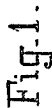


APPLICATION FILED NOV. 25, 1907.

Patented Feb. 22, 1910.

4 SHEETS—SHEET 1.



C. D. DuBois
C. A. Gouty

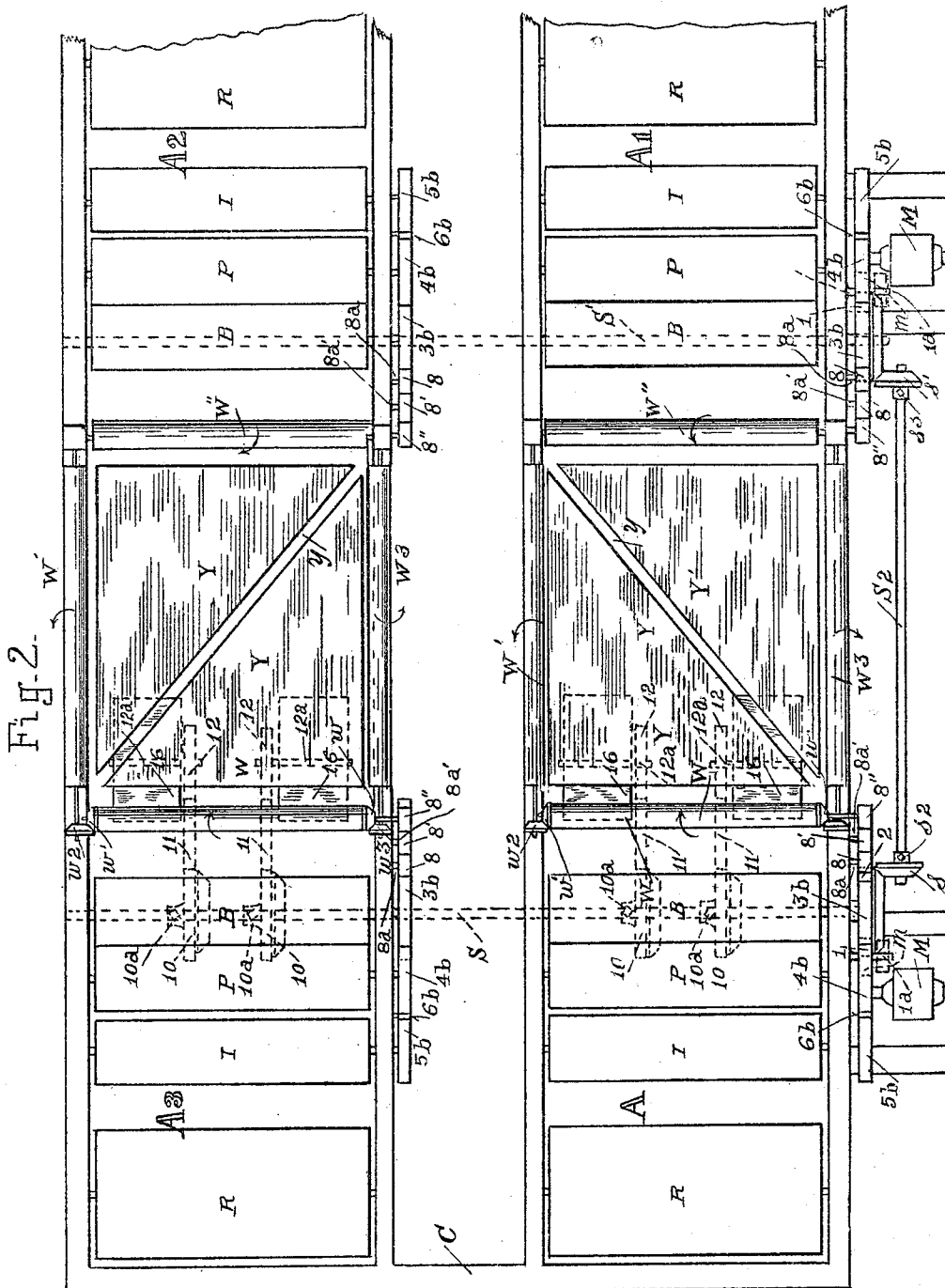
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950,015.

J. A. BOYCE.
PRINTING MACHINE.
APPLICATION FILED NOV. 25, 1907.

Patented Feb. 22, 1910.

4 SHEETS—SHEET 2.



Witnesses.
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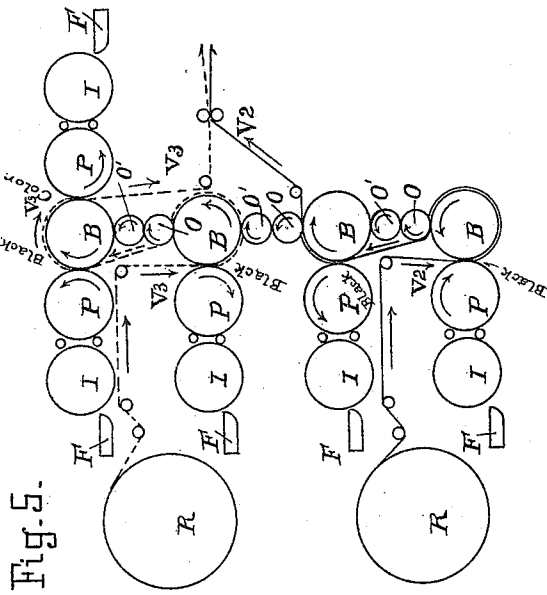


Fig. 5.

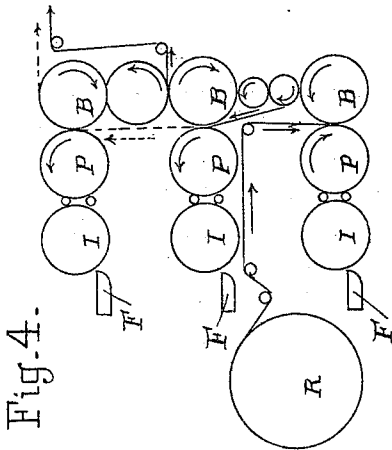


Fig. 4.

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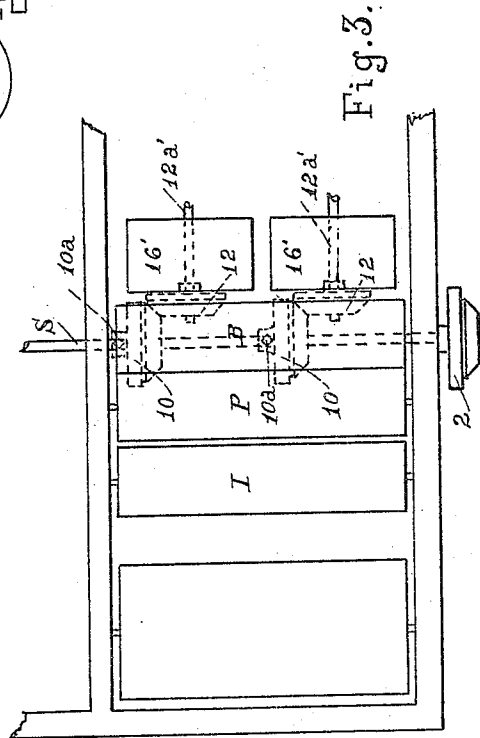


Fig. 3.

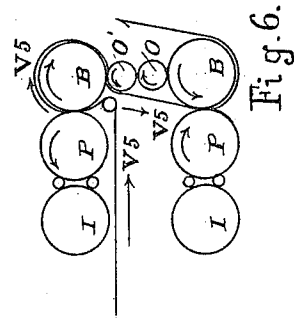


Fig. 6.

