustably supported at said passage and each adapted to receive a web from one unit and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage in a reverse direction to the other folder.

34. A printing machine having two units each adapted to print a web and arranged side by side but spaced apart to afford a passage between them, each unit comprising a frame, and two printing couples the cylinders of which are parallel with said passage and are exposed throughout their lengths at the sides of such unit, means comprising parallel delivery rolls at opposite sides of the passage between the units for directing the webs of the respective units to said passage, alined folders centrally positioned with respect to said units and each located at an end of said passage and spaced from the machine to afford access to said passage, and angle bars at said passage each arranged to receive a web from one of the respective units, and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage to the other folder.

35. A printing machine having two units each adapted to print a web and arranged side by side but spaced apart to afford a passage between them, each unit comprising a frame, two printing couples the cylinders of which are parallel with said passage and are exposed throughout their lengths at the side of such unit, and inking apparatus at opposite sides of the unit and vertically alined with the plate cylinders of the respective couples, alined folders centrally positioned with respect to said units and each located at an end of said passage and spaced from the machine to afford access to said passage, means comprising parallel delivery rollers at opposite sides of the passage for directing the webs of the respective units to said passage, and angle bars at said passage each arranged to receive a web from one of the respective units, and to direct the same along said passage in one direction to one folder and also operable to receve a web from the other unit and to direct the same along said passage to the other folder.

36. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact with a web, the respective cylinders of each printing couple in each of said respective units being extended along and exposed throughout their entire lengths at the opposite sides of such unit, means for directing the webs of the respective units to said passage, alined folders at said passage and spaced from the machine to afford access to said passage, and angle bars at the passage and each adapted to receive the web from one of the respective units and to direct the same along said passage in one direction to

one folder and also operable to receive a web from the other unit and to direct the same along said passage in a reverse direction to the other folder.

37. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact with a web, the respective cylinders of each printing couple in each of said respective units being extended along and exposed throughout their entire lengths at the opposite sides of such unit, means for directing the webs of the respective units to said passage, alined folders at opposite ends of said passage and spaced from the machine to afford access to said passage, and angle bars adjustably supported at the passage and each adapted to receive a web from one unit and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage in a reverse direction to the other folder.

38. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact with a web, the respective cylinders of each printing couple in each of said respective units being extended along and exposed throughout their entire lengths at the opposite sides of such unit, alined folders centrally positioned with respect to said units, and each located at an end of said passage and spaced from the machine to afford access to said passage, means for directing the webs from the respective units to said passage, and angle bars at said passage each arranged to receive the webs from one of the respective units and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage in a reverse direction to the other folder.

39. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact with a web, the respective cylinders of each printing couple in each of said respective units being extended along and exposed throughout their entire lengths at the opposite sides of such unit, alined folders centrally positioned with respect to said units, and each arranged at an end of said passage and spaced from the machine to afford access to said passage, delivery rolls parallel with each other and adapted to direct the webs from the respective units to said passage, and angle bars at said passage each arranged to receive the webs from one of the respective delivery rolls, and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage in a reverse direction to the other folder.

40. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact with a web, the respective cylinders of each printing couple in each of said respective units being extended along and exposed throughout their entire lengths at the opposite sides of such unit, means comprising parallel delivery rolls at opposite sides of the passage between the units for directing the webs of the respective units to said passage, alined folders at opposite ends of said passage, and spaced from the machine to afford access to said passage and angle bars adjustably supported at the passage and each adapted to receive a web from one unit and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage in a reverse direction to the other folder.

41. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact with a web, the respective cylinders of each printing couple in each of said respective units being extended along and exposed throughout their entire lengths at the opposite sides of such unit, means comprising parallel delivery rolls at opposite sides of the passage between the units for directing the webs of the respective units to said passage, alined folders centrally positioned with respect to said units, and each located at an end of said passage and spaced from the machine to afford access to said passage, means for directing the webs from the respective units to said passage, and angle bars at said passage each arranged to receive the web from one of the respective units and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage to the other folder.

42. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact with a web, the respective cylinders of each printing couple in each of said respective units being extended along and exposed

throughout their entire lengths at the opposite sides of such unit, and the plate cylinder of each printing couple being adjacent to but extended outwardly at the side of the corresponding unit beyond the impression cylinder of the other printing couple of that unit, alined folders at said passage, means for directing the webs of the respective units to said passage and spaced from the machine to afford access to said passage, and angle bars at the passage and each adapted to receive a web from one of the respective units and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage in a reverse direction to the other folder.

43. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact with a web, the respective cylinders of each printing couple in each of said respective units being extended along and exposed throughout their entire lengths at the opposite sides of such unit, and the plate cylinder of each printing couple being adjacent to but extended outwardly at the side of the corresponding unit beyond the impression cylinder of the other printing couple of that unit, means for directing the webs of the respective units to said passage, alined folders at opposite ends of said passage, and angle bars adjustably supported at the passage and each adapted to receive a web from one unit and to direct the same in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage in a reverse direction to the other folder.

44. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact with a web, the respective cylinders of each printing couple in each of said respective units being extended along and exposed throughout their entire lengths at the opposite sides of such unit, and the plate cylinder of each printing couple being adjacent to but extended outwardly at the side of the corresponding unit beyond the impression cylinder of the other printing couple of that unit, alined folders centrally positioned with respect to said units, and each located at an end of said passage and spaced from the machine to afford access to said passage, means for directing the webs from the respective units to said passage, and angle bars at said passage, each arranged to receive a web from one unit and to direct the same along said passage in one direction to one folder, and also operable to receive a web from the other unit and to direct the same along said passage in the reverse direction to the other folder.

45. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact with a web, the respective cylinders of each printing couple in each of said respective units being extended along and exposed throughout their entire lengths at the opposite sides of such unit, and the plate cylinder of each printing couple being adjacent to but extended outwardly at the side of the corresponding unit beyond the impression cylinder of the other printing couple of that unit, alined folders centrally positioned with respect to said units, and each arranged at an end of said passage and spaced from the machine to afford access to said passage, delivery rolls parallel with each other and adapted to direct the webs from the respective units to said passage, and angle bars at said passage each arranged to receive a web from one of the respective delivery rolls and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage in a reverse direction to the other folder.

46. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact with a web, the respective cylinders of each printing couple in each of said respective units being extended along and exposed throughout their entire lengths at the opposite sides of such unit, and the plate cylinder of each printing couple being adjacent to but extended outwardly at the side of the corresponding unit beyond the impression cylinder of the other printing couple of that unit, means comprising parallel delivery rolls at opposite sides of the passage between the units, for directing the webs of the respective units to said passage, alined folders at opposite ends of said passage, and angle bars adjustably supported at the passage and each adapted to receive a web from one unit and to direct the same in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage in a reverse direction to the other folder.

47. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact with a web, the respective cylinders of each printing couple in each of said respective

units being extended along and exposed throughout their entire lengths at the opposite sides of such unit, and the plate cylinder of each printing couple being adjacent to but extended outwardly at the side of the corresponding unit beyond the impression cylinder of the other printing couple of that unit, means comprising parallel delivery rolls at opposite sides of the passage between the units for directing the webs of the respective units to said passage, alined folders centrally positioned with respect to said units, and each located at an end of said passage and spaced from the machine to afford access to said passage, means for directing the webs from the respective units to said passage, and angle bars at said passage each arranged to receive a web from one of the respective units and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage to the other folder.

48. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact with a web, the respective cylinders of each printing couple in each of said respective units being extended along and exposed throughout their entire lengths at the opposite sides of such unit, and the plate cylinder of each printing couple being adjacent to but extended outwardly at the side of the corresponding unit beyond the impression cylinder of the other printing couple of that unit, and each unit comprising inking apparatus at opposite sides of the unit and vertically alined with the plate cylinders of the respective print couples, alined folders at opposite ends of the passage and spaced from the machine to afford access to said passage, means for directing the webs of the respective units to said passage, and angle bars at the passage and each arranged to receive a web from one of the respective units, and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage to the other folder.

49. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact with a web, the respective cylinders of each printing couple in each of said respective units being extended along and exposed throughout their entire lengths at the opposite sides of such unit, and the plate cylinder of each printing couple being adjacent to but extended outwardly at the side of the corresponding unit beyond the impression cylinder of the other printing couple of that unit, and each unit comprising inking apparatus at opposite sides of the unit and vertically alined with the plate cylinders of the respective couples, alined folders at opposite ends of said passage, means for directing the webs from the respective units to said passage, and angle bars adjustably supported at said passage and each adapted to receive a web from one unit and to direct the same in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage in a reverse direction to the other folder.

50. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact with a web, the respective cylinders of each printing couple in each of said respective units being extended along and exposed throughout their entire lengths at the opposite sides of such unit, and the plate cylinder of each printing couple being adjacent to but extended outwardly at the side of the corresponding unit beyond the impression cylinder of the other printing couple of that unit, alined folders centrally positioned with respect to the units and each spaced from the end of the machine, and means for directing a web from each unit in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage in a reverse direction to the other folder.

51. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact with a web, the respective cylinders of each printing couple in each of said respective units being extended along and exposed throughout their entire lengths at the opposite sides of such unit, and the plate cylinder of each printing couple being adjacent to but extended outwardly at the side of the corresponding unit beyond the impression cylinder of the other printing couple of that unit, alined folders centrally positioned with respect to said units and each spaced from the end of the machine, and angle bars each adapted to receive a web from one of the respective units and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage to the other folder.

52. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact

with a web, the respective cylinders of each printing couple in each of said respective units being extended along and exposed throughout their entire lengths at the opposite sides of such unit, and the plate cylinder of each printing couple being adjacent to but extended outwardly at the side of the corresponding unit beyond the impression cylinder of the other printing couple of that unit, alined folders centrally positioned with respect to said units, and each located at an end of said passage and spaced from the machine to afford access to said passage, means for directing the webs from the respective units to said passage, and angle bars at said passage each arranged to receive the webs from one of the respective units and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage in a reverse direction to the other folder.

53. A printing machine having two units spaced apart to afford a passage between them, each unit comprising two printing couples having cylinders parallel with said passage and adapted for printing contact with a web, the respective cylinders of each printing couple in each of said respective units being extended along and exposed throughout their entire lengths at the opposite sides of such unit, and the plate cylinder of each printing couple being adjacent to but extended outwardly at the side of the corresponding unit beyond the impression cylinder of the other printing couple of that unit, alined folders centrally positioned with respect to said units, and each arranged at an end of said passage and spaced from the machine to afford access to said passage, delivery rolls parallel with each other and adapted to direct the webs from the respective units to said passage, and angle bars at said passage each arranged to receive the webs from one of the respective rolls and to direct the same along said passage in one direction to one folder and also operable to receive a web from the other unit and to direct the same along said passage to the other folder.

54. A printing machine having two pairs of horizontally alined web perfecting units, the units of each pair being positioned side by side, and the units of one pair being located end to end with those of the other pair, an unobstructed passage parallel to the axes of the cylinders of said units being produced between the units of the respective pairs and extended from end to end of the machine, horizontally and longitudinally alined folders positioned adjacent said passage, and means capable of interchangeable operation to direct the web from any one of said units in a direction parallel to said passage to any folder.

55. A printing machine having two pairs of horizontally alined web perfecting units, the units of each pair being positioned side by side, and the units of one pair being located end to end with those of the other pair, an unobstructed passage parallel to the axes of the cylinders of said units being produced between the units of the respective pairs and extended from end to end of the machine, a folder located adjacent to the central part of said passage, another folder horizontally and longitudinally alined with the first mentioned folder and located at one end of the machine, and means capable of interchangeable operation to direct the web from any one of said units in a direction parallel to said passage to either folder.

56. A printing machine having two pairs of perfecting units, the units of each pair being side by side, and the units of one pair being located end to end with those of the other pair, a passage parallel to the axes of the cylinders of said units being produced between the units of the respective pairs and extended from end to end of the machine, another passage extended between the respective pairs of units and intersecting said first-named passage adjacent to the central part of the machine, a folder at the intersection of said passages, a second alined folder at the end of one of said passages, and means capable of interchangeable operation for directing the webs from any one of said units to either folder.

57. A printing machine comprising two pair of web perfecting units, the units of each pair being side by side, and the units of one pair being located end to end with those of the other pair, the units of each pair being spaced apart to produce an unobstructed passage through the machine parallel to the cylinders of said units and extending from end to end thereof, folders positioned at opposite ends of said pairs of units and a plurality of turning bars arranged in oppositely inclined sets in adjacent elevated horizontal planes, said bars being positioned to leave said passage unobstructed and being capable of operation to direct a web in a direction parallel to said cylinders from any one of said units to any one of said folders.

58. A web printing machine having four horizontally alined web perfecting units, two of which have their cylinders end to end and arranged side by side with respect to the cylinders of the other two units, whose cylinders are also end to end, and provided with a passageway extended through the machine, separating two of said units from the other two units, a plurality of folders at said passage, and means capable of interchangeable operation to direct the webs from either of the units to either of the folders.

59. A printing machine comprising four

web perfecting units arranged in the same horizontal plane, the units of each pair being positioned side by side with a passage between them, and the corresponding units of different pairs being arranged end to end with a passage between them, whereby each unit is freely accessible on all sides, a plurality of horizontally alined folders for said machine, means to drive any number of said units and folders synchrononously, and means to direct the webs to said folders effective to interchangeably direct a web from any one of said units to any one of said folders along reversed lines parallel to the axes of the cylinders of said units.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

CARL A. KELLOGG.

Witnesses:
J. D. CAPLINGER,
ALAN F. CONNELL.