Nov. 16, 1926. 1,607,143

B. C. WHITE

MULTICOLOR PRINTING PRESS

Filed Jan. 22, 1923 9 Sheets-Sheet 1

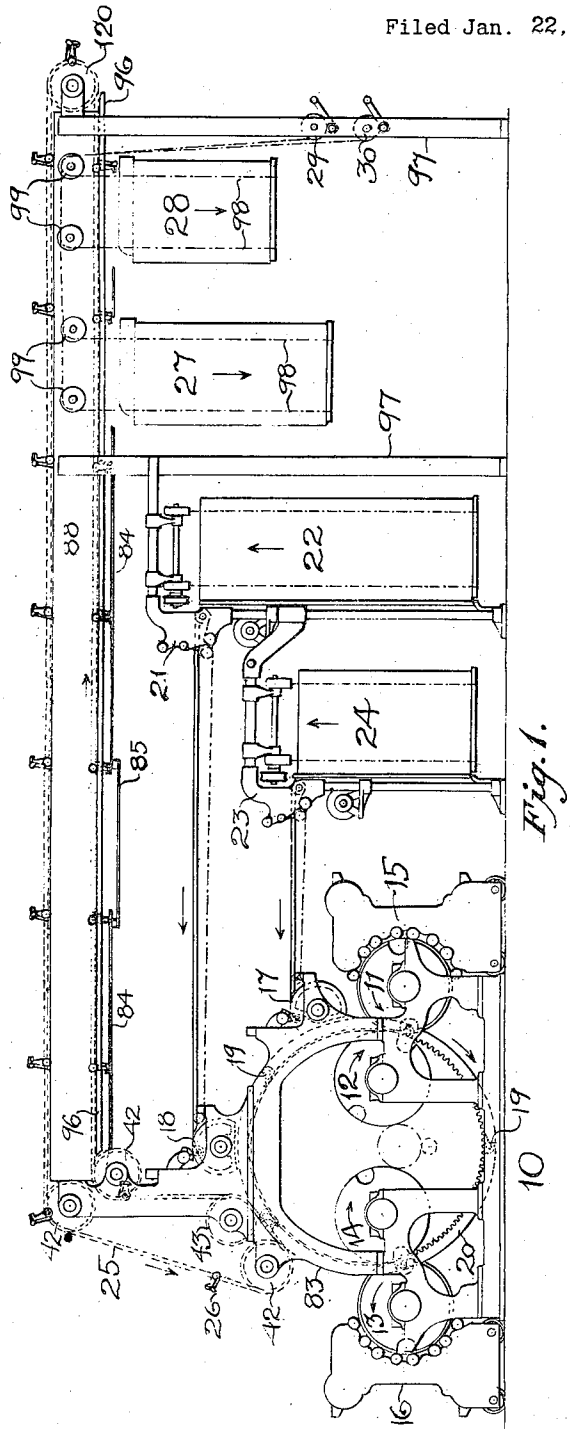


Fig. 1.

INVENTOR.
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BY
Wm Bodge ATTORNEYS.

Nov. 16, 1926. 1,607,143

B. C. WHITE

MULTICOLOR PRINTING PRESS

Filed Jan. 22, 1923 9 Sheets-Sheet 2

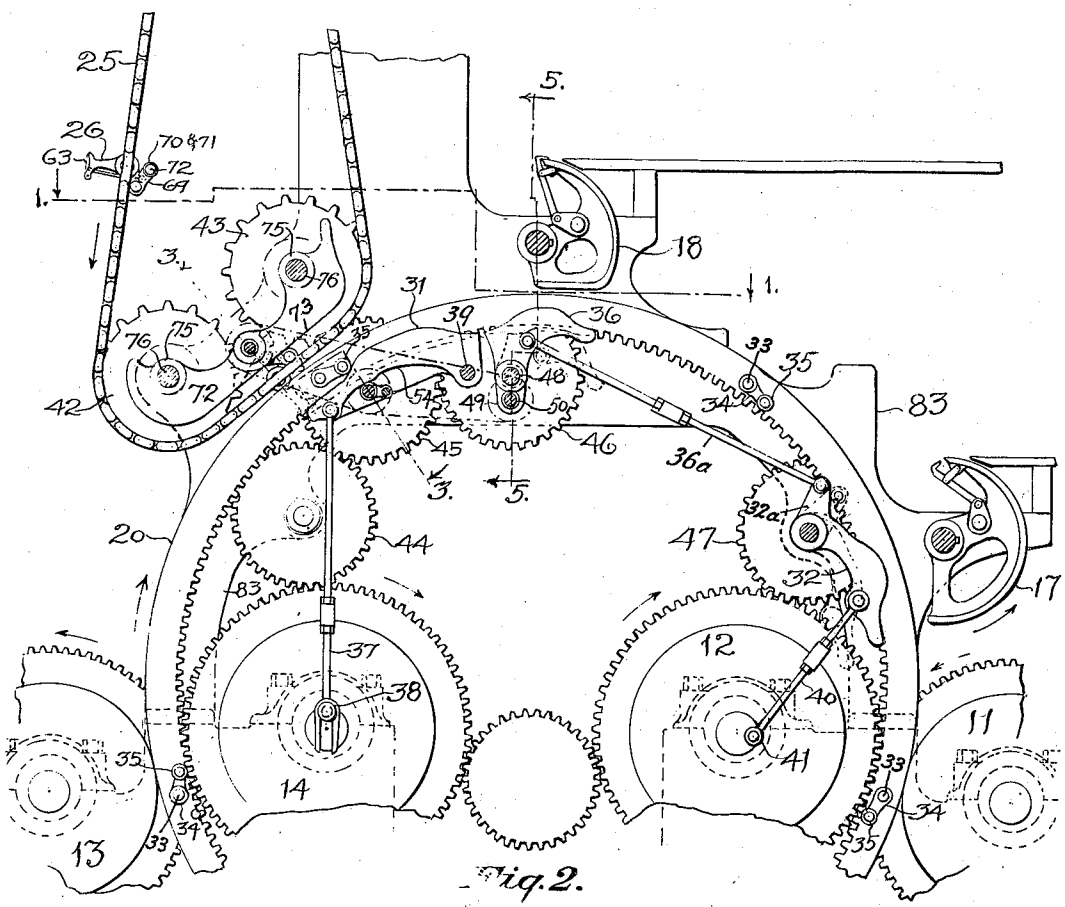


Fig. 2.

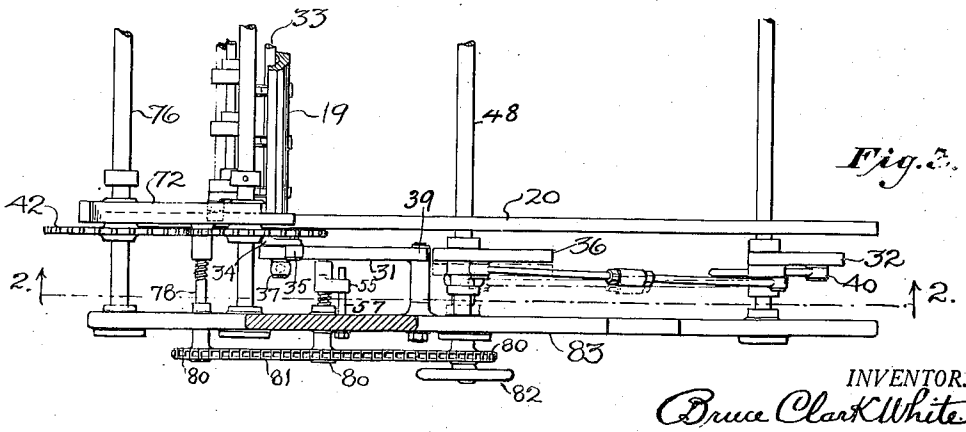


Fig. 3.

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Nov. 16, 1926. 1,607,143

B. C. WHITE

MULTICOLOR PRINTING PRESS

Filed Jan. 22, 1923 9 Sheets-Sheet 3

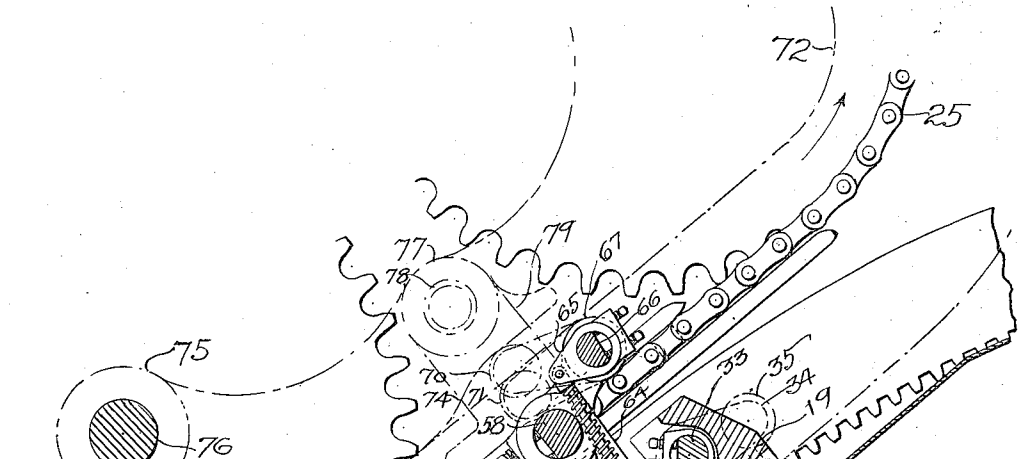


Fig. 4.