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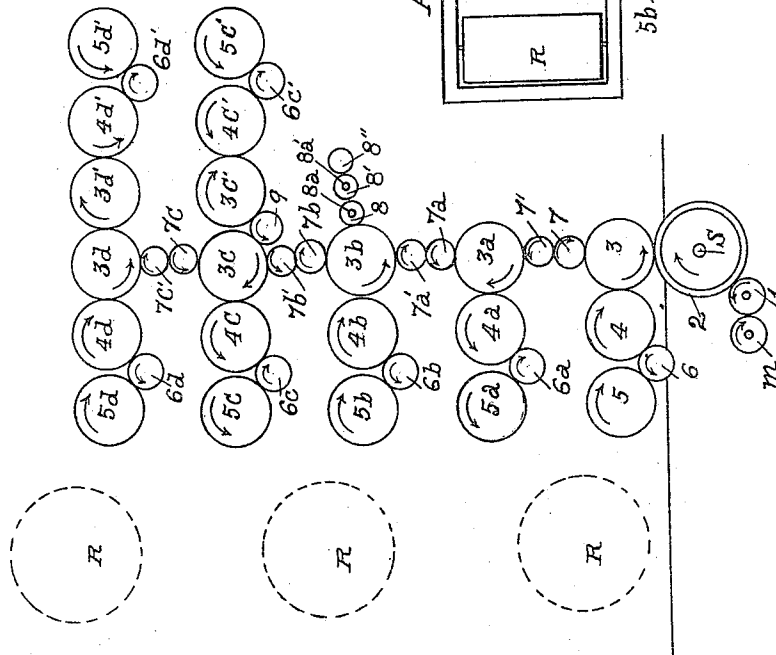


Fig. 7.

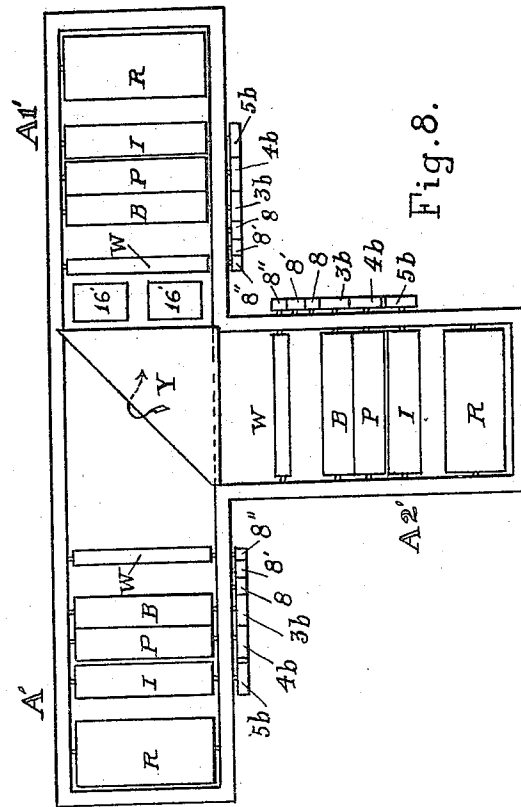


Fig. 8.

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UNITED STATES PATENT OFFICE.

JOHN A. BOYCE, OF SPRINGFIELD, ILLINOIS.

PRINTING-MACHINE.

950,015.

Specification of Letters Patent.

Patented Feb. 22, 1910.

Application filed November 25, 1907. Serial No. 403,637.

To all whom it may concern:

Be it known that I, JOHN A. BOYCE, a subject of His Majesty Edward VII, King of Great Britain and Ireland, have made oath of my intention to become a citizen of the United States, as evidenced by the certificate of the county clerk of Sangamon county, Illinois, now on file in the Patent Office; be it further known that I am a resident of the city of Springfield, in the county of Sangamon and State of Illinois, and that I have invented certain new and useful Improvements in Printing-Machines, of which the following is such a full, clear, and exact description as will enable others skilled in the art to which it appertains to make and use my said invention.

This invention relates to rotary perfecting printing machines and the purposes of the invention are to arrange the mechanisms in such relation to each other that the inking mechanisms which, in the art as practiced prior to my invention, have been located between the plate cylinders and the folder mechanisms, will be located between the printing couples and the rolls of paper being operated upon; in other words the inking mechanisms instead of being adjacent to the folder mechanisms will be adjacent to the rolls of paper; to so arrange the mechanisms that all the blanket cylinders of the primary printing mechanisms printing in black may occupy a single tier, one above the other so that the folder mechanism, whether parallel to the printing couples or at right angles thereto, may be located next to the blanket cylinders receiving the last impression, so that the web will have a short and direct run to the folder mechanism without the use of tapes or other leader devices; to so arrange the mechanisms that offset cylinders will be situated between or adjacent to the blanket cylinders and will not interfere with the placing of the plates on the plate cylinders and by reason of the lateral extensions comprising the secondary printing mechanisms, being above the pulling mechanisms and the folder mechanisms, the height of the machine may be less than it would be if the offset cylinders were adjacent to the plate cylinders; to provide extensions above the folder mechanisms and in line with one or more lines of the primary printing mechanisms and equipped with printing couples effective for printing either in black or in colors; to

tion to the blanket cylinders of said tier of primary blanket cylinders, some of said offset cylinders being also adapted to cooperate with the secondary blanket cylinders on the extensions; to provide means for controlling the run of the webs in such manner that the first impression may be made on either side of the web at the option of the operator; to provide a train of gears, in a single vertical tier having their axes in the same plane with the axes of the first and second impression cylinders and driving the printing mechanisms and connected to drive folder mechanisms at right angles to the printing couples, or in cooperation with and connected to drive folder mechanisms parallel to the printing couples; to provide web propelling devices actuated by a gear of the train of gears driving the tier of primary blanket cylinders and adapted to propel the webs directly to formers or equivalent associating or folder devices next to said tier of blanket cylinders; to provide a plurality of sets of printing mechanisms arranged end to end and each set comprising a tier of plate cylinders and a corresponding tier of blanket cylinders all of said sets of printing mechanisms and the folder mechanisms cooperating therewith respectively being driven by a single main shaft; to provide a quadrangular printing machine having four sets of printing mechanisms, one set occupying each corner of the quadrangle, said sets being arranged in two pairs, the plate and impression cylinder of one set of a pair being end to end to the plate and impression cylinders of the complementary set of the same pair; to provide means for associating and propelling toward each other and toward a common center full width webs from two or more sets of printing mechanisms which are end to end or side by side as the case may be; to provide a printing machine comprising multiple sets of printing mechanisms, equipped with turner devices and web propelling devices in such relation to the sets of printing mechanisms respectively that the webs printed by any one or more sets of printing mechanisms may be led to and associated with the webs printed by any other one set of printing mechanisms and in conjunction with the webs printed by said last named set of printing mechanisms may be run to and operated upon by the folder mechanism, or mechanisms cooperating with said last named set of printing

mechanisms and to provide web turners and coöperating web propelling devices adapted to turn and propel webs in any one of four directions as hereinafter set forth.

5 With these ends in view this invention consists in the novel features of construction and combinations of parts, shown in the annexed drawings to which reference is hereby made, and hereinafter particularly described and finally recited in the claims.

10 The drawings are in the nature of diagrams intended only to illustrate the relations and coöperation of the mechanisms; it being understood that the elements of several mechanisms may be such (except where otherwise specified) as are commonly used to effect the several different operations set forth.

15 In the drawings I have illustrated, as the preferable form of the apparatus, a quadrangular printing machine having four sets of printing mechanisms A, A¹, A² and A³, one set of printing mechanisms being located near each corner of the quadrangle and the 20 two sets of printing mechanisms at each end of the quadrangle being arranged end to end; it is obvious however that, within the scope of my invention the printing mechanisms may occupy different positions relative to each other, such for example as the 25 position shown in Fig. 8, in which there are three sets A', A¹' and A²', the set A²' being at right angles to the sets A' and A¹', it being essential only that the construction 30 and relation of the printing mechanisms be such that the blanket cylinders of all the printing mechanisms shall be contiguous to each other, and the folder mechanism or mechanisms shall be next to said blanket 35 cylinders.

