G. E. PANCOAST.

COMBINED MULTICOLOR AND PERFECTING WEB PRINTING PRESS.

APPLICATION FILED JUNE 3, 1911.

1,138,782.

Patented May 11, 1915.

5 SHEETS—SHEET 1.

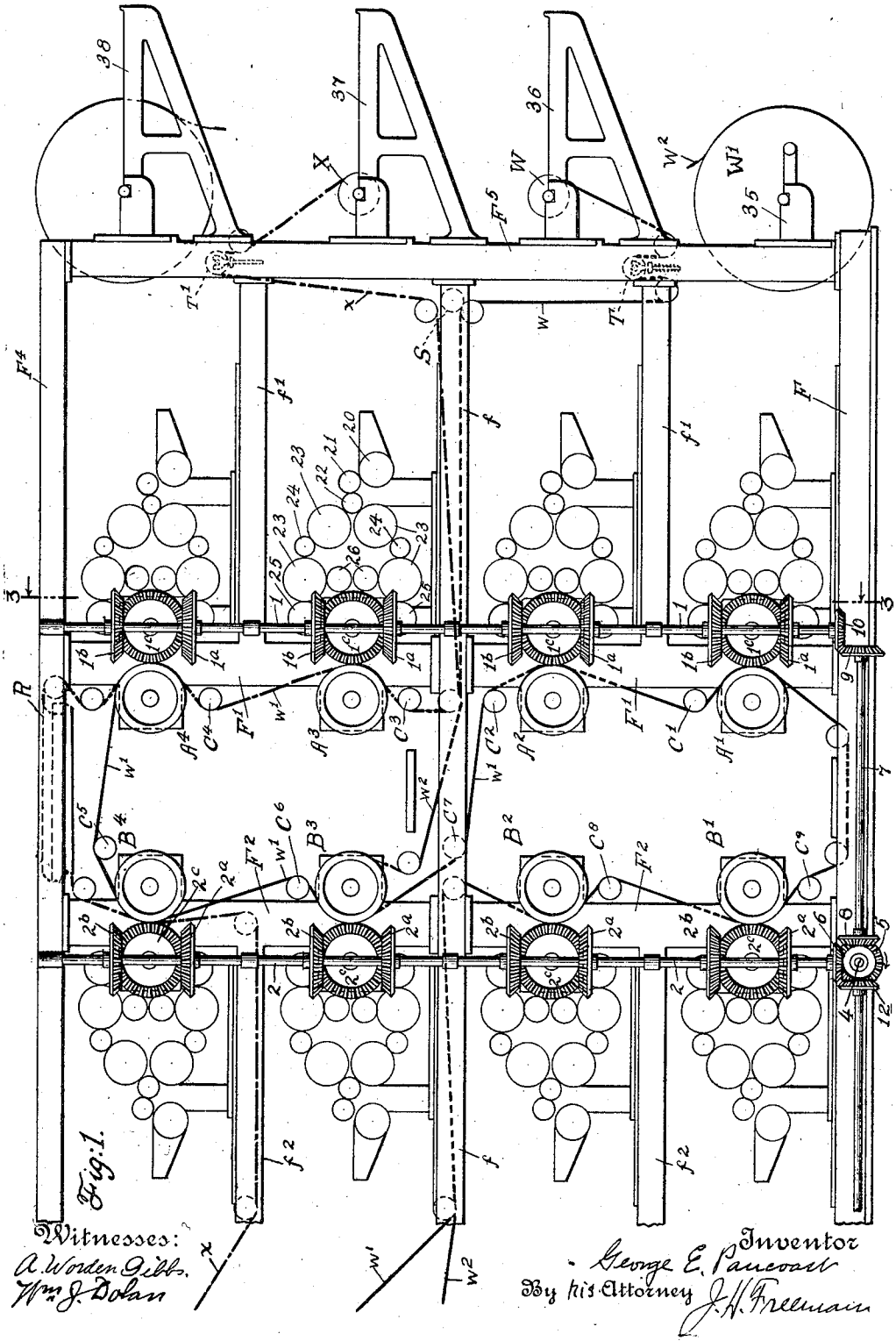


Fig. 1.

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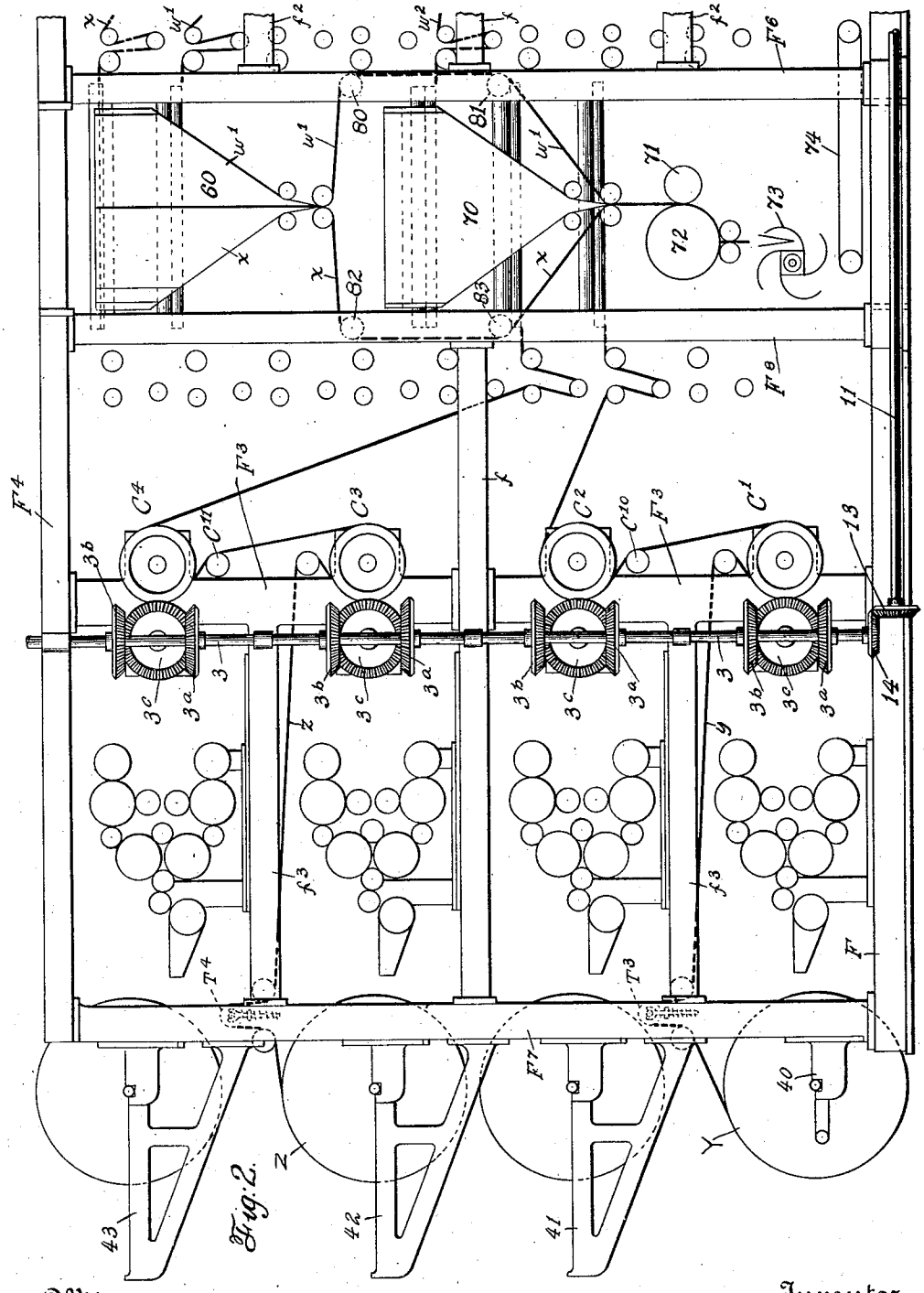


Fig. 2.