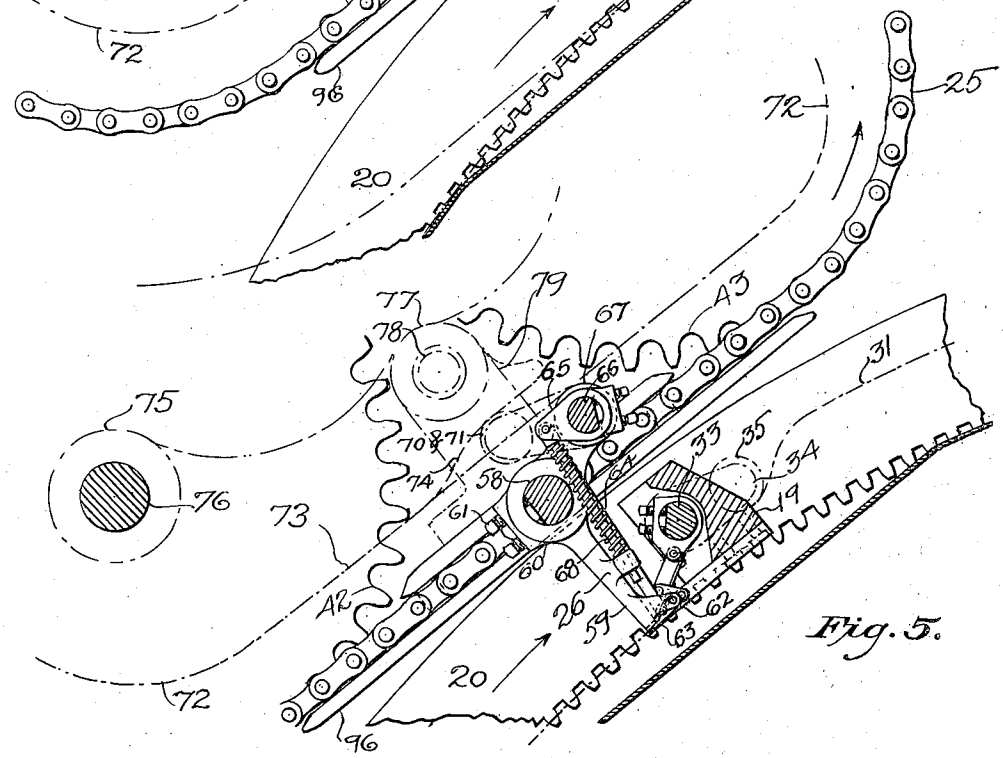


Fig. 5.

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Nov. 16, 1926. 1,607,143

B. C. WHITE

MULTICOLOR PRINTING PRESS

Filed Jan. 22, 1923 9 Sheets-Sheet 4

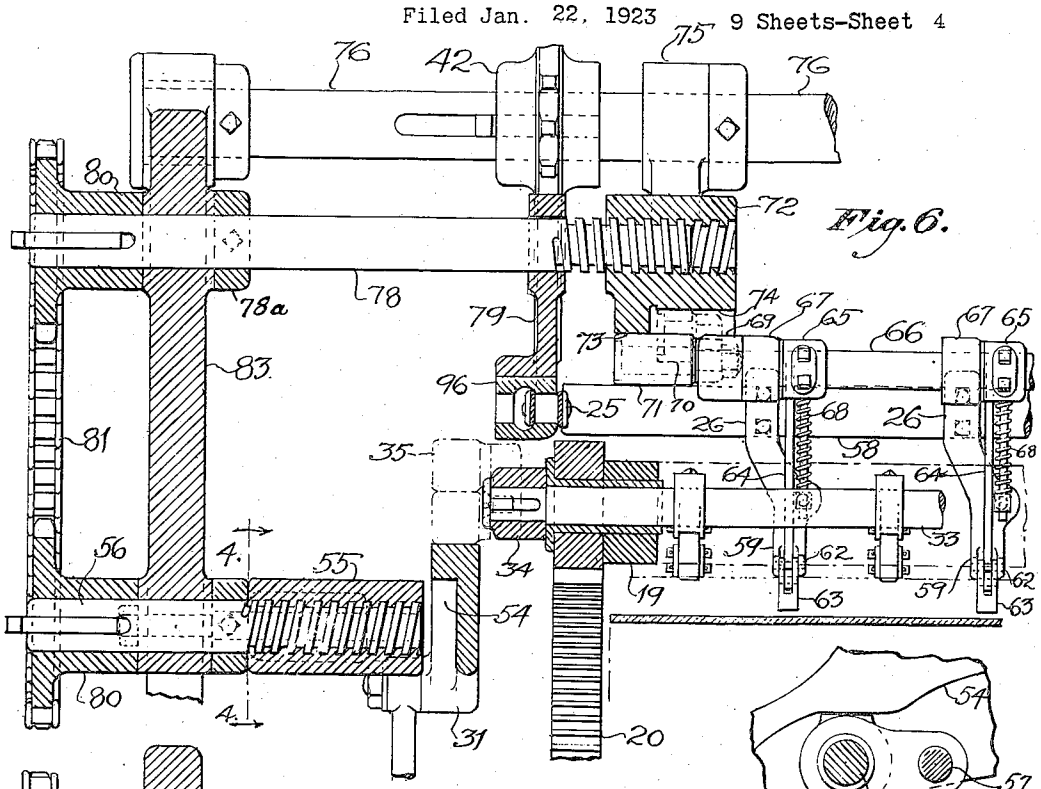


Fig. 6.

Fig. 7.

Fig. 8.

INVENTOR.
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Wm Bodge ATTORNEYS.

Nov. 16, 1926. 1,607,143

B. C. WHITE

MULTICOLOR PRINTING PRESS

Filed Jan. 22, 1923 9 Sheets-Sheet 5

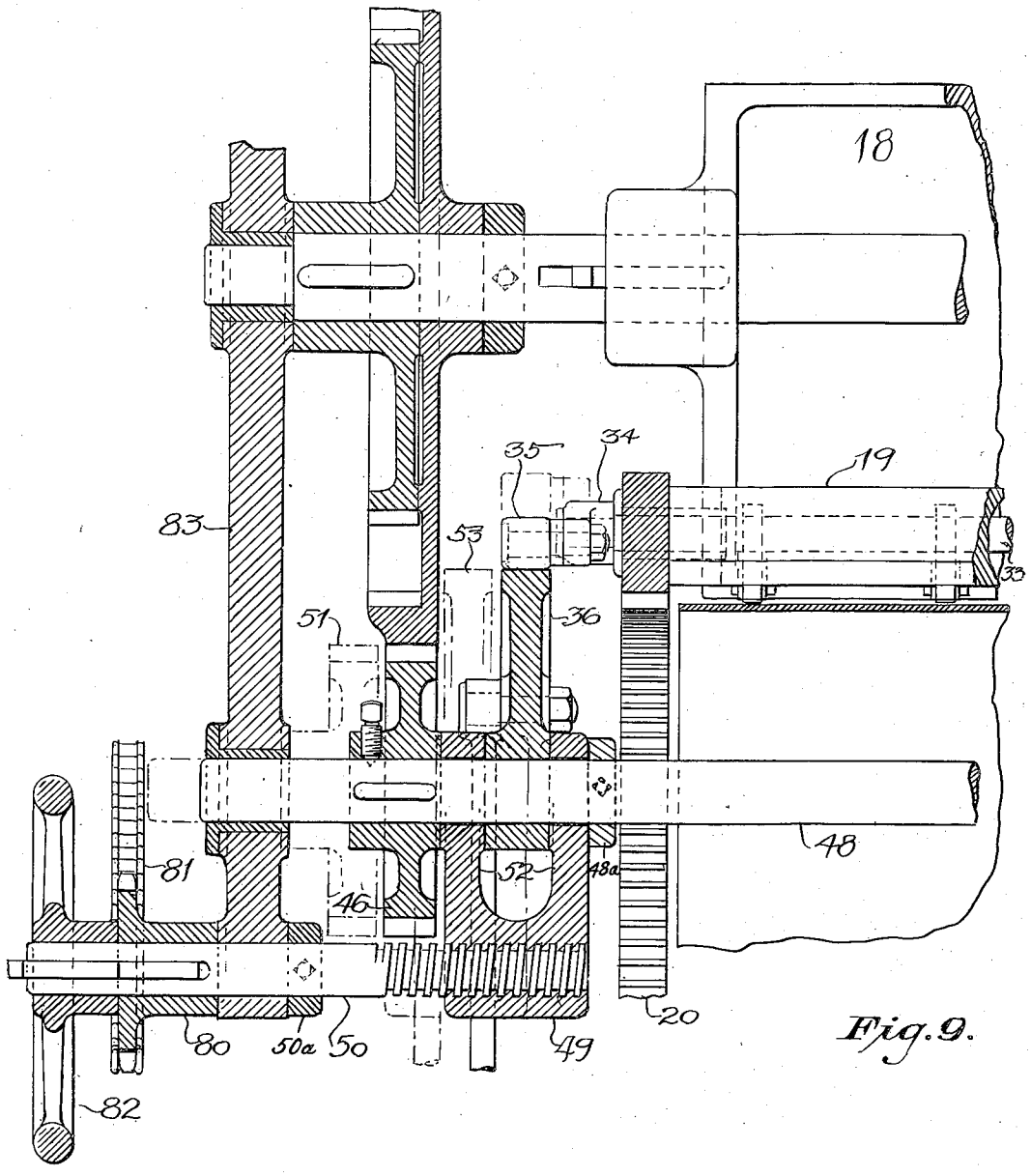


Fig. 9.

INVENTOR.
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Wm Bridge ATTORNEYS.

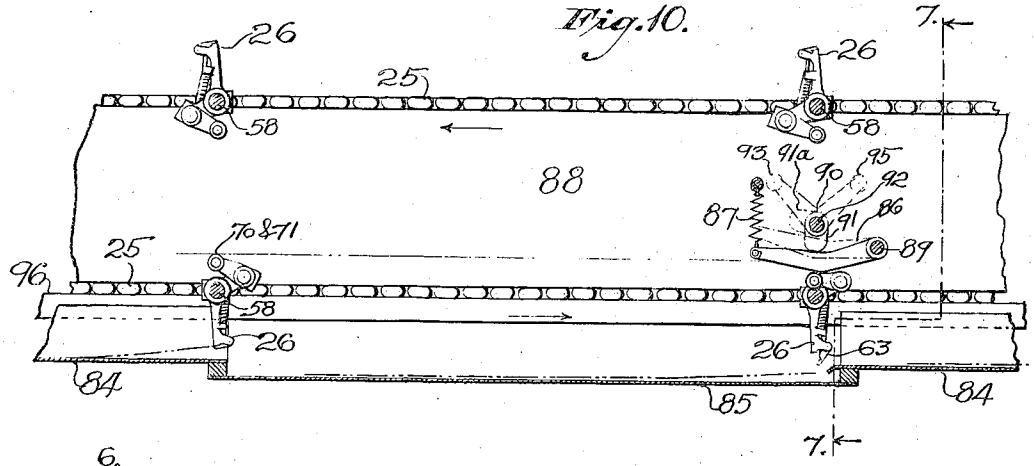
Nov. 16, 1926. 1,607,143

B. C. WHITE

MULTICOLOR PRINTING PRESS

Filed Jan. 22, 1923 9 Sheets-Sheet 6

Fig. 10.