40 I will now describe the printing machine of preferable construction, comprising four sets of printing mechanisms; but it will be understood that a printing machine within 45 the scope of my invention may comprise a greater or less number of sets of printing mechanisms.

Figure 1 is a diagrammatic side elevation of the machine. Fig. 2 is a diagrammatic 50 plan of the mechanisms situated below the line X X of Fig. 1, and shows the gears arranged to operate folder devices parallel to the printing couples. Fig. 3 is a similar 55 partial diagrammatic plan of one set of printing mechanisms and shows the gears arranged to operate folder devices at right angles to the printing couples. Fig. 4 is a diagrammatic elevation of one set of printing mechanisms, arranged to print in black and 60 one color, upon one web. Fig. 5 is a diagrammatic elevation of a set of printing mechanisms arranged to print in black upon two webs and in color on one of said webs. Fig. 6 is a diagram showing the upward run of 65 the web, the first impression being made on

the side of the web the reverse of that receiving the first impression during the downward run of the web, as shown in Figs. 2, 4 and 5. Fig. 7 is a diagrammatic side elevation of one-half of the machine, and shows the train 70 of gears actuating the blanket cylinders, the plate cylinders, the ink drums, the offset cylinders and the web propelling rollers. Fig. 8 is a diagrammatic plan of a machine comprising three sets of printing mechanisms 75 substantially the same as shown in Figs. 1 and 2; but the arrangement of the printing mechanisms relative to each other is different.

15 In the drawings similar reference characters designate like parts in the several views.

A set of printing mechanisms consists of a plurality of blanket cylinders, a plurality 85 of plate cylinders and offset cylinders coöperating with said blanket cylinders respectively. The plate cylinders P and P', the blanket cylinders B and B', the ink drums I and I', the ink fountains F and F', and the offset cylinders O and O' are all of 90 the usual well known construction and may be adapted to operate either with plates having columns lengthwise to the plate cylinders, or with plates having columns circumferential to the plate cylinders. The 95 cylinders and coöperating parts may be supported on any suitable main structure C. The space above the folder mechanisms, which has hitherto been waste space, is occupied by secondary blanket cylinders B', 100 plate cylinders P' and inking devices I' and F' in line with the main or primary blanket cylinders and plate cylinders of the corresponding decks of the main printing mechanisms. The secondary cylinders B' 105 and P' and the secondary inking devices I' and F' are preferably used for color printing; and are adapted to print one or more colors—other than black—as hereinafter described, but may also be used for printing 110 in black.

The secondary printing devices coöperate with the main or primary printing devices in such manner that when printing in black and one or more colors, the color impression 115 may be made on either side of the web and may be made either before or after the black impression. The printing mechanisms are driven by suitably placed motors M and M'. Main drive shafts S and S', parallel to the 120 blanket cylinders, extend across the machine. A combined spur and bevel wheel 2 is secured on the shaft S and a similar wheel 2' is secured on the shaft S'.

A bevel pinion s is secured on a revoluble 125 shaft S² by a set screw s² and meshes with the bevel part of the wheel 2; and a similar pinion s' is secured on the same shaft by a set screw s³ and meshes with the bevel part 130 of the wheel 2'. By loosening the set screw

s^2 the pinion s may be slid inward on the shaft to disengage the pinion from the wheel 2; and by loosening the set screw s^3 the pinion s^1 may be disengaged from the wheel 2'.
 5 Pinions m and m' are fixed on the shafts of the motors M and M' respectively. An intermediate spur pinion 1 intermeshes with the wheel 2 and the pinion m ; and a similar spur pinion 1' intermeshes with the wheel 2' and the pinion m' . The pinions 1 and 1' turn and are slidable on studs 1^a and 1^{a'}.
 10 The pinion 1 may be pulled as indicated by dotted line in Fig. 2, to place the motor M out of commission; and the pinion 1' may be pulled to place the motor M' out of commission.
 15 be pulled to place the motor M' out of commission.

By reason of the described arrangement of the main shafts, the motors, and the gears connecting the motors with the shafts, the motor M may be used to drive the shaft S , or may be used to drive the shafts S and S' ; and in like manner the motor M' may be used to drive the shaft S' or the shafts S' and S .

25 Spur wheels 3, 3^a, 3^b, 3^c and 3^d (Fig. 7) are respectively secured on the shafts of the blanket cylinders B . Spur wheels 4, 4^a, 4^b, 4^c and 4^d are secured on the shafts of the plate cylinders P respectively. Spur wheels 5, 5^a, 5^b, 5^c and 5^d are secured on the shafts of the ink drums I respectively. Intermediate spur pinions 6, 6^a, 6^b, 6^c and 6^d intermesh with the wheels 4 and 5; 4^a and 5^a; 4^b and 5^b; 4^c and 5^c; and 4^d and 5^d; and cause the ink drums to turn in the same direction as the plate cylinders with which they respectively coöperate.

In order to effect the desired run of the web some of the plate cylinders in the primary tiers of plate cylinders turn to the right and some of the plate cylinders in the same tier turn to the left.

Spur pinions 7 and 7' respectively are secured on the shafts of the offset cylinders O and O' coöperating with the blanket cylinder B of the lowest or bottom deck of the machine, and similar spur pinions 7^a, 7^{a'}; 7^b, 7^{b'}; and 7^c and 7^{c'} are secured on the shafts of the offset cylinders coöperating with the blanket cylinders B of the other decks respectively. Spur wheels 3^e and 3^{e'} are secured on the shafts of the blanket cylinders B' respectively. Spur wheels 4^e and 4^{e'} are secured on the shafts of the plate cylinders P' respectively. Spur wheels 5^e and 5^{e'} are secured on the shafts of the ink drums I' respectively. Spur pinions 6^e intermesh with the wheels 4^e and 5^e and spur pinions 6^{e'} intermesh with the wheels 4^{e'} and 5^{e'}. Spur pinions 8'' are secured on the shafts of the web-propelling rollers W , and spur pinions 8 and 8' turn on studs 8^a and 8^{a'} (Fig. 2) and mesh with each other. The pinion 8 meshes with the wheel 3^b, and the pinion 8' meshes with the pinion

8''; and the wheel 3^b drives the roller W through the instrumentality of the pinions 8, 8' and 8''.

I have shown the train 8, 8' and 8'' as driven by the wheel 3^b as that wheel is in the most convenient position for locating the roller W so that the folder mechanism may be situated below the roller W ; it is obvious however that without departure from my invention, the roller W may be so located that the train actuating the roller may be driven by either of the wheels 7^a, 7^{a'}, 3^b, 7^b or 7^{b'}; or any other wheel of the main vertical train of wheels.

Intermediate spur wheels 9 intermesh with the wheels 3^c and 3^{c'} which are respectively connected with the blanket cylinders of the lower horizontal row of secondary printing couples and the blanket cylinders of the primary printing couples in the same row and cause the secondary blanket cylinders to turn in the same direction that the primary blanket cylinders turn; in order that the primary blanket cylinders may coöperate with the primary plate cylinders of the same row and the secondary blanket cylinders may coöperate with the secondary plate cylinders of the same row.

Triangular horizontal flat turner-plates Y and Y' are situated intermediate of the tiers of main blanket cylinders and under the secondary printing couples and are separated by spaces y adapted to permit easy insertion and free travel of webs between the turner-plates. The practical advantages of the flat triangular turner-plates in juxtaposition as shown are; that the flat surface of the plate supports and prevents sagging of the webs and the web to be turned may be caused to run in any one of four directions, viz: forward, or backward, or to the right, or to the left; to bring the webs into position to suit whatever folder mechanism may be used.