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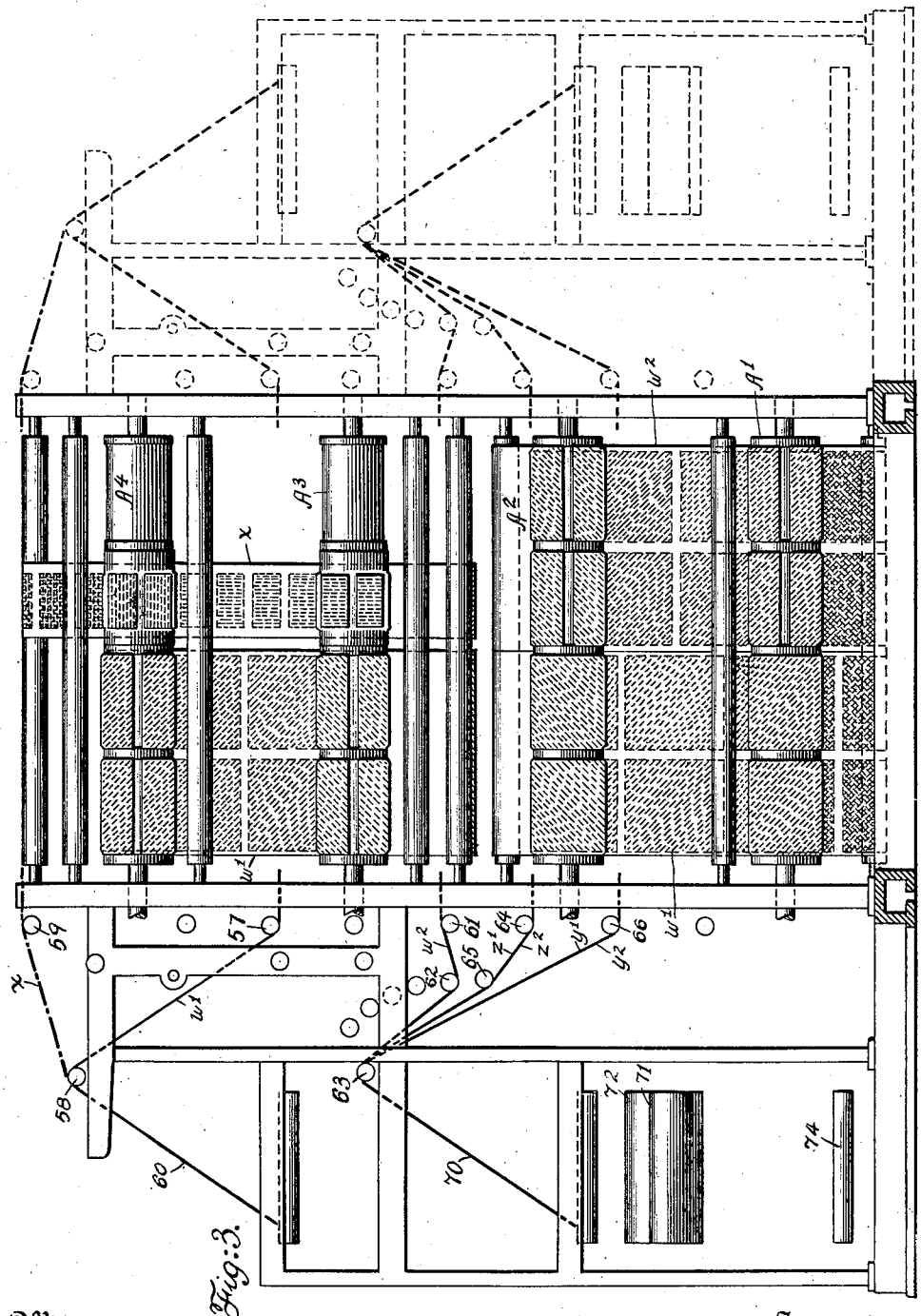


Fig. 3.

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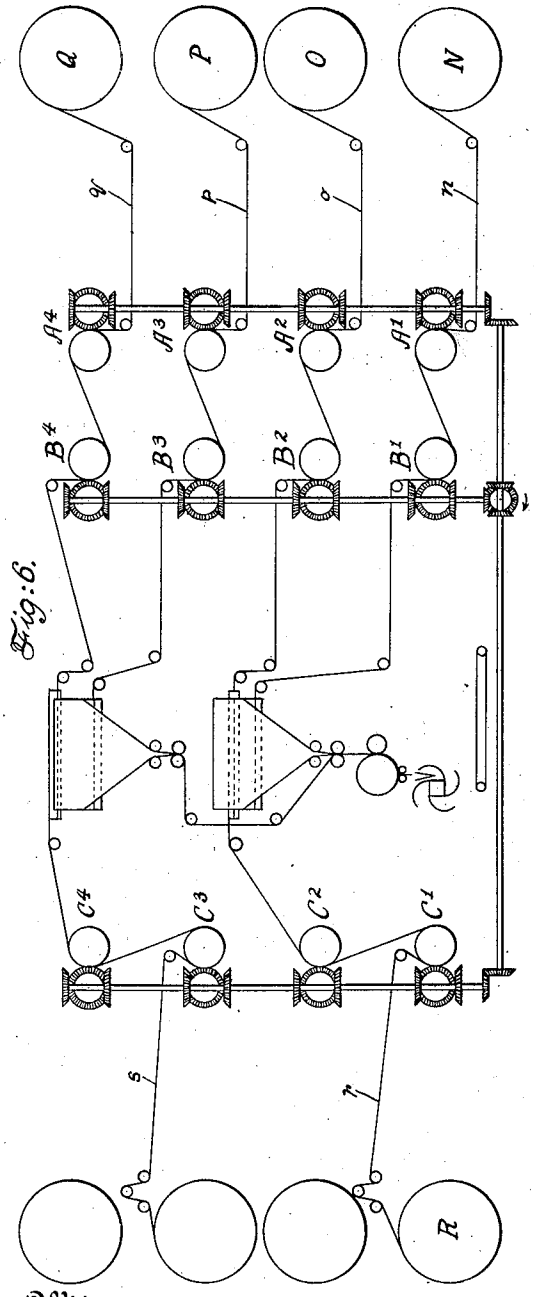


Fig: 6.