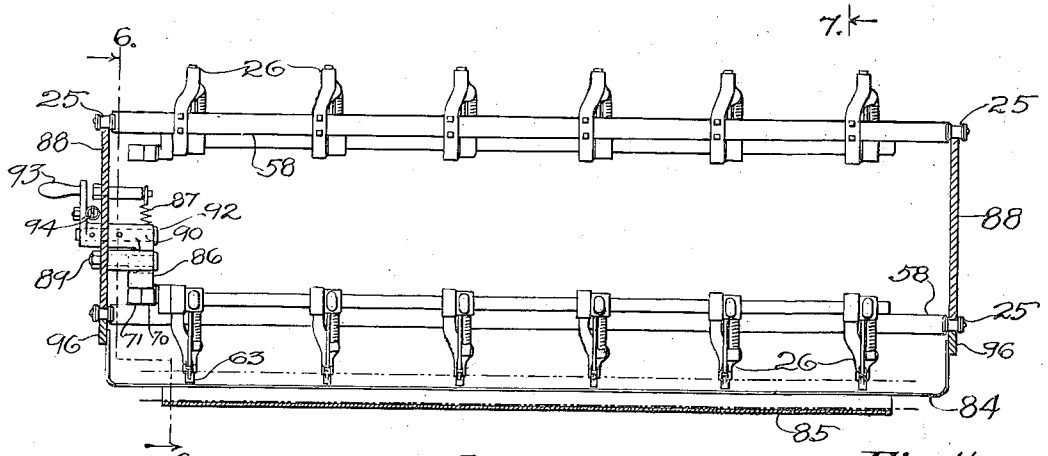


Fig. 11.

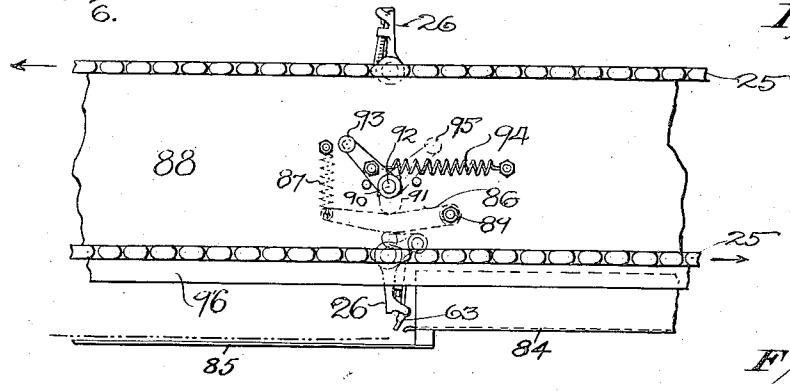


Fig. 12.

INVENTOR.
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Nov. 16, 1926. 1,607,143

B. C. WHITE

MULTICOLOR PRINTING PRESS

Filed Jan. 22, 1923 9 Sheets-Sheet 7

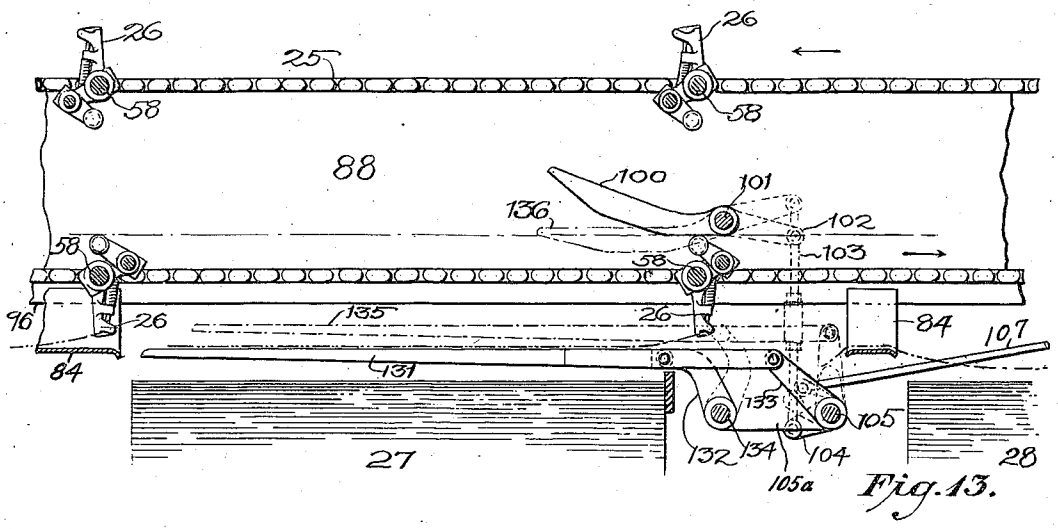


Fig. 13.

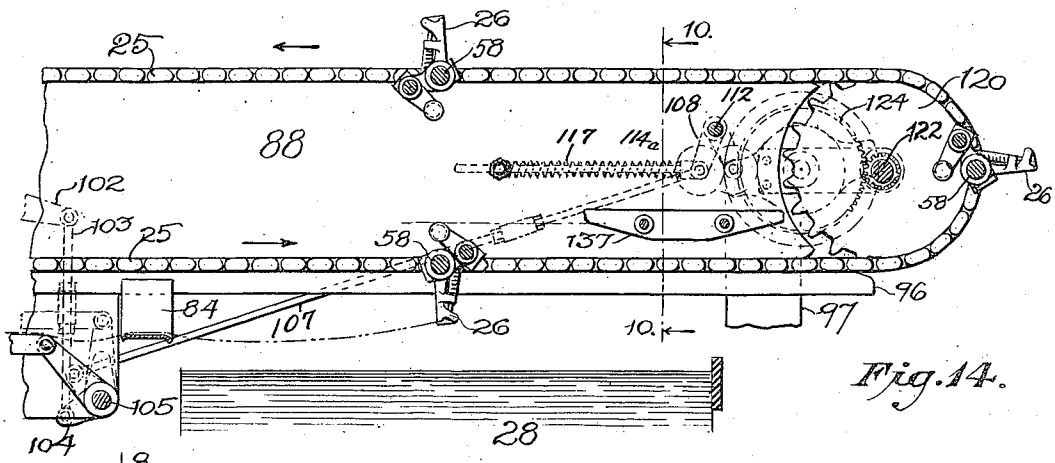


Fig. 14.

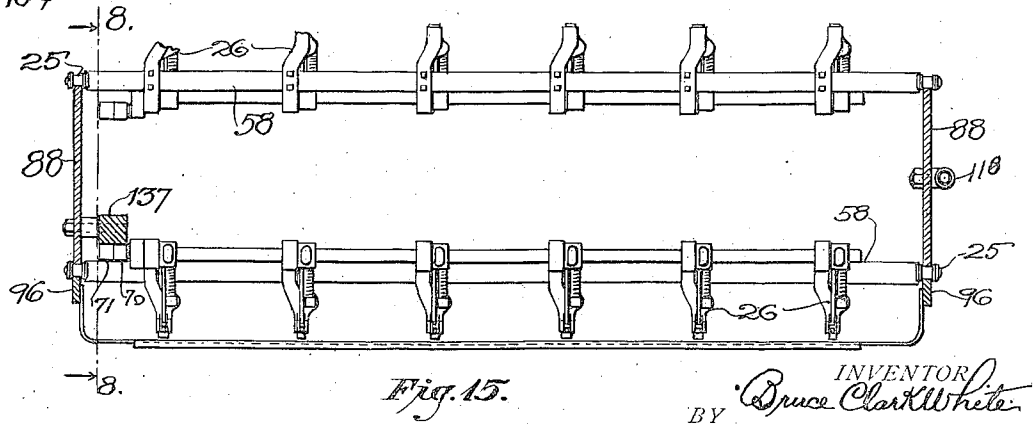


Fig. 15.

INVENTOR
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Nov. 16, 1926. 1,607,143

B. C. WHITE

MULTICOLOR PRINTING PRESS

Filed Jan. 22, 1923 9 Sheets-Sheet 8

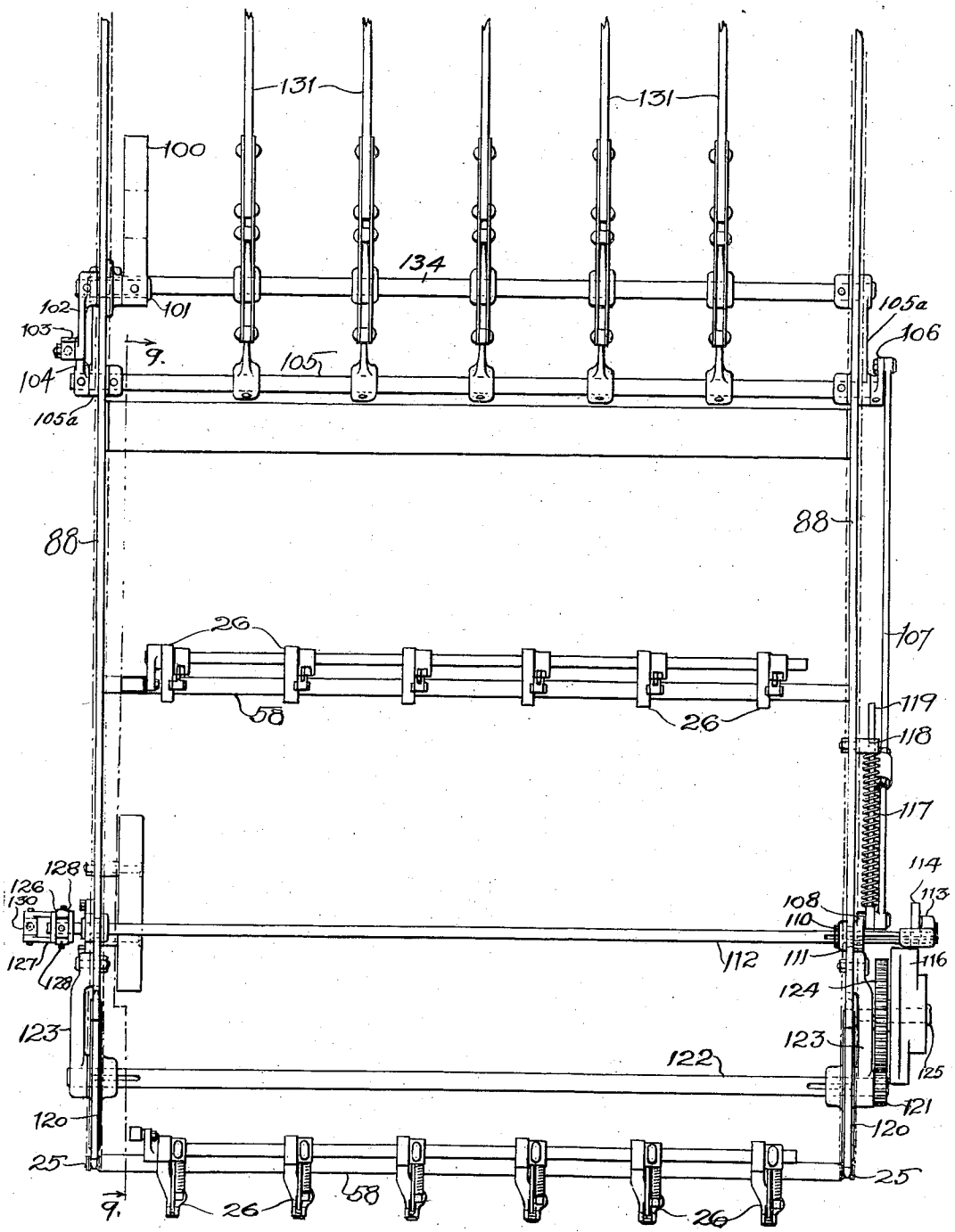


Fig. 16.