Web propelling rollers W , W' , W'' , and W^3 are respectively adjacent and parallel to the edges of the turner-plates. Beveled spur pinions w and w' secured on the shaft of the roller W mesh with and drive bevel spur pinions w^2 and w^3 secured on the shafts of the rollers W' and W^3 respectively. The direction of turning of the rollers W' and W^3 may be changed merely by changing the pinion w^2 to run on the right hand side of the pinion w' , and changing the pinion w^3 to run on the right hand side of the pinion w . By reason of the described arrangement of the parts the rollers W are driven by the trains of gears 8, 8', 8'', actuated by the wheels 3^b and the rollers W drive the rollers W' and W^3 in unison. This arrangement of the web-propelling devices admits of propelling in either direction, according to the setting of the pinions w^2 and w^3 , a single web, or a plurality of webs, or

web-members, in line with the initial direction of travel of the webs as they come from the last impression cylinder; or propelling them at right angles to the direction of said initial travel; or propelling them in a direction the reverse of the initial direction of travel.

Combined spur-and bevel wheels 10 are secured on the shafts S by set screws 10^a and by loosening the set screws the wheels may be placed in different positions on the shafts and when so placed may be secured by tightening the set screws. The wheels 10 are in the form of combined spur-and bevel wheels in order that they may be used in coöperation with wheels 12 on the first drive shafts 12^a of the folder mechanisms parallel to the blanket cylinders B as shown in Figs. 1 and 2; and may likewise be used in coöperation with wheels 12 on the first drive shafts 12^{a'} of folder mechanisms at right angles to the blanket cylinders as shown in Fig. 3. The wheels 10 are all alike and the wheels 12 are all alike. In case the first-drive shaft 12^a of the folder mechanism 16 is parallel to the blanket cylinder B the spur member of the wheel 10 will mesh with the pinion 11 which will in turn mesh with the spur member of the wheel 12. It is obvious that if it be desirable to turn the wheel 12 in a direction opposite to that indicated, wheels 10 and 12 of enlarged diameters may be used and the spur member of the wheel 12 may mesh with the spur member of the wheel 10 and the wheel 12 may be driven directly by the wheel 10.

In case the first-drive shaft 12^{a'} of the folder mechanism 16' is at right angles to the blanket cylinder B the wheel 12 will be secured on the shaft 12^{a'}, and the wheel 10, (being secured in suitable position on the shaft S), the bevel member of the wheel 10 will mesh with the bevel member of the wheel 12 and the coöperating wheels 10 and 12 will drive the folder mechanism. It is obvious that the direction of turning of the shafts 12^{a'} may be changed by reversing the wheels 10 so that they will contact with the wheels 12 at points diametrically opposite to the points of contact shown in Fig. 3. In each set of printing mechanisms all of the main blanket cylinders B which coöperate with the main or black-printing plate cylinders P are in a single tier; all of the primary plate cylinders P are in a single tier; and all of the offset cylinders O and O' are in the same tier with the blanket cylinders.

The folder mechanisms 16 or 16', as the case may be, (according as the folder devices are parallel to, or at right angles to the printing couples) are located next to the main tier of blanket cylinders. In rotary perfecting printing and folding machines the folder mechanisms may be so arranged that the folder rollers will be par-

allel to the printing couples, or they may be so arranged that the folder rollers will be at right angles to the printing couples. In this apparatus the shafts and gears actuating the printing mechanisms are so arranged that the same shaft that drives the printing mechanism will be effective to drive the folder mechanisms, whether they be parallel to the printing couples or whether they be at right angles to the printing couples, as hereinafter more fully described. The folder mechanisms 16 or 16', which may be of any approved construction, are involved in this invention only so far as relates to their location relative to the blanket cylinders, and the shaft and gears which drive the printing mechanisms and the folder mechanisms. I have therefore shown conventionally in the drawings, the approximate location of the first gear only of the folder mechanism and its relation to the gear of the printing machine which drives the folder mechanism; the purpose being to show that the gears of the printing machine are so arranged as to be effective to drive folder devices parallel to the printing couples and equally effective to drive folder devices at right angles to the printing couples, merely by changing the position of the wheels 10 on the shaft S; to mesh with and actuate the first-drive wheels 12 of the folder mechanisms parallel, or at right angles to the blanket cylinders, as the case may be.

Owing to the position of the blanket cylinders relative to each other, and relative to the plate cylinders and the offset cylinders, each web may be caused to run downward between one pair of plate and blanket cylinders to print on one side of the web and to run upward between a complementary pair of plate and blanket cylinders to print on the other side of the web, as shown in Figs. 4 and 5, and the side first printed will run upon an offset cylinder to prevent smutting. Furthermore by reason of the relation of the cylinders as stated, the webs may be caused to run through the press so that the outside pages which are preferably printed last, will always be on the outside of the folded papers, regardless of the kind of associating devices which may be used, whether formers or angle bars or rollers, or equivalent associating devices, and regardless of the kind of folder mechanism which may be used, whether revoluble folder devices or swinging blade folder devices or chopper folder devices, or the like; and likewise regardless of the position of the associating devices and folder devices relative to the printing mechanisms, whether they be parallel to or at right angles to the printing couples. In short the arrangement of the mechanisms of the printing machine is such that the run of the webs is controlled within the printing machine so that the

printed webs have a straight run from the blanket cylinder on which the last impression is made, directly to the folder mechanism, without the use of tapes or other leader devices extraneous to the printing machine proper.

The machine being so constructed that the folder mechanisms occupy a position next to the blanket cylinders, a shorter run of the printed webs from the printing couples to the folder devices is attained than it would be possible to attain if the plate cylinders were next to the folder mechanism, for the reason that if the plate cylinders were next to the folder mechanism, it would be necessary in order to avoid smutting of the printed web, to lead the web away from the plate cylinder and then lead it to the folder device; whereas if the blanket cylinders are next to the folder device the printed web may hug the blanket cylinder and may run directly to the folder device without danger of smutting. The two offset cylinders O and O' between the blanket cylinders B of the main tier of blanket cylinders are adapted for either upward run or downward run of the web. If the web runs upwardly around the offset cylinder the lower offset cylinder will be effective, as shown in Figs. 1, 4 and 5; and if the web runs downwardly around the offset cylinder the upper offset cylinder will be effective, as shown in Fig. 6.

The operation of the machine is as follows: With both motors running the shafts S and S' will be driven by the motors jointly; or one motor may drive both shafts; or by sliding the wheels s and s' inward on the shaft S² to disengage them from the wheels 2 and 2' respectively, the motor M will drive the shaft S and the motor M' will drive the shaft S'. The wheels 10 on the shaft S will, (either directly, or through the instrumentality of an intermediate gear) drive the first-drive wheels and actuate the folder mechanisms 16, or 16', as the case may be. The wheel 2 on the shaft S will drive the vertical train of gears shown in Fig. 7, to actuate the blanket cylinders, the plate cylinders, the ink drums, the offset cylinders, and the web-propelling rollers W, W' and W³ and the webs propelled by said rollers will—by suitable instrumentalities, which are not part of the present invention and are therefore not shown,—be led into position to be operated upon by the folder mechanisms 16 or 16'. Webs from the sets A² and A³ of printing mechanisms, may run in a direct line to the web-propelling roller W and thence to the folder 16 adjacent to the blanket cylinders of the set A³; or webs from the set A² may run upon and across the two flat turner-plates Y to the web-propelling roller W of the set A of printing mechanisms and thence to the folder mechanisms 16 adjacent to the blanket cylinders of the

set A; or webs from the set A² may run upon and across the flat turner-plate Y' which is adjacent to the set A², thence around the roller W', thence upon and across the flat turner-plate Y adjacent to the set A of printing mechanisms and around the roller W to the adjacent folder mechanisms 16; and in like manner webs from the sets A, A¹ and A² may be led to and may be operated upon by the folder mechanisms 16 adjacent to the set A³ of printing mechanisms.