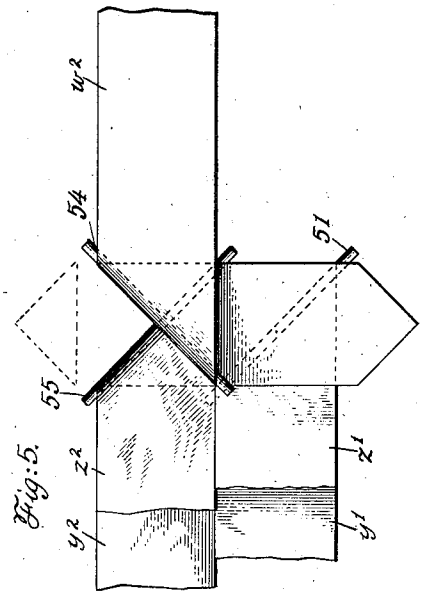


Fig: 5.

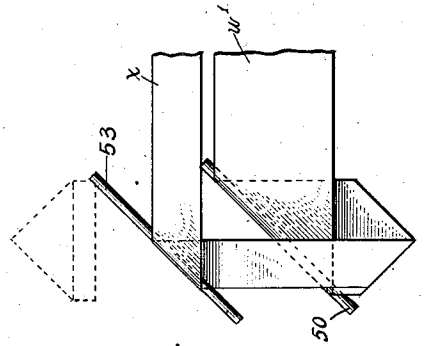


Fig: 4.

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5 SHEETS—SHEET 5.

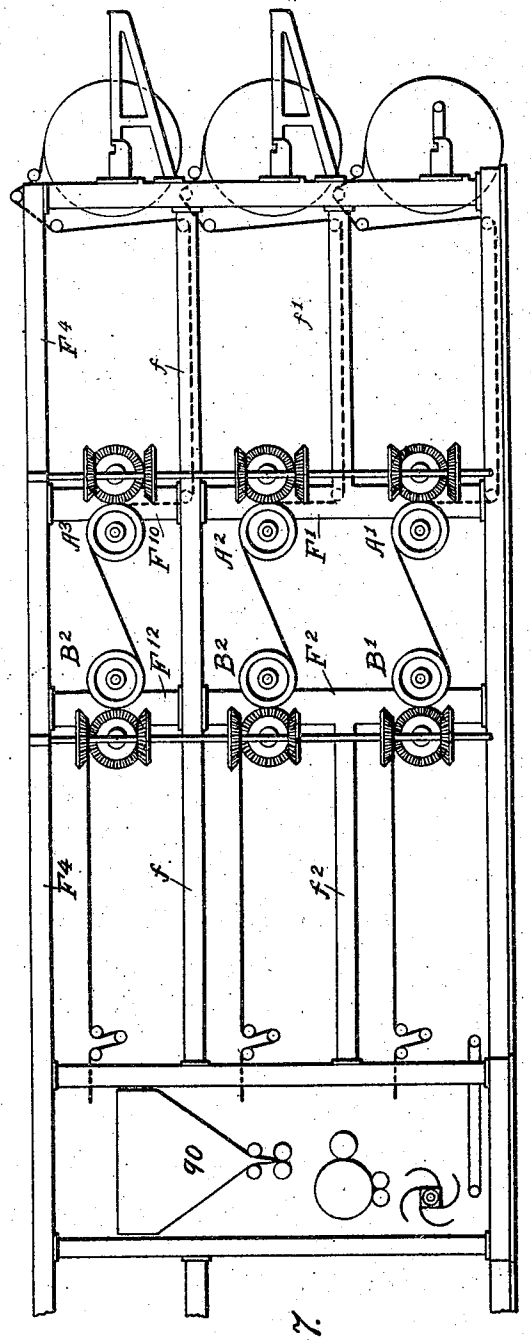


Fig. 7.

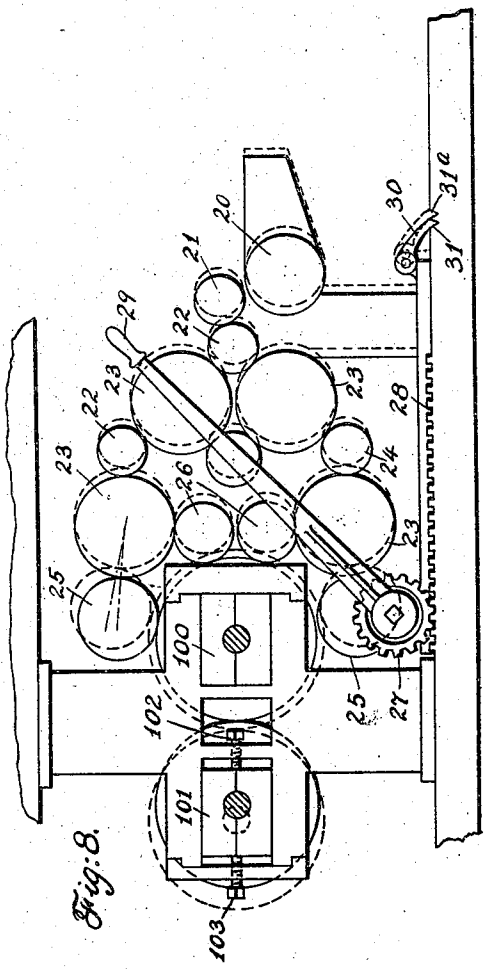


Fig. 8.

Witnesses:
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UNITED STATES PATENT OFFICE.

GEORGE E. PANCOAST, OF BROOKLYN, NEW YORK.

COMBINED MULTICOLOR AND PERFECTING WEB PRINTING-PRESS.

1,138,782. Specification of Letters Patent. Patented May 11, 1915.

Application filed June 3, 1911. Serial No. 631,153.

To all whom it may concern:

Be it known that I, GEORGE E. PANCOAST, a citizen of the United States, and a resident of Bensonhurst, borough of Brooklyn, county of Kings, State of New York, have invented certain new and useful Improvements in Combined Multicolor and Perfecting Web Printing-Presses, of which the following is a specification.

This invention is addressed to the provision of a rotary web printing machine capacitated to print one or more colors on each side of one or more webs or web sections of the same or of different widths, and to associate the webs or web sections in a great variety of ways, and to cut and fold the associated webs to produce practically any size or character of product required by publishers of newspapers and the like.

It is also an object of the invention to provide a machine of the character referred to which, when used for perfecting a number of webs, may be arranged to give substantially the same length and character of path of travel to each of the webs, whereby the webs to be associated with each other may be readily and reliably synchronized, and, when used for color printing may be arranged to give the webs a minimum length of travel between the couples which apply the successive colors; also to provide a machine which may be readily changed to produce different products; which may be operated to produce simultaneously a variety of products, and to realize to the greatest extent possible the full capacity of the machine, whatever may be the character of the product or products produced; also to provide a machine, every part of which is readily accessible for "making ready," for applying and removing plates, cleaning up, threading, etc.; also to provide a machine which shall occupy a small space in proportion to its capacity; which is composed of various elementary duplicate and interchangeable sections adapted to be readily built up to produce a machine of any desired capacity; and to produce a machine in which the sizes of the cylinders forming the couples may be changed to produce a product of different page sizes without changing the frame or other major parts of the machine.

These and other objects of the invention will be in part obvious and in part hereinafter more fully explained.

The invention consists in the novel constructions, combinations, and improvements herein shown and described.