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Nov. 16, 1926. 1,607,143

B. C. WHITE

MULTICOLOR PRINTING PRESS

Filed Jan. 22, 1923 9 Sheets-Sheet 9

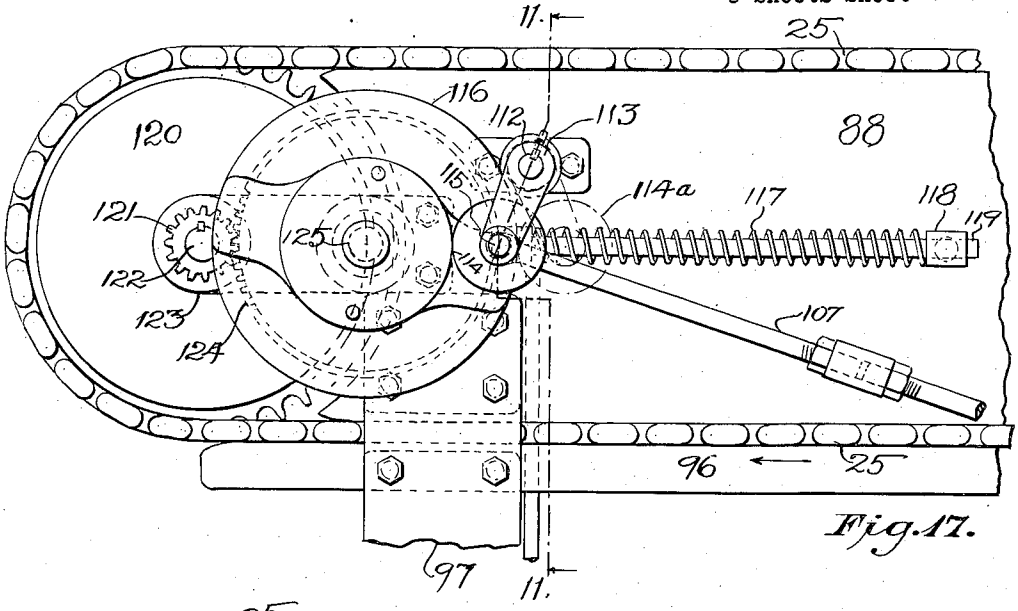


Fig. 17.

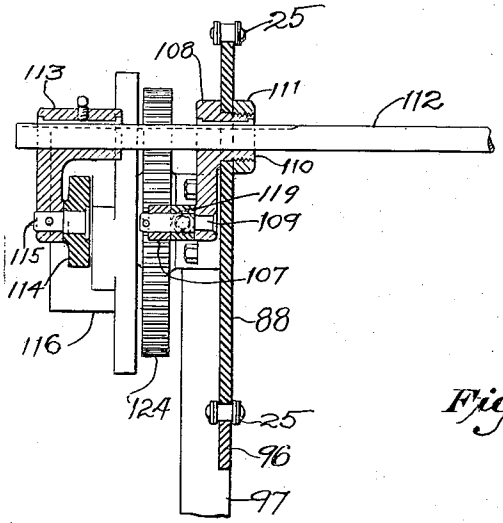
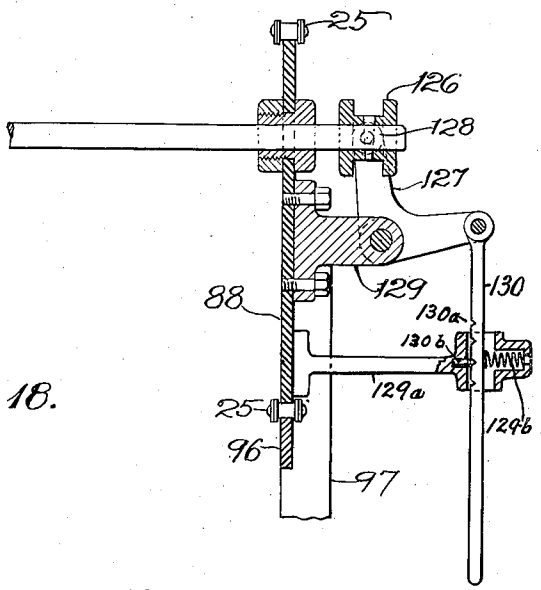


Fig. 18.



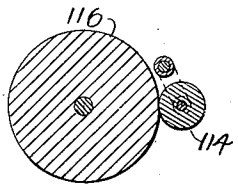


Fig. 19.

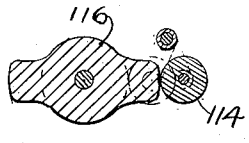


Fig. 20.

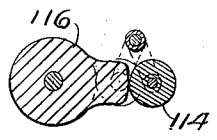


Fig. 21.

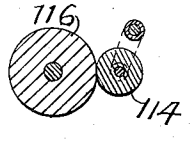


Fig. 22.

INVENTOR.
BY Bruce Clark White
Wm Bodge ATTORNEYS.

Patented Nov. 16, 1926. 1,607,143

UNITED STATES PATENT OFFICE.

BRUCE CLARK WHITE, OF NEW YORK, N. Y.; MARIA LOUISA WHITE EXECUTRIX OF SAID BRUCE CLARK WHITE, DECEASED.

MULTICOLOR-PRINTING PRESS.

Application filed January 22, 1923. Serial No. 614,211.

The invention relates to improvements in multicolor printing presses of the class wherein the sheets to be printed are automatically transferred from feed piles to the printing devices and from there carried and stacked in delivery piles.

The essential object of the present invention is to provide a new and improved means for printing sheets at a maximum printing speed in four colors at a single operation, and to adapt said four-color printing means to print double the number of sheets in two colors at one time at a corresponding maximum printing speed

A further object of the invention is to provide means whereby the necessary change in the adjustments of the press from four color to two color printing may be effected by a single hand operation, and by reversing said operation a return to the four color printing may be readily made.

A further object is to provide in one press two complete and independent sheet-feeding devices, each thereof being provided with independent inking, printing and delivering means, whereby, when the press is operated for two-color printing, two complete and independent systems are obtained in which two different sizes of sheets may be run off at one time, two different color schemes and two different sets of printing plates, each of the products being adapted to be delivered and stacked in separate piles.

A further object is to provide convenient means for the occasional removal of a sheet from the delivery mechanism of the press for the inspection of the printed work without interrupting the regular run of the machine.

A further object is to provide means for delivering all of the run of printed sheets for a period of time into either one of the delivery piles in order to permit the removal of the opposite pile without stopping the press.

Heretofore four-color printing has been done either on a one-color press, or on a two-color press, or on a four-color press. When four-color printing is done on a one-color press, each sheet must be handled, fed and registered, four times for each side or printed surface thereof. When the work is done on a two-color press each sheet must be correspondingly handled, fed and registered twice for each side or printed surface. And when the ordinary four-color press is used for two-color printing, only half of the quantity of work is printed in a given time as compared with the press disclosed in the present invention.

To meet the varying conditions of the color-printing trade it has heretofore been necessary to install both two-color and four-color presses to do both kinds of printing at the best advantage, with the result that much of the equipment remains idle for a greater or less period, hence a convertible press in accordance with the present invention, capable of doing both four-color and two-color printing, each at maximum capacity and economy, will reduce the equipment of a color printing plant to a minimum of cost and operating space.

For further comprehension of the invention, and of the objects and advantages thereof, reference is had to the following description and accompanying drawings, and to the appended claims in which the various features of the invention are more particularly pointed out.

In the drawings, Figure 1 is a general side elevation of a printing press embodying the present invention and including sheet-feeding and delivering means.

Figure 2 is an enlarged side elevation of a portion of the press, showing the relation between the feeding, printing and delivering devices.

Figure 3 is a horizontal section on line 1—1 of Fig. 2.

Figure 4 is an enlarged vertical section on line 2—2 of Fig. 3, showing the relative position of certain parts of the press adapted to direct the sheet on its second circuit before delivery as for four-color printing.

Figure 5 is a view similar to that of Fig. 4, but showing the parts positioned to direct the sheets to the delivery device, as for both two-color and four-color printing.

Figure 6 is an enlarged section on line 3—3 of Fig. 2 and corresponding with the setting of the parts as shown in Fig. 4.

Figure 7 is a detail section on line 4—4 of Fig. 6.

Figure 8 is a view similar to that of Fig. 6, but showing a setting corresponding with Fig. 5.

Figure 9 is a sectional view on line 5—5 of Fig. 2.

Figure 10 is a sectional view on line 6—6 of Fig. 11.

Figure 11 is a sectional view on line 7—7 of Fig. 10.

Figure 12 is a fragmental side elevation of the inspection drop of the sheet delivery.

Figure 13 is a sectional view of the inner delivery drop on line 8—8 of Fig. 15.

Figure 14 is a sectional view of the outer delivery drop on line 9—9 of Fig. 16.

Figure 15 is a transverse section of the delivery on line 10—10 of Fig. 14.

Figure 16 is a plan view of the outer end of the delivery.

Figure 17 is a rear elevation in detail of the outer end of the delivery.

Figure 18 is a transverse sectional view on line 11—11 of Fig. 17.

Figures 19, 20, 21 and 22 are diagrammatic sectional views of the cams which control the sheet drop.

In the accompanying drawings the printing press is indicated generally by the numeral 10 in Fig. 1, and comprises a pair of spaced printing couples, the plate cylinders thereof being represented by 11 and 13 and their respective cooperating impression cylinders by 12 and 14, the two printing couples being equally divided about their respective cylinders to form for each couple a pair of independent printing surfaces, the printing plates thereof, four in number, being adapted to be separately inked by roller mechanisms of any approved form as indicated generally at 15 and 16.

Also included in the press mechanism is a sheet-carrier comprising a pair of spaced rings 20, having a series of lines of sheet grippers 19 arranged to divide the carrier into five equal segmental gripper sections and to advance successive sheets to be printed in a circular path meeting the printing lines of the separate printing couples, the general construction thereof and the driving connections with respect to the printing couples and the sheet carrier being of the general class more particularly shown in Patent No. 1.306,086, granted to F. M. Turck and B. C. White on June 10, 1919.

The press is further provided with sheet transfer or feed drums 17 and 18 having variable rotative movement arranged to supply the sheets from a state of rest to the grippers 19 of the carrier-rings 20 in the manner fully described in applicant's copending application. Serial No. 554,886, filed April 18, 1922. In the operation of the press for printing the sheets in four colors, the drum 17 only is employed, and for two-color printing both the drums 17 and 18 are used.