The run of the webs when operating to print in black and colors is clearly shown in Figs. 1, 4 and 5. Arrows V (Fig. 1) indicate the run of the web from the upper left hand roll R when printing in black and one color; one secondary printing couple printing in black, and the other printing in color. Arrows V¹ indicate the run of the web from the middle right hand roll R, when printing in black and two other colors; the third and fourth printing couples (counting upward from the bottom) respectively making the black impressions, the upper secondary printing couple making the first color impression and the lower secondary printing couple (in the second horizontal row from the top) making the second color impression. Arrows V², Fig. 5, indicate the run of the webs from the first or lower left hand roll R upwardly around the first and second main blanket cylinders and between the blanket cylinders and the offset-cylinders coöperating with said blanket cylinders respectively. Arrows V³ (Fig. 5) indicate a similar run of the web from the middle left hand roll R when printing in black and color; the color impression being made by the upper secondary printing couple. Dotted arrows V⁴ (shown at the right hand side of Fig. 1) indicate the run of the web from the upper right hand roll R when printing in black and one color; the black impression being made by the upper main printing couple and the upper secondary printing couple, and the color impression being made by the lower secondary printing couple. Arrows V⁵ (Fig. 6) indicate the run of a web first upward around the upper blanket cylinder of a set of printing couples, between said upper blanket cylinder and the offset cylinder coöperating therewith, downward to the lower blanket cylinder and thence around the lower blanket cylinder, upward to the web-propelling rollers as shown in Fig. 1.

Referring to the two upper rows of printing couples at the right-hand end of Fig. 1 it will be seen that the impression cylinder B of the top row rotates counter-clock-wise; the off-set cylinder O' adjacent thereto rotates clock-wise; the off-set cylinder O adjacent to the impression cylinder B of the second row and coöperating with said off-set

cylinder O' rotates counter-clock-wise; the impression cylinder B of the second row from the top rotates clock-wise and the impression cylinder B' of the same row also rotates clock-wise. It is obvious therefore that the cylinders are so arranged and rotate in such directions that the top web running downward between the cylinders B and P of the top row may run to the right around the cylinder O'; then between the cylinders O' and O; then to the left around the cylinder O and between the cylinder O and the cylinder B of the second row, directly to the cylinder B' of the second row and may then run downward between said cylinder B' and the cooperating cylinder P' as indicated by arrow V. It is obvious also that the web from the middle roll R may run downward between the cylinders B and P of the third row, then to the right upward around said cylinder B and between said cylinder and the cooperating off-set cylinder O; then upward around the cylinder B of the second row, as indicated by arrow; then to the right directly onto the cylinder B' of the second row; and then downward between the cylinders B' and P' of the second row as indicated by the arrow V.

Having fully described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a multiple deck printing machine the combination of two sets of printing mechanisms each set being adapted to print on both sides of continuously moving webs and said sets being arranged with the printing cylinders of one set end to end and in line with the printing cylinders of the other set; associating and web-propelling devices parallel to the printing cylinders of each of said sets of printing mechanisms; web pulling devices at right angles to the associating and web-propelling devices of each set of printing mechanism, and parallel turner devices adjacent to and situated diagonally relative to the associating and web propelling devices and the web pulling device of each set of printing mechanisms.

2. In a multiple deck printing machine the combination of four sets of printing mechanisms arranged in two pairs; said pairs of sets being arranged with the printing cylinders thereof parallel to each other and the printing cylinders of the sets composing each pair of sets being end to end and in line with each other and the printing mechanisms of each set being adapted to print on both sides of continuously moving webs; associating and web-propelling devices parallel to each set of printing mechanisms; web-pulling devices between and at right angles to said associating and web-propelling devices, and parallel turner devices intermediate of and situated diagonally

relative to said associating and web-propelling devices and said pulling devices of each pair of sets of printing mechanisms.

3. In a printing machine the combination of a plurality of sets of first and second impression cylinders, and a pair of intermediate cylinders between the first and second impression cylinders of each set of impression cylinders, all of said impression cylinders and intermediate cylinders being in a single vertical tier; plate cylinders all in a single vertical tier and cooperating with said impression cylinders respectively; associating and web-propelling means immediately adjacent to said tier of impression and intermediate cylinders and adapted to associate and propel perfected webs running directly from the cylinders of said tier of impression and intermediate cylinders; folder mechanism immediately adjacent to said tier of impression and intermediate cylinders; and means for effecting a quarter turn of the associating webs between said associating means and said folder mechanism.

4. In a printing machine, the combination of a plurality of sets of printing mechanisms arranged end to end with the first and second impression cylinders of each set in one vertical tier and the plate cylinders of the same set in another vertical tier, and cooperating with said impression cylinders to perfect a continuously moving web; web pulling devices adjacent and parallel to said tiers of impression cylinders and adapted to pull in a straight line the webs perfected by said sets of printing mechanisms respectively; web-turners adjacent to said tiers of impression cylinders respectively and adapted to effect a quarter turn of the perfected webs pulled in parallel by said web pulling devices; and means for propelling in line with each other after they receive said quarter turn the webs perfected by said end-to-end printing mechanisms.

5. In a printing machine the combination of a plurality of revoluble plate cylinders in a single vertical tier; inking devices adapted to apply ink to said plate cylinders, respectively, first and second impression cylinders in a single vertical tier and cooperating with said plate cylinders, respectively; intermediate cylinders in pairs in the same tier with and between said first and second impression cylinders, one intermediate cylinder of a pair cooperating with the adjacent first impression cylinder to propel upward the perfected web between said intermediate cylinder and said first impression cylinder, and the other intermediate cylinder of the same pair cooperating with the second impression cylinder to propel downward the perfected web running between said last named intermediate cylinder and the second impression cylinder and means adjacent to said tier of impression cylinders, for associating and

propelling all of the perfected webs running between said impression cylinders and said intermediate cylinders.

6. The combination of revoluble main impression cylinders in a single tier; revoluble main plate cylinders in a single tier and cooperating with said main impression cylinders, respectively; a secondary impression cylinder turning reversely of and cooperating with one of said main impression cylinders; a secondary plate cylinder cooperating with said secondary impression cylinder; a second secondary impression cylinder adjacent and parallel to one of said main impression cylinders; a secondary plate cylinder cooperating with said second secondary impression cylinder; and means for turning said second secondary impression cylinder in the same direction as the main impression cylinder adjacent thereto.

7. The combination of a plurality of sets of printing mechanisms arranged end to end, each of said sets being equipped with a single tier of blanket cylinders and a single tier of cooperating plate cylinders adapted to print on both sides of continuously moving webs; a train of gears actuating the tier of blanket cylinders of each set; a main drive shaft parallel to the tiers of blanket cylinders and connected to drive the trains of gears of all of said tiers of blanket cylinders; folder mechanism adjacent to the tiers of blanket cylinders of said printing mechanisms respectively, and equipped with drive-wheels; wheels fixable on said main shaft, and intermediate wheels coacting with the wheels fixable on the main shaft and the drive wheels of the folder mechanisms to actuate said folder mechanisms.

8. The combination of a plurality of sets of printing mechanisms arranged end to end, a plurality of sets of complementary printing mechanisms also arranged end to end, a main drive shaft parallel to the printing couples of said first named sets of printing mechanisms and connected to actuate said printing couples, a complementary drive shaft parallel to the printing couples of said complementary sets of printing mechanisms and connected to actuate the printing couples of said complementary sets of printing mechanisms, motors connected to actuate said main drive shaft and said complementary drive shaft respectively, beveled gear wheels fixable on said shafts respectively, beveled cog-wheels secured on said main drive shaft and said complementary drive shaft respectively, a counter shaft intermediate of and at right angles to said main drive shaft and said complementary drive shaft, and bevel pinions on said counter shaft meshing with the bevel cog-wheels on said main drive shaft and said complementary drive shaft respectively.