In the drawings, referred to herein and forming a part hereof, is illustrated a machine embodying my invention together with modifications of certain features, the same serving in connection with the description herein to explain the principles of the invention.

Of the drawings: Figure 1 is a side elevation, partly diagrammatic in character, illustrating about one-half of the machine; Fig. 2 is a similar view illustrating the other half of the machine; Fig. 3 is a transverse sectional view, partly in elevation, the section being about upon the line 3—3 of Fig. 1; Fig. 4 is a diagrammatic plan view of the upper portion of the central or web-associating part of the machine; Fig. 5 is a similar view of the lower portion of the central or web-associating part of the machine; Fig. 6 is a diagrammatic side elevation of the operative parts of the machine upon a smaller scale, illustrating a different web-lead from that illustrated in Figs. 1, 2, and 3; Fig. 7 is a diagrammatic side elevation of the right-hand and central portion of a modified form of machine; and Fig. 8 is a similar view, illustrating the method of changing the sizes of the cylinders forming the printing couples.

Referring at first more particularly to the embodiment of the invention illustrated in Figs. 1 and 2, it will be seen that the machine there shown comprises three sets of printing couples vertically arranged and spaced apart longitudinally of the machine, the cylinders of the several couples being parallel and in tracking relation to each other, *i. e.*, in such relation that the web or webs passing therethrough may travel from one couple to another without sidewise deflection, or within the space inclosed by the planes in which the opposite ends of the several cylinders are located.

The several sets of couples are designated by reference letters A^1, A^2, A^3, A^4, B^1, B^2, B^3, B^4, and C^1, C^2, C^3, C^4, respectively, there being in this embodiment four couples in each series. It is to be understood that the invention is not limited to any particular number of series of couples nor to any particular number of couples in any series, the number of series and number of couples in

the respective series being determined according to the maximum desired capacity of the particular machine.

In accordance with one feature of the invention, two of the series of couples are arranged side by side with an open space or open spaces between them, the impression cylinders of both series of couples being arranged to face the space or spaces so as to be freely accessible therefrom for "making ready" purposes. As shown, the two series A^1, A^2, etc., B^1, B^2, etc., near the right-hand end of the machine are thus arranged, the spaces between the impression cylinders of the corresponding couples in the respective series preferably being approximately the same as the distance between the impression cylinders of adjacent couples in each series so as to afford as direct a line of travel for a web from one impression cylinder to another as is consistent with the provision of sufficient space to afford access to the various impression cylinders. To this end and for other reasons which will presently appear, the cylinders of each of the couples are preferably arranged with their axes in the same horizontal plane and the corresponding couples of the respective series are also located with the axes of their cylinders in the same horizontal planes.

In accordance with another feature of the invention, means are provided for driving a plurality of the couples in each series in either direction. Preferably, as in the embodiment illustrated, the design cylinders of the several couples constitute the driving members thereof. To this end the design cylinders of each series are arranged with their axes in the same plane, and a driving shaft is located in this plane and extended in a direction transverse to the axes of the cylinders, means being provided for connecting the driving shaft to each design cylinder so that the latter may be driven in either direction. As shown, a vertical driving shaft 1 is located in the plane of the axes of the design cylinders of series A^1, A^2, A^3, etc., a shaft 2 is similarly arranged with relation to the design cylinders of series B^1, B^2, B^3, etc., and a third shaft 3 is similarly arranged with relation to the series C^1, C^2, C^3, etc.

The shafts 1, 2, and 3 may be driven in unison by any suitable driving connections. As shown, a power shaft 4 is located in the same transverse plane with but at right angles to the vertical shaft 2, and is provided with a bevel gear 5 which meshes with a bevel gear 6 on the shaft 2. The shaft 1 is connected with the driveshaft 4 by a longitudinally arranged shaft 7, having at one end a bevel gear 8 meshing with the bevel gear 5 at the other end, a bevel gear 9 meshing with a bevel gear 10 at the lower end of the shaft 1. Similarly, the shaft 3 is connected with the power shaft 4 by a longitudinally arranged shaft 11, having at one end a bevel gear 12 meshing with the bevel gear 5 and at the other end a bevel gear 13 meshing with a bevel gear 14 at the lower end of the shaft 3. The advantage of this construction is that the three sets of couples are independently connected with the bevel gear 5 of the driveshaft so that the maximum strain transmitted to any one tooth or any one set of meshing teeth on that gear is that required to drive only one set of printing couples. Each of these shafts 1, 2, and 3 is provided with a pair of bevel gears for each design cylinder, these pairs of gears upon the several shafts 1, 2, and 3 being respectively lettered in the drawing 1^a, 1^b, 2^a, 2^b, and 3^a, 3^b. The members of each of the pairs of bevel gears 1^a, 1^b, 2^a, 2^b, and 3^a, 3^b are arranged to be moved into and out of driving engagement with a single bevel gear fixed upon the shaft of the corresponding design cylinder, these bevel gears being lettered 1^c, 2^c, and 3^c, respectively. Since the members of each of the several pairs of bevel gears are reversely arranged with respect to each other and adapted to mesh with the opposite sides of the design cylinder gears, it will be seen that the direction of rotation of each printing couple will depend upon which member of the corresponding pair of bevel gears is in inoperative position.

It will be seen that means are thus provided for driving each of a plurality of printing couples in each of a plurality of the sets of printing couples in either direction, each of the printing couples in each of the sets being in the embodiment shown provided with means whereby it may be driven in either direction. If it is desired to render any one or more of the printing couples inoperative, this may be done by simply throwing each of the bevel gears for driving such couple or couples out of mesh with the gear carried by the couple or couples.

An inking mechanism is provided for the design cylinder of each printing couple. Preferably and as shown, this inking mechanism is so constructed that it will operate to properly distribute and apply the ink irrespective of the direction of rotation of the printing couple. Preferably and as shown, the several inking mechanisms are exact duplicates of each other and are interchangeable. In the form illustrated each inking mechanism comprises a fountain 20, a ductor roller 21, a transfer roller 22, distributing cylinders 23, transfer rollers 24, large form rollers 25, and small form rollers 26. It will be observed that there is the same number of intermediate rollers between the first transfer roller 22 and each pair of form rollers, so that irrespective of the direction in which the inking mecha-

nism is driven the ink will be transmitted to the two sets of form rollers with the same amount of distribution. Each of the inking mechanisms is moreover mounted for movement to and from its design cylinder so as to afford access to the design cylinder for the application and removal of plates and to the inking mechanism for removing and replacing the rollers and cleaning them. In Fig. 1 the inking mechanisms are shown in operative positions, while in Fig. 2 the inking mechanisms are shown in their inoperative positions. Any suitable mechanism may be provided for moving the inking mechanisms and for holding them in their operative positions. As shown in Fig. 8, the inking mechanism is provided with a pinion 27 arranged to mesh with a rack 28 fixed on the frame of the machine, a suitable handle 29 being provided to turn the pinion and a pawl 30 being provided on the inking mechanism to engage a notch 31 in the frame and hold the inking mechanism in its operative position.