Delivery chains 25 are also provided for the press and arranged to receive the printed sheets from the carrier-rings 20 and deliver them to either one or both the delivery piles 27 and 28 in a manner hereinafter described. Also the press is provided with automatic sheet-feeders 21 and 23, respectively cooperating with the feed-piles 22 and 24, the same being of any of the well-known types of pile-feeding devices in which the sheets are separately advanced to points desired.

In the four-color printing operation of the press, the new, or blank sheets to be printed are taken from the pile 24 by the automatic feeder 23 and carried thereby to the transfer drum 17, which delivers them to the grippers 19 of the carrier-rings 20, and by which latter, during a two cycle rotation, the sheets are advanced for engagement by the two printing couples 11 and 12, and 13 and 14, to receive four superposed impressions. The transfer drum 17 and the printing couples are respectively driven at a common rate of rotation, corresponding with a movement of two gripper sections of the carrier-rings 20, so that at each revolution of the drum a new sheet is transferred to every second or alternate gripper, the direction of rotation of the several parts being indicated by the arrows shown in the drawings. The cylinders of each of the printing couples are divided in their direction of rotation to form a pair of equal and independent printing surfaces arranged to print in different colors, and having their printing contact line disposed on the circular path of the sheet-carrier. The successive sheets in their advancement by the sheet-carrier from the drum 17 engage the first printing couple 11 and 12 where they receive the first-color impression from a common plate thereon. As the sheets continue their movement they advance a distance of two gripper sections along the lower circular path of the sheet-carrier where they are engaged by the second printing couple 13 and 14 and receive from a common plate thereof a superposed second-color impression. From the second-color impression the advancement of the sheets is continued for a distance of three gripper sections along the upper path of the carrier, where the sheets are again engaged by the first printing couple 11 and 12 on the second cycle of rotation to receive a superposed third-color impression by the plate of the couple opposite to the one by which the first-color impression was made. the relative change to the new printing plate being occasioned by the additional half revolution of the couple, corresponding to the difference

of advancement of the sheets as between the prior impressions. After receiving the third color impressions the sheets again make the advancement of two gripper sections along the lower path of the carrier to receive the superposed fourth and last color impression, after which they are delivered into the delivery-chain 25. From the above it will be seen that on the successive sheets throughout the run, the first and second color impressions will be made on corresponding half-sections of the plate cylinders 11 and 13, and the third and fourth color impressions on the opposite half-sections of the same cylinders. The occurrence of the feeding, printing and delivering of successive sheets as engaged and advanced by the five gripper sections of the sheet-carrier with respect to the rotation of the latter is as follows:

First rotation of carrier.

(Sec. 1)—New sheet fed; 1st and 2nd colors printed.
(Sec. 3)—New sheet fed; 1st and 2nd colors printed.
(Sec. 5)—New sheet fed; 1st color printed.

Second rotation of carrier.

(Sec. 1)—3rd and 4th colors printed; sheet delivered.
(Sec. 2)—New sheet fed; 1st and 2nd colors printed.
(Sec. 3)—3rd and 4th colors printed.
(Sec. 4)—New sheet fed; 1st color printed.
(Sec. 5)—2nd and 3rd colors printed.

Third rotation of carrier.

(Sec. 1)—New sheet fed; 1st and 2nd colors printed.
(Sec. 2)—3rd and 4th colors printed; sheet delivered.
(Sec. 3)—Sheet delivered; new sheet fed; 1st and 2nd colors printed.
(Sec. 4)—2nd and 3rd colors printed.
(Sec. 5)—4th color printed; sheet delivered; new sheet fed; 1st color printed.

Fourth rotation of carrier.

(Sec. 1)—3rd and 4th colors printed; sheet delivered.
(Sec. 2)—New sheet fed; 1st and 2nd colors printed.
(Sec. 3)—3rd and 4th colors printed.
(Sec. 4)—4th color printed; sheet delivered; new sheet fed; 1st color printed.
(Sec. 5)—2nd and 3rd colors printed.

For the two-color operation of the press, the new sheets are taken from both feed-piles 22 and 24 by their respective automatic feeders 21 and 23 and carried to their corresponding transfer-drums 18 and 17, which deliver them to the grippers 19 of the sheet carrier 20, the two drums being respectively positioned in the path of the sheet-carrier to jointly transfer the sheets to each successive gripper, which in turn advances them between the two sets of printing couples for effecting a double printing action on each sheet at each revolution of the sheet-carrier. Also the spacing of the transfer-drums with respect to the printing couples provides that the impressions on the successive sheets of each drum will be made by a common printing plate of each of the two couples, whereby two different sizes of sheets may be run off at one time on different sets of plates having different colors. After the sheets have received their second and final impression, they are advanced by the carrier to the point of delivery, where each successive sheet is engaged by the delivery device and conveyed to their respective delivery piles, the sheet-carrier continuing into a second cycle of rotation for the reception of new sheets.

While the general construction of the transfer drums 17 and 18 is fully described in the patent application above mentioned, their operating mechanism in connection with the present invention is more particularly shown in Figs. 2, 3 and 9, which includes the upper drum 18, provided with its regular driving gear and shaft, the latter mounted for rotation in the opposite side frames 83 of the press. Below the drum 18 a cross-shaft 48 is rotatably mounted in bearings of the frames, and also arranged for lengthwise sliding movement therein, a pinion-gear 46 being fixedly secured to the shaft 48 and adapted, by the sliding action of the shaft, for detachable driving engagement with the gear of the drum 18, whereby the latter may be readily rotated or stopped, the driving action of the pinion being effected from the gear on the impression cylinder 14 meshing through the train of gears 44 and 45. Also rotatably mounted in the front frame 83 is a screw-rod 50, threaded at its inner end in a yoke member 49, having an upwardly extending pair of arms 52 loosely encircling the shaft 48, the latter also loosely supporting for pivotal movement a cam 36 positioned thereon between the arms of the yoke member 49. Exteriorly of the frame the screw-rod 50 is fixedly provided with a sprocket-wheel 80 and a hand-wheel 82, the latter serving to rotate the screw-rod and effect thereby, through the yoke member 49, the lengthwise movement in opposite directions of the shaft 48, which in turn correspondingly shifts the lateral position of the cam 36 and the gear 46 into the respective positions indicated by the dotted lines 53 and 51, whereby their corresponding

engaging members remain inoperative. For opposing the opposite end thrusts of the thread of the screw-rod 50, the latter is laterally positioned in its bearing by the extension of the hub of the sprocket 80 and by the collar 50a, and for correspondingly positioning the yoke member 49 on the shaft 48, the hub of the pinion-gear 46 and the collar 48a are employed.

The transfer drum 17 is driven from the impression cylinder 12 through the gear 47 in a manner similar to the driving action of gear 46 with respect to the drum 18, excepting that no provision is made for independently stopping and starting the former drum owing to its necessary operation for both two-color and four-color work. For the transfer of the sheets from the drums 17 and 18 to the sheet-carrier 20, the lines of grippers 19 of the latter are fixed upon the shafts 33, the outer ends thereof being provided with arms 34, carrying at their free ends anti-friction rollers 35 disposed to be engaged by the cams 32 and 36. The cam 32 is pivotally mounted on the shaft carrying the gear 47 and from which point the cam is adapted to be swung into and out of operative position by a connection rod 40, one end thereof being pivotally connected to the cam while the opposite end is similarly connected eccentrically to the end of the shaft carrying the cylinder 12, the shaft connection serving as a crank for the operation of the cam coincident with the advancement of every second or alternate line of grippers of the sheet-carrier 20, the cam being shaped and respectively positioned to open the carrier grippers and close them upon the leading edge of the sheet to be transferred slightly before the latter is released by the grippers of the transfer drum. The cam 32 is also provided with an arm 32a adapted to transmit motion to the cam 36 through the connecting rod 36a, the latter being pivotally connected and positioned at its opposite ends to afford a common movement of the two cams from the rod 40. The operation of the cam 36 with respect to the transfer drum 18 is similar to that of the cam 32 and drum 17 when the press is used for two-color work only, the two drums being spaced apart and arranged to jointly effect the transfer of a sheet to each successive line of grippers of the sheet-carrier. When it is desired to operate the press for four-color work, the cam 36 and gear 46 is laterally shifted by the hand-wheel 82, as described above, thus displacing their respective operative alinements with the gripper-operating rollers 35 and the driving gear of the drum 18, resulting in the stoppage of the latter and the arrest of operation at this point of the sheet-carrier grippers, the cam 36 continuing its rocking movement in an idle manner during this period.

For the release of the printed sheets as delivered by the lines of carrier-grippers 19, a cam 31 is provided and pivotally mounted at one end on a stud 39, fixed on the inner side of the front frame 83 of the press. During the operation of the press on two-color work, the cam 31 is held immovable in its upper position, as indicated in Fig. 2, to operate each of the several lines of carrier-grippers 19 in turn for the release of successive sheets, and during its operation on four-color work the cam is adapted to be raised and lowered for operating every second or alternate line of carrier-grippers for the release of every second sheet, whereby the latter may be caused to make two revolutions between each of the printing couples before delivery. For effecting the raising and lowering movements of the cam 31, a connecting-rod 37 is pivoted at its upper end to the free end of the cam, the opposite or lower end of the rod being provided with a fork or slot engaged by a stud or crank-pin 38 eccentrically positioned in the end of the shaft of the impression cylinder 14, the latter at each revolution being adapted to operate the cam coincident with the passage of every second line of carrier-grippers, the shape and position of the cam at its upper extreme of movement being adapted to engage the rollers 35 and effect the necessary releasing action of the grippers, and in its lowermost position to allow a clear and inoperative passage for the rollers.

For holding the cam 31 in its upper position, a recess 54 is provided therein to receive a stop-nut 55, having threaded engagement with a screw-rod 56, rotatably mounted in a bearing of the frame 83, see Figs. 2, 3, 6, 7 and 8. At its outer end the screw-rod 56 is provided in fixed relation with an operating sprocket-wheel 80 having a hub engaging an end face of the bearing, the opposite face thereof being engaged by a collar 56a, fixed to and adapted to position the screw-rod within the bearing. By means of the wheel 80 the screw-rod may be rotated for effecting the inward and outward movements of the stop-nut 55, the latter being provided with a short arm adapted to slidingly engage a guide-rod 57, fixed in the frame 83 and by means of which guide-rod the nut is held against rotation. In its outward position, as indicated in Fig. 6, the stop-nut 55 is free of the cam 31, whereby the latter may be lowered by gravity under the movement of the connecting-rod 37 for the purpose above described, and in its inward movement the stop-nut will enter the recess 54 of the cam and serve to hold the latter in its upper position, as shown in Fig. 8.