9. The combination of a plurality of rows

of sets of printing mechanisms, the sets of printing mechanisms of each row being arranged end to end; drive shafts connected to actuate the sets of printing mechanisms of said rows respectively; a revoluble counter shaft; gears connecting said counter shaft with said drive shafts; motors adjacent to said drive shafts respectively; gears on the shafts of said motors respectively; and slidable intermediate gears connecting the gears on the shafts of said motors with the gears on said drive shafts respectively; in such manner that said motors may actuate said drive shafts respectively or any one of said motors may actuate all of said drive shafts.

10. In a printing machine, the combination of a plurality of sets of first and second impression cylinders and a pair of intermediate cylinders between the first and second impression cylinder of each pair of impression cylinders, all of said impression cylinders and intermediate cylinders being in a single vertical tier; plate cylinders all in a single vertical tier, and cooperating with said impression cylinders, respectively; and associating and web-propelling means immediately adjacent to said tier of impression and intermediate cylinders and adapted to associate and propel perfected webs running directly from the cylinders of said tier of impression and intermediate cylinders.

11. In a multiple deck printing machine the combination of a vertical tier of cylinders composed of revoluble impression cylinders, exclusively; a vertical tier of cylinders composed of plate cylinders, exclusively, cooperating with said impression cylinders, respectively, to print on both sides of continuously moving webs; a train of gears adapted to turn oppositely the successive impression cylinders of said tier of impression cylinders; a revoluble main shaft adjacent and parallel to one of said impression cylinders; a wheel on said main shaft, driving the train of gears actuating said impression cylinders; a second wheel settable on said main shaft; folder mechanism adjacent to said main shaft and having a wheel in line with said second gear wheel on said main shaft; and an intermediate wheel driven by said second wheel on said main shaft, and driving said wheel of said folder mechanism to actuate the folder mechanism.

12. In a multiple deck printing machine, the combination of a plurality of first impression cylinders and a plurality of second impression cylinders arranged in a single tier; a train of spur wheels actuating all of said impression cylinders; web-propelling rollers adjacent and parallel to one of said impression cylinders; an intermediate spur wheel directly driven by a spur

wheel of the train of wheels actuating said impression cylinders and driving directly said web propelling rollers; and a web propelling device at right angles to said tier of impression cylinders and connected to be actuated by a gear connected with one of said web propelling rollers.

13. The combination of a plurality of sets of first and second impression cylinders in a single tier, a pair of intermediate cylinders in the same tier with and cooperating with each of said sets of impression cylinders, and a pulling device adjacent to said tier of impression and intermediate cylinders and adapted to receive webs running directly from either intermediate cylinder of a pair to said pulling device.

14. In a printing machine, the combination of blanket cylinders in a tier; plate cylinders in a tier cooperating with said blanket cylinders; and pairs of offset cylinders between said blanket cylinders, one offset cylinder of a pair being effective on downwardly running webs and the other offset cylinder of the same pair being effective on upwardly running webs.

15. In a printing machine, the combination of first and second impression cylinders all in a single tier, main spur wheels connected with said impression cylinders, respectively, a pair of spur wheels intermediate of each pair of and meshing with said main spur wheels, plate cylinders all in a single tier and cooperating with said impression cylinders respectively, ink drums all in a single tier and supplying ink to said plate cylinders, respectively, spur wheels connected with said ink drums, respectively, spur wheels connected with said plate cylinders, respectively, and meshing with the spur wheels connected with said impression cylinders, respectively, intermediate spur wheels intermeshing with the spur wheels connected with said plate cylinders and ink drums, respectively, a pulling device adjacent to said tier of impression cylinders, a turner device adapted to effect a quarter turn of the perfected webs pulled by said pulling device, and folder mechanism immediately adjacent to said tier of impression cylinders.

16. In a multiple deck printing machine the combination of a plurality of sets of adjacent multiple-deck printing mechanisms, each set comprising a single vertical series of impression cylinders, and a single vertical series of plate cylinders cooperating with said impression cylinders to print on both sides of continuously moving webs, and all the series of impression cylinders of said plurality of sets of printing mechanisms being contiguous to each other; and folder mechanisms located next to and receiving perfected webs in a straight run from all the series of impression cylinders of all of said

plurality of sets of multiple deck printing mechanisms.

17. The combination of a printing couple comprising a plate cylinder and an impression cylinder cooperating therewith to print one side of a web and propel the web downward; a complementary printing couple comprising a plate cylinder and an impression cylinder cooperating therewith to print on the other side of the same web and propel the web upward; means for leading the web in the first instance to either of said printing couples; and an intermediate pair of cylinders between the impression cylinders of said printing couples, one cylinder of said intermediate pair co-acting with one impression cylinder to propel the web upward and the other cylinder of said pair co-acting with the other impression cylinder to propel the web downward.

18. The combination of two printing couples each comprising a plate cylinder and an impression cylinder; with two oppositely turning offset cylinders between the impression cylinders of said printing couples; one of said offset cylinders serving to offset the impression upon the web running upwardly from one impression cylinder, and the other offset cylinder serving to offset the impression upon the web running downwardly from the other impression cylinder.

19. The combination of a revoluble first impression cylinder, a second impression cylinder turning reversely of said first impression cylinder, and a pair of offset cylinders between said first and second impression cylinders; one offset cylinder of said pair being adjacent to and turning reversely of said first impression cylinder and the other offset cylinder of said pair being adjacent to and turning reversely of said second impression cylinder.

20. In a printing machine, the combination of a plurality of sets of printing mechanisms, one above the other, all of the impression cylinders of said sets being in one vertical tier and all of the plate cylinders of the same sets being in another vertical tier and cooperative with said impression cylinders to perfect a plurality of continuously moving webs; a complementary plurality of sets of printing mechanisms, one above the other and end to end relatively to said first named plurality of sets of printing mechanisms, all of the impression cylinders of said complementary plurality of sets of printing mechanisms being in one vertical tier and all of the plate cylinders of the same plurality of sets being in another vertical tier and cooperative with said impression cylinders to perfect a plurality of continuously moving webs; associating and pulling mechanism adjacent and parallel to the tier of impression cylinders of said first named plu-

5 rality of sets of printing mechanisms and
 adapted to associate and pull a plurality of
 webs perfected by said first named plurality
 of sets of printing mechanisms; associating
 10 and pulling mechanism adjacent and paral-
 lel to the tier of impression cylinders of said
 complementary plurality of sets of printing
 mechanisms and adapted to associate and
 15 pull a plurality of webs perfected by said
 complementary plurality of sets of printing
 mechanisms; turner devices respectively ad-
 jacent to said associating and pulling mech-
 anisms and adapted to effect a quarter turn
 of the perfected webs associated and pulled
 by said associating and pulling mechanisms;
 and means for propelling in line with each
 other and toward a common center all of
 said perfected webs after they receive said
 quarter turn.

20 21. In a printing machine, the combina-
 tion of a plurality of sets of printing mech-
 anisms one above the other and adapted to
 perfect a plurality of continuously moving
 webs; a complementary plurality of sets of
 25 printing mechanisms one above the other
 and end to end relatively to said first named
 plurality of sets of printing mechanisms and
 adapted to perfect a plurality of continu-
 ously moving webs; associating and pulling
 30 mechanisms adjacent to and in line with said
 first named plurality of sets of printing
 mechanisms and adapted to associate and
 pull a plurality of webs perfected by said
 first named plurality of sets of printing
 35 mechanisms; associating and pulling mech-
 anisms adjacent to and in line with said
 complementary plurality of sets of printing
 mechanisms and adapted to associate and to
 40 pull a plurality of webs perfected by said
 complementary plurality of sets of printing
 mechanisms; web turners respectively adja-
 cent to said associating and pulling mech-
 anisms and adapted to effect a quarter turn
 of the perfected webs pulled by said asso-
 45 ciating and web-pulling mechanisms; and
 means for propelling toward a common center
 all of the webs printed by all of said
 printing mechanisms.