Any suitable construction of frame may be provided for supporting the various sets of printing couples and the parts associated therewith. In the preferred embodiment, however, and as shown, the frame is constructed to afford ready access to the space which is faced by the impression cylinders of the various sets. To this end each of the printing couples is mounted in a vertical frame member and, preferably, two overlying printing couples are mounted in the same vertical frame member. As shown, the members of the printing couples A^1, A^2, and A^3, A^4, respectively, constituting the right-hand end set of printing couples, are mounted in vertical frame members F^1. The members of couples B^1, B^2, and B^3, B^4, respectively, forming the second or intermediate set of couples, are mounted in the upright frame members F^2. The members of couples C^1, C^2, and C^3, C^4, respectively, forming the left-hand end set of printing couples, are mounted in the upright frame members F^3. The lower frame members F^1, F^2, and F^3 are mounted upon the base frame F and are secured at their upper ends to a longitudinal frame member f which forms a support for the upper upright frame members F^1, F^2, and F^3, the upper ends of the latter being secured to the top longitudinal frame member F^4. The upright frame members F^1, F^2, F^3 are preferably each braced by longitudinal frame members f^1, f^2, and f^3, respectively, which are connected at their ends opposite the members F^1, F^2, and F^3 with the vertical frame members F^5, F^6, and F^7. A fourth upright member F^8 is provided, the same serving in connection with the member F^6 as a support for the web-associating mechanism which will be presently described. It will be noted that the intermediate longitudinal member f is formed in two parts respectively arranged between the uprights F^5, F^6, and the uprights F^7, and F^8. It will be observed that the uprights F^1, F^2, F^3 and the members f^1, f^2, f^3 may be integrally formed, as shown, these parts together constituting T-shaped frame sections which are duplicated on opposite sides of the machine and which may be interchangeable.

Any suitable means may be provided for supplying one or a plurality of webs to the various sets of printing couples. As shown in Fig. 1, a series of brackets 35, 36, 37, 38 are provided to support web rolls in position to supply webs to the various couples A^1, A^2, A^3, A^4 of the first set of printing couples. A similar set of brackets 40, 41, 42, and 43 may be provided at the opposite end of the machine to supply webs to the corresponding set of printing couples.

The printing couples may be capacitated to print any desired width of web. Preferably and as shown, however, (see Fig. 3), they are capacitated to print upon double-width webs. That is to say, the cylinders are of such length as to adapt them to receive four printing plates abreast of each other, each plate being of a size to print the page of a newspaper or other publication, and the plates are arranged on the cylinders with the columns running circumferentially thereof. Preferably, also, the plates at the opposite ends of the cylinders are staggered with relation to each other, as indicated in the lower part of Fig. 3, where both sides of the cylinders are utilized to print full-size pages. If desired, however, plates adapted to print pages of different sizes and differently arranged may be mounted on the cylinders. As shown in Fig. 3, the right-hand ends of the two upper couples A^3, A^4 are provided with smaller plates adapted to print upon a narrow web. By staggering the plates so that the spaces between the pages at one end will come opposite the centers of the pages at the other end of the cylinders, as shown in the lower part of Fig. 3, the webs or web sections printed upon the machine may be readily synchronized and associated with each other irrespective of the direction of rotation of the couples.

As previously indicated, the machine may be threaded to print in a great variety of ways. As shown in Figs. 1, 2, and 3, a full width web w is led from the supply roll W mounted on the bracket 36 at the right-hand end of the machine, through a spring tension device T and a slitting device S, and one-half of this web w' is first led upward through the couples A^3, A^4 of the first set, thence down through the couples B^4, B^3 of the second set, these four couples serving to print four colors upon one side of this web

section. This section w' then passes back to the first set of couples and down through couples A^2, A^1, then back again to the second set and up through the couples B^1, B^2, the last four couples serving to print four colors upon the opposite side of the web. This web section thus perfected is led to the associating mechanism. The other half w^2 of the web W is first led to the opposite end of couple B^3 of the second set, where it is printed on one side with a single color and then it follows the same path as the first half w' through the four couples A^2, A^1, and B^1, B^2 but at the opposite ends of these couples from the web section w', receiving on the reverse side four colors and then passing to the associating mechanism. A second web x is led from a web roll X through a second tension device T', thence up through the couples A^3, A^4 of the first series around a reversing mechanism R and down through the couple B^4 of the second set and to the associating mechanism. As shown in Fig. 3, this narrow web passes through that end of the couples A^3, A^4 opposite that through which the first section w' of the first web passes and is printed in two colors by the small plates on the couples referred to. The couple B^4 prints a single color on the opposite side of this narrow web which is thus perfected. To secure accurate register between the designs printed by the several couples upon the same side of the respective webs or web sections, compensating rollers C^1, C^2, C^3, etc., are adjustably mounted between the several couples, to vary the lengths of the web paths and thus control the points of application of the designs.

Referring to Fig. 2, a web y is led from a supply roll Y through a tension device T^3 and thence downwardly through the couple C' of the third set and from this couple upward through the couple C^2 of this set and then to the associating mechanism. A fourth web z is led from a supply roll Z through a tension device T^4, then downward through the couple C^3 of the third set and upward through the couple C^4 of this set and thence to the associating mechanism. Where these webs are of double width, a slitting mechanism may be provided to divide them into two sections. It will be seen that each web is printed on each side or perfected with a single color.

The associating mechanism may be of any suitable construction adapted to associate the webs or web sections in any desired relation. The associating mechanism, as arranged to handle the webs illustrated in Figs. 1 and 2, is shown in Figs. 3, 4, and 5. As shown in Figs. 4 and 5, the associating mechanism comprises two sets of turner bars, one set being arranged in line with each half of the double width printing couples or to handle one-half of the several webs or web sections. As indicated, one set of turner bars comprises an upper turner bar 50 (see Fig. 4) adapted to receive the web section w' and two lower turner bars one of which is indicated at 51 in Fig. 5, these turner bars receiving the halves y' and z' of the webs y, z, respectively. The other set of turner bars comprises an upper turner bar 53 adapted to receive the narrow web x and deflect it transversely over the web section w', a second lower turner bar 54 adapted to receive the section w^2 of the web w and deflect it transversely over the web sections y', z' and two still lower turner bars, one of which is indicated at 55 in Fig. 5, which receive the web sections y^2 and z^2 and deflect them transversely out in associated relation with the sections y', z'. The transversely deflected web sections are associated and delivered to the folding mechanism which is located at the side of the press in the same transverse plane with the sets of turner bars. As shown in Fig. 3, the web w' is directed from the turner bar 50 by a guide roller 57 to a guide roller 58 which also receives the web x from the turner bar 53 and a guide roller 59. From the guide roller 58 these two webs pass over an upper longitudinal folder 60. The web section w^2 passes over the turner bar 54, over guide rollers 61 and 62 to a guide roller 63, and the web sections z', z^2 pass from their turner bars over guide rollers 64 and 65 to the guide roller 63, while the web sections y' and y^2 pass from their turner bars over a guide roller 66 and then to the guide roller 63, the several web sections w^2, z', z^2, y', y^2 which are thus associated on the roller 63 passing from that roller to a lower longitudinal former 70. Obviously the webs which are associated and folded longitudinally upon the formers 60 and 70 may be passed to any suitable mechanism for cutting them on transverse lines between the pages, giving them a second fold as usual, and delivering the folded products. As shown in Fig. 2, however, the associated longitudinally folded webs passing from the upper former 60 are transferred around the lower former 70 and associated with the webs delivered from this former to a cutting and folding mechanism comprising a cutting cylinder 71, the collecting and folding cylinder 72, and a delivery mechanism comprising a rotary fly 73 and traveling apron 74. In order that the product of the upper former may be associated with the product of the lower former either on the inside or the outside thereof, means are provided for guiding the product of the upper former to either side of the lower former, this means comprising guide rollers 80 and 81 on one side of the lower former and guide rollers 82 and 83 on the other side of the lower former. As shown, the

web section w', which is longitudinally folded on the upper former, is passed to the right of the lower former 70 and associated with the product from the lower former on the outside thereof, while the narrow web x passing over one side of the upper former is deflected to the left and is associated with the product of the lower former on the inside thereof. Instead of associating all the webs and delivering them to the folding mechanism at one side of the machine, as shown in full lines in Fig. 3, a second folding mechanism may be arranged at the opposite side of the press, as indicated in dotted lines in Fig. 3, and all or a part of the webs delivered to this folding mechanism and associated in any desired relation to each other.