As released from the lines of grippers 19 of the carrier-rings 20, the printed sheets are engaged by a series of lines of delivery-

grippers 26, supported upon a cross-shaft 58, the latter being fixedly secured at its opposite ends to the links of a pair of chains 25. As shown more particularly in Figs. 4, 5, 6 and 8, each of the delivery grippers comprises a finger 59, projecting from a hub 60 provided with set-screws 61 whereby the grippers may be adjusted lengthwise of their supporting shaft 58. Also projecting from the hub 60 is a side bearing 67 arranged to rotatably support a gripper-operating shaft 66. At its extremity the finger 59 is adapted to form a gripper-face and adjacent thereto are provided a pair of lugs 62 between which is pivotally mounted a movable gripper-jaw 63, the latter being operated by a connecting-rod 64, pivoted at one end to the gripper-jaw and at its opposite end to an arm 65 mounted on the shaft 66 and adjustably secured lengthwise thereof by set-screws, the gripper-jaw 63 being normally held in a closed position with respect to the terminal gripping face of the finger 59 by a spring 68 exerting a thrust at its opposite ends against the relatively movable arm 65 and a lug formed on the relatively fixed projecting finger-bar 59.

The several lines of grippers in the delivery device are uniformly spaced apart to accord with the spacing of the carrier-gripper lines 19, and are driven at a common rate of speed therewith, and also operate to effect on the transfer of the printed sheets an engagement by the delivery-grippers slightly in advance of the release of those of the sheet-carrier in order to prevent accidental displacement of the work at this point. For the delivery of four-color sheets every second or alternate line of delivery-grippers 26 are operated to engage and transfer a sheet from a corresponding alternate line of sheet-carrier grippers 19, and for the delivery of two-color sheets all the lines of delivery-grippers are operated to engage and transfer successive sheets from corresponding lines of sheet-carrier grippers.

For operating the several lines of delivery-grippers, the operating shafts 66 thereof are provided at their front ends with actuating arms 69, having terminal studs 69[a] provided with anti-friction rollers 70 and 71, which are respectively of two different lengths for alternate lines of grippers. As indicated in Figs. 2, 3, 4, 5, 6 and 8, the rollers 70 and 71 are adapted in their advancement to engage a cam 72, supported through its hubs 75 for sliding movement on the sprocket shafts 76, the movement being effected by a screw-rod 78, threaded through the central hub 77 of the cam. An inner bearing 79 is provided for the screw-rod adjacent the thread thereof, and a second bearing is also provided therefor in the frame 83, the screw-rod being further provided with an actuating sprocket-wheel 80, the hub of the latter, in connection with the collar 78[a], being adapted to position the screw-rod within the bearings in opposition to the thrusts of the screw thread. By rotating the wheel 80 in opposite directions the cam may be shifted toward or away from the delivery-grippers. The cam is provided with a double operating face or track, the main track-line thereof being curved at opposite ends concentrically with the shafts 76, and extending between the curved portions thereof in a straight or tangent line parallel with the delivery-chain 25, this track-line being indicated by full lines in Fig. 2, and in Figs. 4 and 5 by the dotted lines 72 and 73. A second track section 74, upwardly curved from the main track line to a different level, is provided for the cam as shown by dotted lines in Figs. 4 and 5, and in transverse sections in Figs. 6 and 7. In the movement of the delivery-chain 25 as indicated by the arrows, the rollers 70 and 71 engage the main track of the cam and open the delivery-gripper jaws 63 of successive gripper lines, and which remain open until they have cleared the leading edge of the sheets advanced by the adjacent sheet-carrier 20. For four-color printing the cam 72 is shifted inwardly to the position shown in Fig. 6, wherein the longer cam-roller 71 engages the main track line of the cam throughout its entire length to hold the jaws of the alternate lines of delivery-grippers in open position, in which position the corresponding alternate lines of carrier-grippers are free to advance the sheets for a second printing revolution. As the movement of the carrier-chain 25 continues, the next following shorter roller 70, operating the delivery grippers of the second alternate line, engages the cam, first on the main track line to open the jaws of the grippers and hold them open until they have passed the leading edges of the sheets to be transferred from the sheet-carrier, and then to close upon the sheets by the reaction of the springs 68 as the roller passes over the second cam section 74. Thus it will be clear that every second or alternate line of delivery-grippers may be operated to engage and deliver a sheet from the carrier-rings while the intermediate lines of delivery-grippers will remain inoperative with respect to the sheets. For printing the sheets in two-colors, the cam 72 is outwardly moved by the rotation of the screw-rod 78 into the position shown in Fig. 8, wherein both of the rollers 70 and 71 run over the track-line 74 of the cam and operate to open and close the jaws of each succeeding delivery gripper line in the manner just described for the shorter roller 70, and in which the delivery device is adapted to transfer the sheets from each successive line of sheet-carrier grippers.

For converting the press either into a two-

color or a four-color printer, the screw-rods 50, 56 and 78, may be jointly rotated in either direction by their sprocket wheels 80, driven through the chain 81 from the screw-rod 50 by the hand-wheel 82, the latter serving by a single general movement in either direction to quickly make the change. For four-color work the hand-wheel is rotated in a left hand manner to operate the screw-rod 50 to outwardly shift the parts and stop the rotation of the transfer drum 18 and the operation of the corresponding carrier-grippers at this point, also, to operate the screw-rod 56 to outwardly shift the stop nut and permit the operation of the cam 31 which releases alternate sheets only, and likewise to operate the screw rod 78 to inwardly shift the cam 72 for the delivery of alternate sheets, the thread of the several screw-rods being made right and left hand to suit the inward and outward movement of the parts as effected by the joint rotation of the rods in one direction. By reversing the rotation of the hand-wheel the respective parts will be inwardly shifted for the operation of the press for printing in two colors.

The delivery device includes a pair of endless chains 25, connected together by a series of transversely extending gripper shafts 58. The chains are preferably of the roller chain type arranged to run on a series of guiding and driving sprocket wheels 42, 43 and 120, fixed on transverse shafts journaled in bearings formed in the opposite frames of the press. At the receiving end of the delivery the chain wheels are fixed upon the shafts 76, one of which carrying the pair of wheels 43 being preferably used as the driver. From this end the chains are guided upwardly and then horizontally above the sheet-feeding devices of the press and pass around the wheels 120, fixed on the shaft 122, the latter being rotatably mounted in the bearings 123, carried by the frame-legs 97. Extending on opposite sides of the press, along the horizontal run of the delivery and between the upper and lower lines of the chains are rail plates 88, supported by the frames 83 and the legs 97, the rail plates being preferably made of sufficient strength to carry the weight of the delivery piles 27 and 28 and to also serve at their upper edges as tracks for the support and alinement of the upper lines of the opposite chains, the lower chain lines thereof being carried by the bottom rails 96.

In their delivery, the printed sheets are carried along by the grippers 26 over the surfaces of the horizontal guide plates 84, a section thereof at 85 being depressed to form an inspection drop, having adjacent its forward edge a trip-cam 86, pivoted at one end to the front rail-plate 88 upon a pin 89, the trip-cam being normally sustained out of the path of the delivery cam-rollers 70 and 71 by the spring 87. A trip arm 90 having a toe 91 alining with the trip cam and fixed to the inner end of a stub shaft 92 is operated by a handle 93 fixed to the outer end of the shaft whereby an operator may turn the trip-arm and force the trip cam 86 down to the position shown by full lines in Fig. 10, where it will be positoned in the path of a delivery cam roller and depress the cams sufficiently to operate the delivery gripper jaw thereof for the release of a sheet and permit it to drop upon the depressed plate 85, from which it may be removed by the operator from either side of the delivery for inspection without stopping the press or interrupting its operation. Upon the release of the handle 93 a spring 94, attached thereto and to the rail-plate 88 will return the handle back to its normal position shown at 95 in dotted lines in Figs. 10 and 12, thus swinging the toe 91 to the position 91^a and permitting the spring 87 to lift the trip-cam 86 out of the path of the oncoming rollers 70 and 71. With the inspection drop as thus arranged, the usual practice of disturbing a pile of sheets for inspecting the work is overcome.

For discharging the printed sheets into either one of the delivery piles 27 or 28, openings are provided between the sections of the guide plate 84, and through which openings the sheets may be dropped upon the release of the carrier-gripper by the action of the trip-cams 100 and 137, the former being movable and the latter fixed. As shown in Figs. 13, 14 and 16, the cam 100 is fixed on the inner end of a stub shaft 101, rotatable in a bearing fixed to the front rail-plate 88, the shaft extending exteriorly of the plate and having an arm 102 fixed thereon, the free end of the latter being pivotally connected to the upper end of a connection-rod 103, the lower end of which is pivoted to the outer end of a lever 104, fixed to one end of a rock-shaft 105, and which latter extends across the machine below the delivery path of the sheets and is journaled at opposite ends in bearings 105^a fixed to the front and rear rail-plates 88. On the rear end of the rock shaft 105 is fixed an operating arm 106, having its free end pivoted to one end of a connection-rod 107, the opposite end thereof being similarly connected to a stud 109, fixed to the free end of the arm 108, the latter having a hub 110 arranged to freely turn in the wall of the rear rail-plate 88 and held in position therein by the interior nut 111, as clearly shown in Figs. 18 and 17. A shaft 112 extends across the machine and through the hub 110, in which latter a feather connection is made which provides for the shaft an endwise sliding movement therethrough and a rotary driving movement thereof. Fixed upon the rear end of the shaft 112 is an arm 113 provided at

its free end with a stud 115, rotatably supporting a roller 114 adapted to be yieldingly urged by a spring 117 into engagement with a multiple cam 116, the latter being fixed to a gear-wheel 124 and jointly rotatable therewith upon a stud 125, fixed to the foot of the rear bearing 123, the gear 124 being driven by a pinion 121, fixed upon the rear end of shaft 122. The pair of chain-wheels 120, as carried by the latter shaft, are proportioned in diameter to make one revolution for the passage of each line of carrier-grippers, corresponding with the maximum rate of delivery of the printed sheets and also with a revolution of the pinion-gear 121, the latter being proportioned with respect to its engaging gear 124 to drive the latter at one-fourth the number of turns, corresponding to one revolution of its connected cam 116 for every four passages of the delivery-grippers, or possible sheets delivered.