22. In combination with printing mech-
 50 anisms comprising a vertical tier of im-
 pression cylinders exclusively, and a hori-
 zontal color-extension or extensions; turners
 below said extension or extensions and
 adapted to aline in parallel turned webs
 55 perfected by said printing mechanisms, and
 folder mechanisms under said turners and
 immediately adjacent to said vertical tier
 of impression cylinders.

23. In a printing machine adapted to op-
 60 erate upon first and second continuously
 moving webs; the combination of an upper
 printing unit comprising two pairs of plate
 and impression cylinders and two oppositely
 65 rotating inking cylinders arranged in a
 single row, and cooperating to make the

first impression upon one side of the first
 web during the downward run of said web,
 and to make the second impression upon the
 reverse side of the same web during the
 downward run of said web; a lower printing
 70 unit comprising an impression cylinder, a
 plate cylinder, and an inking device rotating
 always in one direction, and adapted to make
 the first impression upon one side of the
 second web during the downward run of
 75 said web; and an intermediate printing unit
 comprising two inking cylinders invariably
 rotating in the same direction, and two pairs
 of cooperating plate and impression cylin-
 80 ders arranged in a single row, and cooper-
 ating to make the second impression on
 said second web during the upward run
 thereof and to make a third impression upon
 the same web during the downward run
 thereof, and upon the same side as the sec-
 85 ond impression upon said web; or to make
 a second impression upon said first web
 during the downward run thereof and re-
 verse to the first impression on said first
 web; or to make a third impression upon
 90 said first web during the downward run
 thereof and reverse to the first impression;
 all of said impressions being made without
 change in the direction of rotation of the
 inking cylinders.

24. In a printing machine, the combina-
 tion of a first impression cylinder, a first
 plate cylinder cooperative with said first im-
 pression cylinder, a spur wheel connected
 with said first impression cylinder, a spur
 10 wheel connected with said first plate cylin-
 der and meshing with and driven by the
 spur wheel connected with said first
 impression cylinder, a second impression
 cylinder, in the same vertical plane with
 10 said first impression cylinder, a spur wheel
 connected with said second impression cylin-
 der, intermediate spur wheels meshing with
 each other and with the spur wheels con-
 11 nected with said first and second impression
 cylinders respectively, a second plate cylin-
 der cooperative with said second impression
 cylinder, a spur wheel connected with said
 second plate cylinder and meshing with and
 11 driven by the spur wheel connected with said
 second impression cylinder, a third impres-
 sion cylinder in operative relation to said
 second impression cylinder, a spur wheel
 connected with said third impression cylin-
 12 der, an intermediate spur wheel intermesh-
 ing with and driven by the spur wheel con-
 nected with the said second impression cylin-
 der and meshing with and driving the spur
 wheel connected with said third impression
 cylinder, a third plate cylinder cooperative
 with said third impression cylinder, and a
 spur wheel connected with said third plate
 cylinder and meshing with and driven by
 the spur wheel connected with said third
 impression cylinder.

25. In a printing machine the combination of a set of printing mechanisms comprising a plurality of printing units arranged one above the other and each unit adapted to
 5 perfect a continuously moving web, pulling mechanism adjacent to said set of printing mechanisms and adapted to associate and propel a plurality of webs perfected by said sets of printing mechanisms, a web-turner
 10 adapted to effect a quarter turn of the associated webs printed by said set of printing mechanisms and propelled by said pulling mechanism, a second set of printing mechanisms end to end to the printing mechanisms
 15 of said first named set and comprising a plurality of printing units arranged one above the other, and each unit adapted to perfect a continuously moving web, pulling mechanisms adjacent to said second set of
 20 printing mechanisms and adapted to associate and propel a plurality of webs perfected by said second set of printing mechanisms, a web-turner adjacent to said second set of printing mechanisms and adapted
 25 to effect a quarter turn of the associated webs running thereon, and pulling mechanisms adjacent to said web-turners respectively and adapted to propel in line with each other and toward a common center, the
 30 associated webs running on said web-turners respectively.

26. In a printing machine the combination of a plurality of sets of printing mechanisms arranged end to end, each set comprising a plurality of printing units and each printing unit being adapted to perfect
 35 a continuously moving web, pulling mechanisms adjacent to said sets of printing mechanisms respectively and adapted to propel in a straight line the webs perfected by said printing mechanisms, turner devices adjacent
 40 to said printing mechanisms respectively and adapted to effect one quarter turn of said perfected webs respectively to bring them into line with and cause them to run
 45 toward each other, and propelling means adapted to propel said webs toward a common center.

27. In combination with primary printing
 50 means adapted to print on both sides of continuously moving webs and comprising a vertical tier of exclusively impression cylinders; a horizontal extension comprising a printing couple adapted to make an additional
 55 impression on one side of a given web previously printed on both sides by said primary printing means; and folder mechanism under said extension and immediately adjacent to the vertical tier of exclusively
 60 impression cylinders of said primary printing means, and adapted to operate upon a given web which has been printed on both sides by said primary printing means and has received an additional impression on one

side of the same web, from the printing
 65 couple of said extension.

28. The combination of end-to-end sets of printing mechanisms, each set having the impression cylinders thereof in a single vertical
 70 tier and each set being equipped with an extension; converging turners below said extensions respectively and adapted to turn from opposite directions toward a common center the webs running upon said turners;
 75 web-pulling devices adapted to pull the aligned webs running from said turners, and folder mechanism below said turners and immediately adjacent to the vertical tiers of impression cylinders of said sets of printing
 80 mechanisms and positioned to operate upon webs running from one or more of said turners.

29. The combination of a plurality of black-printing couples in vertical series, with all the impression cylinders thereof in a
 85 single vertical tier; a main drive in the plane of and connected to actuate the gears connected with said vertical tier of impression cylinders; gears connected with said impression cylinders respectively and connected
 90 to actuate the plate cylinders and inking devices of said printing couples; first and second intermediate gears in the same vertical train with the main drive, and co-acting with the gears connected with said first
 95 and second impression cylinders; color-printing means adjacent to the second impression cylinder of the black-printing couple making the last impression, and geared to be actuated by the gear connected with
 100 the second impression cylinder of the printing couple making the last impression in black, to operate said color-printing means to make the color impression on the same side of the web that receives the last impression
 105 in black.

30. The combination of printing couples is series one above the other, with the first impression cylinders and second impression cylinders thereof in a single vertical tier
 110 comprising impression cylinders exclusively; a horizontal row of printing couples above said tier of first and second impression cylinders; a single vertical train of gears directly actuating said tier of first and second
 115 impression cylinders and connected to actuate said horizontal row of printing couples; a web-pulling device below said horizontal row of printing couples and immediately adjacent to said tier of first and second impression
 120 cylinders and adapted to simultaneously pull in a direct straight line webs receiving the last impression on a second impression cylinder of said vertical tier of impression cylinders and webs perfected by
 125 said horizontal row of printing couples; and a web-turner below said horizontal row of printing couples and adapted to turn per-

fectured webs receiving the last impression on an impression cylinder of said horizontal row of printing couples and webs receiving the last impression of a second impression cylinder of said tier of impression cylinders.

31. The combination of a plurality of printing couples in series one above the other, with all the impression cylinders thereof in a single vertical tier; a plurality of horizontal rows of printing couples above said vertical series of printing couples; a single vertical train of gears directly actuating said vertical series of printing couples and connected to actuate said plurality of horizontal rows of printing couples; a web-pulling device below said horizontal rows of printing couples and adjacent to said vertical tier of impression cylinders and adapted to pull simultaneously in a straight line perfected webs running from all of said printing couples.