In Fig. 6 the machine is illustrated as adjusted to print one color on each side, or perfect each, of six webs. As shown, one web n is led from the lower web roll N at the right-hand end of the machine, up through the lower printing couple A^1 of the first set, then up through the first printing couple B^1 of the second set, and thence to the associating mechanism. Similarly, a second web is led from a web roll O through the couples A^2, B^2 to the associating mechanism, and third and fourth webs p and q are led from web rolls P and Q through the couples A^3, B^3 and A^4 and B^4, respectively, and thence to the associating mechanism. A fifth web r is led from the lower web roll R at the left-hand end of the machine through the couples C^1, C^2 of the third set so as to receive a single color on each side, and thence to the associating mechanism; and a sixth web s is similarly led through the couples C^3 and C^4, and thence to the associating mechanism. Obviously, these webs may be associated in any desired relation and delivered to the folding mechanisms either at one or both sides of the machine.

It will be obvious from what has already been stated that a machine may be built up with any desired number of printing couples in the various sets. In Fig. 7 is illustrated a machine having two vertically arranged sets of printing couples, each set containing three couples, A^1, A^2, A^3, and B^1, B^2, B^3, respectively. In this case the two lower couples in each set are mounted in frame members F^1, F^2, as in the machine illustrated in Fig. 1. The upper couples A^3, B^3 of this machine are mounted in short upright frame sections F^{10} and F^{12}, these being arranged between the longitudinal frame members f and F^4 which are spaced apart only one-half the distance of the frame members f and F^4 of the machine shown in Fig. 1. While no inking mechanisms are illustrated in Fig. 7, it will be understood that they will be supplied and may be identical with those illustrated in Fig. 1. While the machine shown in Fig. 7 is illustrated as threaded with three webs, each of which receives a single color on each side, it will be understood that by driving the printing cylinders in the proper direction by the reversible driving mechanism shown, this being of the same character as that illustrated in Fig. 1, one or more webs may be printed with several colors on one or both sides. This machine is illustrated as provided with a single former 90 and a single cutting, transverse folding and delivering mechanism, but it will be understood that more cutting and delivering mechanisms may be provided, if desired, either upon the same or upon the opposite side of the machine. It will be understood that, if desired, a third set of printing couples may be provided at the opposite end of the machine which, as indicated in Fig. 7, is cut away.

In Fig. 1 is illustrated a manner of bringing into action a new roll of paper when a preceding roll has become exhausted. When, for instance, the roll W is about to become exhausted, the leading end of a second roll W^1 mounted in an adjoining bracket is provided with paste and the press being stopped for a few seconds, the tail end of the exhausted web is brought down and attached by the paste to the leading end W^2 of the web W^1. The machine is then started and the web from the roll W^1 will be pulled through the machine by the web W and will take the place of the latter. A new roll is then mounted in place of the roll W, and when the web W^1 is exhausted, its tail end is attached to the leading end of the new roll, and so on.

To change the length of the pages printed in a machine of the character herein set forth, the cylinders of the various printing couples are removed and cylinders of a different diameter substituted therefor. The construction by which this is accomplished is illustrated in Fig. 8. As indicated in this figure, the bearings 100 for the design cylinder are fixed to maintain a fixed relation between the shaft of this cylinder and the driving mechanism. The impression cylinder and the inking mechanism are made adjustable to coöperate with design cylinders of different diameters, as follows: The bearings 101 for the impression cylinder are adjustable to and from the design cylinder bearings by means of screws 102 and 103. These screws are adapted to give a certain amount of adjustment of the impression cylinder to accommodate design cylinders of slightly different sizes and also to secure the required degree and evenness of pressure contact between the two cylinders. In order to accommodate the larger variation in the diameter of the cylinders, the boxes 101 for the impression cylinder may be

bored to one side of the center so that by turning these boxes over a considerable variation in the distance between the centers of the two cylinders may be secured, the lesser variations being again effected by the manipulation of the set screws 102 and 103. To adjust the inking mechanism to design cylinders of different diameters, it is only necessary to mount the two large form rollers 25 so that they may be adjusted around the centers of the adjacent distributing rollers 23 and to vary the position of the inking mechanism as a whole to secure the required relation between the design cylinders and the smaller form rollers 26. The variations in the operative position of the inking mechanism may be determined by providing the frame with additional notches 31ª adapted to coöperate with the locking pawl 30.

Among the advantages of a machine constructed in accordance with the invention the following may be here mentioned. When the machine is employed for printing a plurality of colors on one or more, of the webs, the webs are led with a minimum length of path from one couple to the next, being only slightly deviated from the direct path by the compensating rollers which are required to effect only minor adjustments for registry, the major adjustments being effected by shifting the printing couples with relation to each other. It will be noted that the extent of this latter adjustment is limited only by the coarseness of the teeth by which the printing couples are geared to the driving mechanism.

When the machine is employed for simply perfecting a plurality of webs, as indicated for instance in Fig. 6, it will be seen that each of the webs has substantially the same length and character of path through the machine so that there will be a minimum of difficulty in causing synchronism of travel to bring the pages of associated webs into registering relation with each other. It will be further noted that whether used for color work or simply perfecting, each of the webs or web sections passes from its printing mechanism over a turner bar and only one turner bar to the folding mechanism, this arrangement being also of advantage in securing synchronism due to the uniformity of the angle bar drag on all the webs.

By reason of the employment of the vertical frame members for mounting the various printing couples of adjacent sets, the sides of the frame opposite the open spaces between the sets are provided with openings of sufficient size to afford ready access to the spaces between the sets of printing couples.

Other advantages of the construction illustrated and described and not herein mentioned will be obvious to those skilled in the art.

It is to be understood that my invention in its broader aspects is not limited to the particular constructions herein shown and described, as many changes may be made in the structural details and arrangements of the parts without departing from the main principles of the invention and without sacrificing its chief advantages.

What I claim is:

1. A rotary web printing machine including in combination, two sets of printing couples vertically arranged side by side with an open space between them and with their cylinders parallel and in tracking relation, the impression cylinders of both sets being accessible from said space, means for driving a plurality of the couples in either direction, an inking mechanism adapted to be driven in either direction associated with the design cylinder of each of said reversible couples, means for supplying a plurality of webs to one set, and means for delivering the printed webs from the other set, said delivering means comprising a set of turner bars arranged in a transverse plane adjacent to the last-mentioned set of printing couples and folding mechanism arranged at the side of the press in the plane of the turner bars.