In the discharge of the sheets from the delivery-grippers to the piles 27 and 28, a series of horizontal guide-bars 131 are disposed above the pile 27 on a level with the sheet guide plates 84, as shown in Figs. 13, 14 and 16. Each of the bars is pivotally connected to the upper end of an arm 133 fixed to the rock-shaft 105, the bar being also similarly connected to the upper end of a second arm 132 fixed to a shaft 134, the two sets of arms being of equal lengths and arranged to brace and effect a parallel vertical movement of the bars in opposite directions by the rocking movement of the shaft 105. The shaft 134 is mounted at opposite ends in the bearings 105[a] in a manner similar to shaft 105 and with which it rocks in unison to effect the parallel vertical movement of the several horizontal guide-bars. As controlled and operated from the multiple-cam 116 through the connection-rod 107, the shaft 105 jointly actuates the guide-bars 131 and the trip-cam 100, and in their positions, as shown in full lines, the guide-bars are disposed with their upper edges on a level with the main sheet guide-plates 84, and the trip-cam 100 in its upper position clear of the operating rollers 70 and 71 of the delivery-grippers 26. In the positions thus shown all of the printed sheets will be carried along over the horizontal guide-bars 131 and delivered into the pile 28, the positions being maintained during the engagement of the roller 114 with the larger concentric section of the multiple cam 116, as shown by the dotted lines of the roller at 114[a] in Fig. 17, and also indicated in Fig. 19.

For transmitting the action of the several sections of the multiple cam 116, the roller 114 is laterally shifted for engaging such parts by the lengthwise movement of shaft 112, the movement being effected at the front of the press as shown in Figs. 18 and 16, wherein the shaft is fixedly provided at its front end with a flanged collar 126. In the groove of the collar are loosely positioned a pair of rollers 128, rotatable on pins fixed to one of the legs of a bell-crank lever 127, which is fulcrumed in the bracket 129, fixed to the rail-plate 88, the opposite leg of the lever being pivotally connected to an adjustment-rod 130 having a plurality of notches 130[a] by which the rod is adapted to be locked in variable positions in the bracket 129[a]. This bracket is also fixed upon the rail-plate 88 and has an outer perforated boss arranged to slidingly receive the rod, and a lock-pin 130[b] adapted to engage the notches of the latter. The boss is also provided with a recess adapted to hold a spring 129[b] and receive the thrust of one end thereof, the opposite end being disposed to engage the back of the rod and effect a yielding engagement between the lock-pin and slots. By compressing the spring through the manual operation of the rod, the latter may be moved lengthwise for the engagement of either one of its notches which are spaced apart to retain the necessary lateral movements of the cam-roller 114, the said lateral movement being made when the cam is rotatively positioned with respect to the roller to afford the latter a straight path of movement from one cam section to the other. In the rocking movement of the shaft 112, the thrust of the spring 117 at its opposite ends is received by the post 118, fixed to the rear rail-plate 88, and by the head of the spring-rod 119 pivotally mounted on the stud 109 of the arm 108, and through which latter the spring serves to rock the shaft 112 in opposition to the cam 116.

When the sheets are required to be discharged into the delivery pile 27, the trip-cam 100 and the guide-bars 131 are respectively shifted from their full-line position shown in Figs. 13 and 14 to the dotted-line positions indicated by 136 and 135, the movement of the two members being jointly effected through the rock-shaft 105 and the connection-rod 107 by the reaction of the spring 117, the latter urging the roller 114 into engagement with the smaller concentric section of the cam 116, as shown in full lines in Fig. 17, and also indicated in Fig. 22, the concentric sections of the cam in their engagement with the cam-roller 114 serving merely as a rotating stop to hold the roller and connected parts in a definite position. While the trip-cam 100 and guide-bars 131 are in their dotted-line positions, the successive sheets carried by the delivery-grippers will pass below the bars 131, and fall upon the pile as the delivery-grippers are opened by the engagement of the operating rollers 70 and 71 thereof with the cam 100.

For dividing the delivery of the sheets alternately into the two piles 27 and 28, the multiple cam 116 is provided with operat-

ing sections divided as indicated in Fig. 20 to aline with both the larger and smaller concentric parts thereof in such manner as to produce at each revolution two inward and two outward alternate movements of the roller 114, each movement serving to jointly shift both the trip-cam 100 and the guide-bars 131, whereby, in two-color printing, four sheets will be delivered at each revolution of the cam alternately in the two piles, and in four-color printing where only alternate delivery-gripper lines are used, two sheets will be delivered in a corresponding time, both to a single pile. When sheets of four-colors are to be delivered alternately in separate piles, the cam 116 is provided with a single operating section as shown in Fig. 21 in which only one outward and inward movement of the roller 114 is made at each revolution of the cam, corresponding with four passages of the delivery-grippers or two four-color sheets, delivered alternately into the two piles. In the delivery of the sheets into the last pile 28 the cam 137 is fixed upon the rail-plate 88 and suitably proportioned and positioned to engage the operating roller of each successive delivery-gripper for the release of a sheet held thereby and its delivery into the pile below.

When the press is set for two-color printing with both sheet-feeders in operation, the sheets fed from feed-pile 22 will always be printed by the same set of plates, and, as the delivering and feeding devices are positively driven from the printing units, the sheets will invariably fall into the pile 27, while the sheets starting from feed-pile 24 will be printed by the opposite set of plates and will fall invariably into the pile 28, thus preserving the identity of the products throughout the operations of the press.

The sheets are preferably delivered above and beyond the feeding devices in order to bring the delivery and feed piles close together. Practically all sheets are printed on both sides, and so far as possible on the same plates and it is therefore convenient to have feed and delivery piles in such close relation that the half-printed sheets may be readily transferred to the feed piles for the second printing.

It will be observed that the sheets are delivered in the pile printed side up, and if a pile of sheets be transferred to a feeder for a second printing on the opposite side, the sheets will again be delivered with the freshly printed sides uppermost. This arrangement saves handling and turning over the sheets, preserves the accuracy with which they have been piled and greatly reduces the time and labor of transfer. It is only necessary to turn the truck load of sheets around to bring the advance or gripper edge of the sheets again to the grippers and reverse the side of registry, the above advantages applying in both two-color and four-color printing.

While reference has been made more particularly to four-color and two-color printing, it is to be understood that one-color and three-color printing may also be readily done on the press by omitting certain of the plates on one or both of the plate cylinders.

On long runs it is often desirable, where the same plates are used for both sides of the sheet, to print one side until the first sheets so printed are dry enough to permit them to be printed on the back, when the method will be to transfer these once printed sheets to one of the feed-piles, say 22, from which they will be advanced to receive a second, or back printing, and be delivered into the pile 28, new sheets being always placed in feed-pile 24 and delivered into the delivery-pile 27, from which they would be transferred to feed-pile 22 and continuing in this manner there would be a continuous production of sheets printed in colors on both sides to the end of the run. This arrangement has the advantage of delivering finished sheets in a few days and continuing their delivery at a fixed rate indefinitely with no changes in the method, mechanism or adjustments.

If the front and back of the sheets are to be printed in either one or two colors by different plates, the press may be run for a number of days on front printing only, and then by changing the back set of plates may run continuously, printing both front and back, in which case the first printing may be done in one or two colors and the last printing in one or two colors different from the first.

As the sheets are delivered from the carrier to the delivery piles 27 and 28, the latter may be lowered automatically by any of the approved types of lowering devices, and may also be manually lowered by the drum and cable lowering devices 29 and 30 upon trucks or otherwise in any well-known and appropriate manner.

As the operation of the various parts has been set out in detail and in the connections wherein they cooperate with each other it is believed a recapitulation of the entire operation is unnecessary. It is to be understood that while I have illustrated and described the preferred embodiment of the invention it is susceptible of various changes as regards its form, proportion, detail construction, and arrangement of parts, without departing from the essential principle and scope of the invention.

What I claim as my invention and desire to secure by Letters Patent, is:

1. In a printing press, a printing couple, a rotary sheet carrier operatively supported independently of said couple and having a plurality of sheet engaging sections ar-

ranged to advance the sheets thereto in a path tangent the printing line thereof, and a plurality of sheet feeders arranged to feed the sheets to said carrier.

2. In a printing press, a plurality of printing couples, a pair of sheet feeding devices therefor, means for operating one of said feeding devices to print sheets in four colors at a single operation, and means for operating both of said feeding devices to print double the number of sheets in two colors in the time required in printing said sheets in four colors.

3. In a printing press, a plurality of printing couples, a pair of sheet feeding devices therefor, sheet delivery devices, means for operating one of said feeding devices to print and deliver sheets in four colors at a single operation, and means for operating both of said feeding devices to print and deliver double the number of sheets in two colors in the time required in printing and delivering said sheet in four colors.

4. In a printing press, a printing couple, a rotary sheet carrier operatively supported independently of said couple and having a plurality of sheet engaging sections arranged to advance the sheets thereto in a path tangent the printing line thereof, a plurality of sheet feeders arranged to feed the sheets to said carrier, a plurality of delivery piles, and means for transferring the printed sheets from said carrier to said delivery piles.

5. In a printing press, a plurality of printing couples divided circumferentially to form independent printing sections limited in number to the different colors printed, a sheet carrier divided circumferentially to form a number of carrier sections greater by one than the number of printing sections, and driving means for effecting superimposed impressions from said printing couples at each revolution of said carrier.

6. In a printing press two sheet-feeding mechanisms adapted to feed sheets into alternate sets of moving sheet-carrier grippers, in combination with two rotating printing elements, each having two printing surfaces, one of said printing surfaces registering repeatedly with the sheets carried from one of said sheet-feeding mechanisms and the other of said printing surfaces registering repeatedly with the sheet carried from the other of said sheet-feeding mechanisms.

7. In a printing press, two sheet-feeding mechanisms; a sheet-carrier common to both; in combination with a rotating printing element having two printing surfaces one of which registers with the sheets from one of said sheet-feeding mechanisms and the other of said surfaces with the sheet from the other of said sheet-feeding mechanisms; and means for separately delivering the sheets printed by each of said surfaces.

8. In a printing press the combination of two sheet-feeding mechanisms; a sheet-carrier common to both, and adapted to advance sheets from each of said mechanisms into printing relation with different printing surfaces upon a printing element; said sheet carrier being adapted to advance the sheet beyond said printing element to a delivery mechanism; and means for separately delivering the sheets from each feed mechanism.

9. In a printing press the combination of two sheet-feeding mechanisms; a moving sheet-carrier common to both; two rotating printing couples in the path of said sheet-carrier, each of said couples having two printing surfaces, one of each of said surfaces on both couples registering with a sheet from one of each of said feeding mechanisms; separate inking mechanism for each of said printing surfaces; and separate delivery means for the sheets from each of said feeding mechanisms.

10. In a printing press the combination of two sheet-feeders; a sheet-carrier, two printing couples each provided with two printing surfaces; and separate inking devices for each of said surfaces.

11. In a printing press, two printing couples each provided with two printing surfaces, a rotating sheet carrier provided with a plurality of sheet engaging sections each adapted alternately to receive an impression from the several printing surfaces, a plurality of delivery stations, and means for alternately delivering the printed sheets to alternate delivery stations.