32. In an apparatus of the class described, the combination of sets of end-to-end printing mechanisms, each set comprising a vertical tier of impression cylinders exclusively; pulling mechanisms adjacent and parallel to the respective tiers of impression cylinders and adapted to propel in a straight line the webs perfected by said sets of printing mechanisms; horizontal turners adjacent to the respective tiers of impression cylinders and adapted to effect opposite quarter-turns of the webs perfected by the respective sets of printing mechanisms, to aline all of said quarter-turned webs in parallel; and means for propelling said quarter-turned and alined webs from opposite directions toward a common center between said turners.

33. A printing machine comprising a vertical series of printing couples arranged one above the other and having all the impression cylinders thereof in a single vertical tier; a plurality of complementary printing couples in a horizontal row above said vertical series of printing couples; a single vertical train of gears actuating all of the printing couples of said vertical series and connected to actuate the printing couples of said horizontal row; and folder mechanism immediately under said horizontal row of printing couples and next adjacent to said vertical tier of impression cylinders and in operative relation to the printing couples of said vertical tier and the printing couples of said horizontal row.

34. A printing machine comprising a vertical series of printing couples arranged one above the other and having all the impression cylinders thereof in a single vertical tier; a plurality of complementary printing couples in a horizontal row above said vertical series of printing couples; a single vertical train of gears driving all of the printing couples of said vertical series and

connected to drive the printing couples of said horizontal row and a web-pulling device immediately adjacent to said vertical tier of impression cylinders and also immediately adjacent to the second impression cylinder of said horizontal row; and in position to pull webs running directly from the second impression cylinder of said horizontal row and webs running directly from the second impression cylinders of said vertical tier of impression cylinders.

35. A printing machine comprising a vertical series of printing couples arranged one above the other and having all the impression cylinders thereof in a single vertical tier; a plurality of horizontal rows of printing couples above said vertical series of printing couples; a single vertical train of gears driving all of the printing couples of said vertical series and all the printing couples of said plurality of horizontal rows; and a web-pulling device adjacent to said vertical series of impression cylinders and adapted to pull in a straight line, perfected webs running from the second impression cylinders of said horizontal rows of printing couples and perfected webs running from the second impression cylinders of said vertical tier of impression cylinders.

36. The combination of a plurality of printing couples in series one above the other, with all the impression cylinders thereof in a single vertical tier; a horizontal row of printing couples above said vertical series of printing couples; a main drive and a single vertical train of gears directly actuating said vertical series of printing couples and connected to actuate said horizontal row of printing couples; a web-pulling device under said horizontal row of printing couples and adjacent to said vertical tier of impression cylinders and adapted to simultaneously pull in a straight line web perfected by said vertical series of printing couples and said horizontal row of printing couples; web-turners below said horizontal row of impression cylinders and adapted to turn webs perfected by said vertical series of printing couples and said horizontal row of printing couples; and folder mechanism immediately adjacent to said vertical tier of impression cylinders and in operative relation to said web-turners.

37. The combination of a plurality of impression cylinders exclusively, arranged in a single vertical tier, main gears connected with said impression cylinders respectively and connected to actuate plate cylinders co-operating with said impression cylinders respectively, means for inking said plate cylinders, intermediate gears between the main gears throughout said vertical series of main gears, a main drive in the plane of and

adapted to drive said vertical series of main gears, a color printing couple adapted to perfect a web and connected to be driven by the gears of the impression cylinder which carries the web which is perfected in black while said last named web receives the second impression, web-pulling means located next to the final impression cylinder of said color printing couple and next to a final impression cylinder of said vertical tier of impression cylinders and adapted to pull simultaneously a web running from the final impression cylinder of said vertical tier of impression cylinders and an adjacent web running from the final impression cylinder of said color printing couples.

38. The combination of a plurality of impression cylinders exclusively, arranged in a single vertical tier, main gears connected with said impression cylinders respectively and connected to actuate plate cylinders co-operating with said impression cylinders respectively, means for inking said plate cylinders, an intermediate driver gear and an intermediate driven gear between the main gears throughout the vertical train of gears, a main drive in the plane of said vertical train of gears and adapted to drive same, a color printing couple connected to be driven by the gear of a second-impression cylinder actuated by a driven intermediate gear of the main train; and web-pulling means located next to the final impression cylinder of said color-printing couple and next to a final impression cylinder of said vertical tier of impression cylinders and adapted to pull simultaneously in a direct line a web running from the final impression cylinder of said vertical tier of impression cylinders and an adjacent web running from the final impression cylinder of said color-printing couple.

39. The combination of a plurality of impression cylinders exclusively, arranged in a single vertical tier and coöperating with plate cylinders exclusively arranged in another vertical tier to perfect a continuously moving web, or webs; main gears connected with said first and second impression cylinders respectively, and connected to actuate said plate cylinders respectively; first and second intermediate gears in the same vertical train with the main gears which are connected with said impression cylinders respectively; a revoluble color printing couple comprising a plate cylinder and a coöperating impression cylinder; and a gear connected with the impression cylinder of said color-printing couple and connected to be actuated by the second intermediate gear of the main vertical train of gears which is between the main impression cylinders receiving the first impression and the main impression cylinder receiving the second

impression, and also connected to drive the plate cylinder of said color-printing couple.

40. The combination of a plurality of black-printing couples in vertical series with all the impression cylinders thereof in a single vertical tier; a main drive in the plane of and connected to actuate the gears connected with said vertical train of impression cylinders; gears connected with said impression cylinders respectively and connected to actuate the plate cylinders and inking devices of said printing couples; first and second intermediate gears in the same vertical train with the main-drive and co-acting with the gears connected with said first and second impression cylinders; color-printing means adjacent to the second impression cylinder of the black-printing couple making the last impression and geared to be actuated by the gear connected with the second impression cylinder of the printing couple making the last impression in black, to operate said color printing means to make the color impression on the same side of the web that receives the last impression in black.

41. The combination of a plurality of black-printing couples in vertical series with all the impression cylinders thereof in a single vertical tier; a main drive in the plane of and connected to actuate the gears connected with said vertical train of impression cylinders; gears connected with said impression cylinders respectively and connected to actuate plate cylinders and inking devices of said printing couples; first and second intermediate gears in the same vertical train with the main drive and co-acting with the gears connected with said first and second impression cylinders; color-printing means adjacent to the second impression cylinder of the black-printing couple making the last impression and geared to be actuated by the gear connected with the second impression cylinder of the printing couple making the last impression in black, to operate said color-printing means to make the color impression on the same side of the web that receives the last impression in black; and web-pulling devices and folder mechanisms immediately adjacent to said vertical tier of impression cylinders and adapted to pull webs and fold papers with the color impression on the outside thereof.

42. The combination of two pairs of sets of printing mechanisms, each pair comprising two sets of end-to-end printing mechanisms, and each set comprising a plurality of printing mechanisms; converging turners in line with the respective sets of one pair of sets of printing mechanisms and adapted to turn webs oppositely; diverging turners in line with the respective sets of the other pair of sets of printing mechanisms; and means for leading to a common center between the

turners the webs turned by said converging
turners and the webs turned by said diverg-
ing turners.

43. The combination of two pairs of sets
5 of printing mechanisms, each pair compris-
ing two sets of end-to-end printing mechan-
isms and each set comprising a plurality of
printing mechanisms; converging turners in
line with the respective sets of one pair of sets
10 of printing mechanisms and adapted to turn
webs oppositely; diverging turners in line
with the respective sets of the other pair of
sets of printing mechanisms, means for lead-
ing to a common center the webs turned by

said converging turners and the webs turned 15
by said diverging turners; and folder mech-
anisms in line with one set of printing mech-
anisms and adapted to fold papers derived
from webs running from said converging
turners and webs running from said diverg- 20
ing turners.

In witness whereof I have hereunto sub-
scribed my name at Springfield, Illinois, this
19th day of November, 1907.

JOHN A. BOYCE.

Witnesses:

EDWIN A. WILSON,
W. AURELIUS.