2. A rotary web printing machine including in combination, two sets of printing couples vertically arranged side by side with an open space between them and with their cylinders parallel and in tracking relation, the impression cylinders of both sets being accessible from said space and the design cylinders of each set being arranged in fixed bearings, means mounted in fixed relation to the axes of the design cylinders for driving the printing couples of each set, movable bearings for the impression cylinders of the several couples, inking mechanism for each design cylinder arranged on the opposite side thereof from the corresponding impression cylinder, and supports for the inking mechanism movable with relation to the design cylinder.

3. A rotary web printing machine including in combination, two sets of printing couples vertically arranged side by side with an open space between them and with their cylinders parallel and in tracking relation, the impression cylinders of both sets being accessible from said space and the design cylinders of each set being arranged with their axes in a single plane, means for driving the couples including a shaft arranged in the plane of the axes of the design cylinders of each set and intersecting said axes, and gearing between each of said shafts and the design cylinders of the corresponding set, means for movably supporting the im-

pression cylinders with relation to their respective design cylinders, inking mechanism for each design cylinder, and means for movably supporting the inking mechanism with relation to the corresponding design cylinders.

4. A rotary web printing machine including in combination, two sets of printing couples vertically arranged side by side with an open space between them and with their cylinders parallel and in tracking relation, the impression cylinders of both sets being accessible from said space, and the design cylinders of each set being arranged in a single plane, means for driving the couples in either direction, said means including a shaft arranged in the plane of the design cylinders of each set and at right angles to the axes of said design cylinders, each driving shaft being provided with a pair of bevel gears corresponding to each design cylinder, the members of each pair being independently movable upon its shaft into and out of mesh with a bevel gear upon the shaft of the corresponding design cylinder, and means for driving said shafts in unison.

5. A rotary web printing machine including in combination, two sets of printing couples vertically arranged side by side with an open space between them and with their cylinders parallel and in tracking relation, the impression cylinders of both sets being accessible from said space, an inking mechanism for each design cylinder movably mounted with relation thereto to afford access to the cylinder and to the inking mechanism, and means for driving each of a plurality of the couples in either direction, the corresponding inking mechanisms being reversible so as to properly apply the ink to its design cylinder irrespective of the direction of rotation thereof, and means for supplying one or more webs to one set of printing couples and for delivering the printed web or webs from the other set.

6. A rotary web printing machine including in combination, two sets of printing couples, vertically arranged side by side near one end of the machine with an open space between them and with their cylinders parallel and in tracking relation, a third set of printing couples vertically arranged near the opposite end of the machine with its cylinders parallel to and in tracking relation with those of the first mentioned sets, means for driving a plurality of the printing couples in each of a plurality of sets in either direction, means for supplying webs to the sets of couples nearest the ends of the machine, and means located between the first mentioned sets and the third set for associating the printed webs in various relations to each other.

7. A rotary web printing machine including in combination, two sets of printing couples vertically arranged side by side near one end of the machine with an open space between them and with their cylinders parallel and in tracking relation, the impression cylinders of both sets being accessible from said open space, a third set of printing couples vertically arranged near the opposite end of the machine with its cylinders parallel to and in tracking relation with those of the first mentioned sets, means for driving a plurality of the printing couples of each of the first mentioned two sets in opposite directions, means for supplying one or more webs to the first mentioned two sets of couples, means for supplying one or more webs to the third set of couples, and means including turner bars located between the first mentioned two sets and the third set for associating the printed webs in various relations to each other, and mechanism located at the side of the machine in the same transverse plane with the turner bars for folding, severing, and delivering the associated webs.

8. A rotary web printing machine including in combination, a plurality of vertical sets of printing couples, one near each end of the machine and another intermediate the end sets but spaced therefrom, the cylinders of the several sets being parallel to and in tracking relation with each other, means for driving a plurality of couples in either direction, means for supplying webs to the end sets, web associating means in the space between the intermediate and one of the end sets.

9. A rotary web-printing machine including in combination, a plurality of vertical sets of printing couples, one set near each end of the machine and another set intermediate of and spaced from the end sets, the cylinders of the several sets being parallel to and in tracking relation with each other and the cylinders of each set being arranged with their axes in a horizontal plane, means for driving each of a plurality of the printing couples in either direction, means for supplying webs to the end sets, and web associating means located between the intermediate set and one of the end sets, the impression cylinders of the intermediate set and the other end set being accessible from the space between these sets.

10. A rotary web printing machine including in combination, a plurality of vertical sets of printing couples, one near each end of the machine and another intermediate of and spaced from the end sets, the cylinders of the various couples being parallel to and in tracking relation with each other, and each set having one cylinder of each couple arranged in a single vertical plane, means for driving the several sets

including a vertical shaft located in the said vertical plane of each set, each shaft having a pair of bevel gears corresponding to each of a plurality of couples, the members of each pair of gears being movable into and out of mesh with a gear upon the corresponding cylinder, and means for driving the said shafts in unison.

11. A rotary web printing machine including in combination, a plurality of vertical sets of printing couples, one near each end of the machine and another intermediate of and spaced from the end sets, the cylinders of the various couples being parallel to and in tracking relation with each other, and each set having one cylinder of each couple arranged in a single vertical plane, means for driving the several sets including a vertical shaft located in the said vertical plane of each set, each shaft having a pair of bevel gears corresponding to each of a plurality of couples, the members of each pair of gears being movable into and out of mesh with a gear upon the corresponding cylinder, means for driving the said shafts in unison, means for supplying one or more webs to each of the end sets of printing couples, web associating means arranged between the intermediate set and one of the end sets, the impression cylinders of the intermediate set and of the other end set being accessible from the space between these sets, and a series of inking mechanisms, one for each printing couple, said inking mechanisms being movable into and out of coöperative relation with their respective couples to afford access to the design cylinders.

12. A rotary web printing machine including in combination, a plurality of vertical sets of double wide printing couples one near each end of the machine, the cylinders of the various couples being parallel to and in tracking relation with each other, means for supplying one or more webs or web sections to each side of each of said sets of printing couples, a set of single wide turner bars arranged between each of the corresponding ends of the sets of couples, the two sets of turner bars being in the same transverse plane, and a single wide folding mechanism located at the side of the machine in the same transverse plane with the turner bars.

13. A rotary web printing machine including in combination, a plurality of vertical sets of double wide printing couples one arranged near each end of the machine, the cylinders of the various couples being arranged parallel to and in tracking relation with each other, means for supplying a plurality of webs or web sections to each side of each of said sets of printing couples, a plurality of sets of single wide turner bars, one arranged between each side of the two sets of printing couples, the sets of turner bars being in the same transverse plane, and a plurality of single wide folding mechanisms located at each side of the machine each of the folding mechanisms being in the same transverse plane with the sets of single wide turner bars.