12. In a printing press the combination of two rotating printing couples, each provided with two printing surfaces; two sheet-feeding mechanisms, each adapted to feed a sheet for each rotation of the printing couples; means for disconnecting one of said sheet-feeding means; and means for advancing and delivering the sheets, said delivery means being adjustable to suit the rate at which said sheets are fed.

13. In a printing press two sheet-feeding mechanisms; a sheet carrier adapted to receive sheets alternately from each feeding mechanism; means for advancing the sheets through two printing operations and means for delivering all of said sheets when twice printed upon; in combination with means for silencing one of said sheet-feeding mechanisms, co-acting with releasing mechanism for each alternate set of carrier grippers, whereby when one sheet-feeding mechanism is silenced the sheets will be advanced into printing relation with each of the two printing couples twice before being delivered; and means for delivering.

14. In a printing press, printing devices, a rotary sheet carrier therefor operatively supported independently of said printing

devices, a plurality of sheet feeders for said carrier, and means for jointly and independently operating said sheet feeders.

15. In a printing press a rotating sheet carrier comprising two geared rings spaced apart and provided with spaced carrier-bars extending between them; grippers on said carrier bars, arms at the ends of each carrier bar for opening and closing said grippers and cams in the path of said arms for opening and closing alternate grippers to receive and grasp sheets from two feeding mechanisms alternately; and cams in the path of said arms operating to open said grippers to deliver said sheets either alternately or continuously and connections between said cam operating and feed operating means whereby sheets fed when only one of the sheet feeding mechanisms is in operation will make two circuits of the press before delivery while sheets fed with both sheet-feeding mechanisms in operation will make but one circuit of the press before delivery.

16. In a printing press a rotating sheet-carrier having spaced grippers thereon, adjustable means for opening said grippers for delivering continuously or alternately; in combination with a chain delivery having correspondingly spaced delivery grippers thereon, and means for opening and closing said delivery grippers to receive and seize a sheet, said delivery gripper operating means co-acting and connected with said carrier-gripper operating means whereby when the carrier grippers are set to open to release alternate sheets the alternate delivery grippers registering therewith will close upon said sheets, and means for adjusting the movements of the mechanism controlling the cams for both grippers simultaneously.

17. In a printing press adapted to print a fixed number of sheets in four colors and convertible into a press adapted to print twice that number of sheets in two colors, including two feeding mechanisms, carrier gripper opening and closing cams for each feeder; carrier opening cams for delivering and delivery opening and closing cams for removing the sheets; interlocked and connected mechanisms whereby a single adjustment will silence one feeder and the corresponding carrier gripper movements.

18. In a printing press, two printing couples, each provided with two separate printing sections, a sheet carrier arranged to supply sheets to said printing couples, two separate sheet feeders arranged to supply sheets to said carrier, and adjustable driving means whereby one or both of said feeders may be operated.

19. In a printing press, an annular sheet carrier, means for feeding separate series of sheets to said carrier including independent feed piles for said sheets, a printing couple operatively mounted in the path of said annular sheet carrier and provided with a plurality of independent printing surfaces adapted to print the sheets from the corresponding sheet piles, and means for separately delivering the independent series of sheets.

20. In a printing press, two printing couples, each provided with two separate printing sections, a sheet carrier arranged to supply sheets to said printing couples, two separate sheet feeders arranged to supply sheets to said carrier, and adjustable driving means whereby one or both said feeders may be operated, said driving means including a hand-wheel control.

21. In a printing press, an annular sheet-carrier, a printing couple operatively mounted in the path of said sheet-carrier and having a plurality of independent printing surfaces, a plurality of independent feeding devices for supplying sheets to said annular sheet-carrier, and means for delivering the printed sheets from said sheet-carrier in independent piles corresponding with the independent printing surfaces of said printing couple.

22. In a printing press, a plurality of separate feeding and printing devices arranged to print a plurality of separate series of sheets for different classes of work, a delivery device arranged to receive and deliver the printed sheets, a plurality of separate delivery stations corresponding with the feeding and printing devices, and means for delivering the printed sheets from said printing device to their respective stations.

23. In a printing press, a sheet-carrier provided with sheet feeding means, a printing couple in the path of said carrier, a delivery device arranged to receive and deliver the printed sheets from said carrier, an inspection-drop disposed between the receiving and delivering points of said delivery device adjacent the path thereof, and means for discharging a sheet from said delivery device into said inspection-drop during the movement of said delivery device.

24. In a printing press, a printing device, means for feeding sheets to said printing device, a delivery device arranged to receive and deliver the printed sheets, an inspection-drop disposed between the receiving and delivering points of said delivery device adjacent the path thereof, and means for discharging a sheet from said delivery device into said inspection device during the movement of said delivery device.

25. In a printing press, an annular sheet-carrier having a plurality of gripper lines, means for feeding sheets to alternate gripper lines, printing means disposed in the path of the carrier-grippers and arranged to make superposed impressions during two revolutions of said carrier, a movable cam,

means for moving said cam into operative position to engage alternate gripper lines for the release of alternate sheets, and means for moving said cam out of operative position to permit opposite alternate gripper lines to remain closed on the opposite sheets.

26. In a printing press, an annular sheet-carrier having a plurality of gripper lines, means for feeding sheets to the first alternate lines of grippers, independent means for feeding sheets to the second alternate lines of grippers, printing means disposed in the path of the several gripper lines and arranged to make superposed impression on the sheets carried thereby, a movable cam, automatic means for alternately moving said cam into and out of operative position for the release of alternate sheets, and means operated by an attendant for holding said cam into operative position for the release of successive sheets.

27. In a printing press, a sheet-carrier having a plurality of gripper lines, a plurality of separate feeders therefor, printing means in the path of the carrier and arranged to make superposed impressions on the sheets carried thereby, a movable cam arranged to operatively hold and release the sheet-grippers, detachable driving connections for a portion of said separate feeders, and means for jointly operating said cam and detachable driving connections.

28. In a printing press, a sheet carrier, a plurality of separate feeders therefor, printing means in the path of said sheet carrier, and detachable operating connections for said feeders adapted to operate one or more thereof.

29. In a printing press, two printing couples each provided with two separate printing surfaces, a sheet carrier having a plurality of sheet-engaging sections co-acting with said printing couples, and two feed drums each arranged at every rotation to supply a sheet through said carrier to a common printing surface in each of the couples, whereby at each revolution of the two feed drums two separate sheets may be printed in two colors.

30. In a printing press, two printing couples each provided with two separate printing surfaces, a sheet carrier having a plurality of sheet-engaging sections co-acting with said printing couples, two feed drums each arranged at every rotation to supply a sheet through said carrier to a common printing surface in each of the couples whereby at each revolution of the two feed drums two separate sheets may be printed in two colors, and means for delivering the separately printed sheets into separate piles.

31. In a printing press, two printing couples each provided with two separate printing surfaces, a sheet carrier having a plurality of sheet-engaging sections co-acting with said printing couples, a feed drum arranged at each rotation to supply a sheet to alternate sheet-engaging sections of said carrier, whereby a sheet may be printed in four colors during two revolutions of said carrier.

32. In a printing press, two printing couples each provided with two separate printing surfaces, a sheet carrier having a plurality of sheet-engaging sections co-acting with said printing couples, a feed drum arranged at each rotation to supply a sheet to alternate sheet-engaging sections of said carrier, whereby a sheet may be printed in four colors during two revolutions of said carrier, and means for delivering the printed sheets.

33. In a printing press, two printing couples each provided with two separate printing surfaces, a sheet carrier having a plurality of sheet-engaging sections co-acting with said printing couples, two feed drums each arranged at every rotation to feed a sheet to alternate carrier sections whereby at each rotation of the two feed drums two separate sheets may be printed in two colors, and means for disconnecting one of said feed drums and exchanging the printing plates or surfaces of said printing couples to effect the four color printing of the sheets as fed by the remaining feed drum.

34. In a printing press adapted to print a number of sheets in four colors and convertible into a press adapted in a like period to print double said number of sheets in two colors, the same comprising printing devices, a sheet carrier therefor, two sheet-feeding drums for the carrier, and shiftable operating means whereby one of said feeding drums may be thrown into and out of operation.

35. In a printing press adapted to print a number of sheets in four colors and convertible into a press adapted in a like period to print double said number of sheets in two colors, the same comprising printing devices, a sheet carrier therefor, two sheet-feeding drums for the carrier, and shiftable operating means whereby one of said feeding drums may be thrown into and out of operation, said shiftable means including a hand-wheel rotatable in opposite directions.

36. In a printing press adapted to print and deliver a number of sheets in four colors and convertible into a press adapted in a like period to print and deliver double said number of sheets in two colors, the same comprising printing devices, a sheet carrier therefor, sheet-feeding drums for the carrier, a delivery device for the printed sheets, and joint shiftable operating means whereby one of said feeding drums may be

thrown into and out of operation and the delivery device correspondingly operatively adjusted.

37. In a printing press adapted to print and deliver a number of sheets in four colors and convertible into a press adapted in a like period to print and deliver double said number of sheets in two colors, the same comprising printing devices, a sheet carrier therefor, sheet-feeding drums for the carrier, a delivery device for the printed sheets, and joint shiftable operating means whereby one of said feeding drums may be thrown into and out of operation and the delivery device correspondingly operatively adjusted, said shiftable means including a hand-wheel rotatable in opposite directions.

38. In a printing press, two rotating printing couples, each having two separate printing surfaces, a sheet carrier therefor having a plurality of sheet-engaging sections, two sheet-feeding mechanisms, each adapted to feed successive sheets to alternate carrier sections, the sheets from one feeding mechanism registering repeatedly with one of the printing surfaces of each couple and the sheets from the other feeding mechanism registering repeatedly with the opposite printing surface of each couple.

39. In a printing press, printing devices, sheet feeding means therefor including a suspended pile feeder disposed in alinement with the printing devices, sheet delivering means including a suspended pile delivery alined with and disposed adjacent said pile feeder, the said delivery being arranged to deliver the sheets with their printed faces upward to said pile delivery, whereby the pile feeder and the pile delivery may be transposed with respect to each other at the end of a run to provide feed and delivery means for printing the opposite side of the sheets.

40. In a printing press, printing devices, sheet feeding means therefor including two suspended feed piles, sheet delivering means including two suspended delivery piles, the said feed and delivery piles being disposed in alinement with one another and with the printing devices and constituting feed and delivery devices for two separate series of sheets, the said delivery means for both series being arranged to deliver the sheets with their printed faces upward to their respective delivery piles, whereby the pile feeder and the pile delivery for each series of sheets may be transposed with respect to each other at the end of their runs to provide feed and delivery means for printing the opposite side of the sheets.

Signed at New York, in the county of New York and State of New York this 18 day of January, A. D. 1923.

BRUCE CLARK WHITE.