14. A rotary web printing machine including in combination, a plurality of vertical sets of printing couples, one set being located near each end of the machine and another set located between and spaced from said end sets, the cylinders of the various sets being capacitated to print upon double width webs and being parallel to and in tracking relation with each other, means for supplying webs or web sections to each side of each of the end sets, a plurality of sets of turner bars, one set being arranged between each side of the intermediate set of printing couples and one of the end sets of printing couples, said sets of turner bars being arranged in the same transverse plane, a folding mechanism located at the side of the machine and in the same transverse plane with the sets of turner bars.

15. A rotary web printing machine including in combination, a plurality of vertical sets of printing couples, one arranged near each end of the machine, the cylinders of the various couples being parallel to and in tracking relation with each other, means for driving some of the couples in either direction and simultaneously driving other of the couples in the opposite direction, means for supplying one or more webs to each set of couples, means located in a transverse plane between the sets of couples for assembling the webs from the various sets of printing couples, and folding mechanism at the side of the machine in the same transverse plane with the assembling means.

16. A rotary web printing machine including in combination, a plurality of vertical sets of printing couples, one arranged near each end of the machine and another located between and spaced from the end sets, the cylinders of the various couples being capacitated to print upon double width webs arranged parallel to and in tracking relation with each other, means for driving a plurality of the printing couples of each of a plurality of the sets in either direction, means for supplying one or more webs or web sections to each of the end sets of couples, a plurality of sets of turner bars, one set being arranged between each side of the intermediate and one of the end sets of printing couples, the impression cylinders of the intermediate and the other end set of printing couples being accessible from the space between these sets, and folding mechanism arranged at the side of the machine and in the same transverse plane with the two sets of turner bars, said folding mechanism in-

cluding two longitudinal folders arranged one above the other, and means for transferring the product of the upper folder to either side of and associating it with the product of the lower folder.

17. A rotary web printing machine including in combination, two sets of double wide printing couples vertically arranged side by side near one end of the machine with an open space between them, and with their cylinders parallel to and in tracking relation with each other, the impression cylinders of both sets being accessible from said open space, a third set of printing couples vertically arranged near the opposite end of the machine with its cylinders arranged parallel to and in tracking relation with those of the first mentioned sets, means for driving a plurality of the printing couples of each of the first mentioned sets in either direction, means for supplying one or more webs or web sections to each of the set of couples nearest the ends of the machine, a plurality of sets of turner bars one set being arranged in line with each side of the double wide sets of printing couples and both sets in the same transverse plane, and a folding mechanism located at the side of the machine in the same transverse plane with the sets of turner bars.

18. A rotary web printing machine including in combination, a plurality of sets of printing couples vertically arranged side by side with an open space between them and with their cylinders parallel and in tracking relation, the impression and design cylinders of each set being in the same horizontal plane, and a frame structure supporting the couples and including separate superposed vertical standards, each standard carrying one or more of the printing couples of one set, and the standards for each set being duplicates of each other.

19. A rotary web printing machine including in combination, a plurality of sets of printing couples vertically arranged side by side with an open space between them and with their cylinders parallel and in tracking relation, the impression and design cylinders of each set being in the same horizontal plane, a frame structure supporting the couples and including superposed separate vertical standards, each standard carrying one or more of the printing couples of one set, and horizontal bars in fixed relation to the vertical standards for joining the couple carrying standards to other frame standards, said horizontal bars carrying the inking mechanisms for the respective couples.

20. A rotary web printing machine including in combination, a plurality of sets of printing couples vertically arranged side by side with an open space between them and with their cylinders parallel and in tracking relation, the impression and design cylinders of each set being in the same horizontal plane, a frame structure supporting the couples and including separate superposed vertical standards, each standard carrying one or more of the printing couples of one set, and horizontal bars formed integral with the vertical standards for joining the couple carrying standards to other frame standards, said horizontal bars carrying the inking mechanisms for the respective couples.

21. A rotary web printing machine including in combination, fixed bearings for a plurality of vertically arranged design cylinders, the means mounted in the same vertical plane as the bearings of the design cylinders for driving the design cylinders, impression cylinder bearings movably mounted with relation to the design cylinder bearings, inking mechanisms movably mounted with relation to said design cylinder bearings and having independently movable form rollers, whereby the machine is adapted to receive design and impression cylinders of different diameters without derangement of the driving mechanism.

22. A rotary web printing machine including in combination, fixed bearings for a plurality of design cylinders, said bearings being arranged in a single vertical plane, means for driving the said design cylinders comprising a shaft arranged in fixed relation to the design cylinder bearings and in the same vertical plane therewith, impression cylinder bearings movably mounted with relation to the design cylinder bearings, and inking mechanisms movably mounted with relation to the design cylinder bearings on the opposite side thereof from the impression cylinder bearings, said inking mechanisms having independently movable form rollers, whereby the machine is adapted to receive design and impression cylinders of different diameters without derangement of the driving mechanism.

23. A rotary web printing machine including in combination, two sets of printing couples arranged vertically side by side, with an open space between them and with their cylinders parallel and in tracking relation, the impression cylinders on both sets facing and being accessible from said space, means for driving any couple on either side in either direction irrespective of the direction of drive on any other couple, each of said sets of printing couples having an open space behind it, inking mechanism for each design cylinder in the space behind said sets of printing couples respectively, said inking mechanisms being mounted for movement toward the design cylinders respectively, whereby space to serve the ink fountains is provided behind said inking mechanisms, said inking mechanisms being movable

away from said design cylinders whereby said inking mechanisms are accessible for cleaning.

24. A rotary web printing machine including in combination a plurality of sets of printing couples vertically arranged side by side and spaced apart and with their cylinders parallel and in tracking relation, the impression cylinders of both sets being accessible from said space, means for driving the design cylinders of each set from one shaft, means for reversing the direction of rotation of one or more of the printing couples with relation to the direction of rotation of the other couples, inking mechanism for each design cylinder arranged on the opposite side thereof to the corresponding impression cylinder, supports for the inking mechanism movable with relation to the design cylinder, and means for disengaging any printing couple without affecting the operability of the remaining couples.

25. A rotary web printing machine including in combination two sets of printing couples vertically arranged side by side with an open space between them and with their cylinders parallel and in tracking relation, the impression cylinders of both sets facing and being accessible from said space, the design cylinders of each set being arranged in fixed bearings, means mounted in fixed relation to the axes of the design cylinders for driving each of the printing couples of each set in either direction, inking mechanism for each design cylinder arranged on the opposite side thereof from the corresponding impression cylinder, and means for moving the inking mechanisms toward and from the design cylinders in the common plane of the printing couple axes respectively.

26. A rotary web printing machine including in combination, two sets of printing couples vertically arranged side by side with an open space between them and with their cylinders parallel and in tracking relation, the impression cylinders of both sets being accessible from said space, and each set having one of the cylinders of the different couples arranged in a single plane, means for driving the couples in either direction, said means including a shaft arranged in the plane of those cylinders of each set that are arranged in a single plane and at right angles to the axis of said cylinders, each driving shaft being provided with a pair of bevel gears corresponding to each of said cylinders arranged in a single plane, the members of each pair being independently movable upon its shaft into and out of mesh with a bevel gear upon the shaft of the corresponding cylinder, and means for driving said shafts in unison.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

GEORGE E. PANCOAST.

Witnesses:
CARL W. WINKLER,
LEE W. LIBERMAN.