

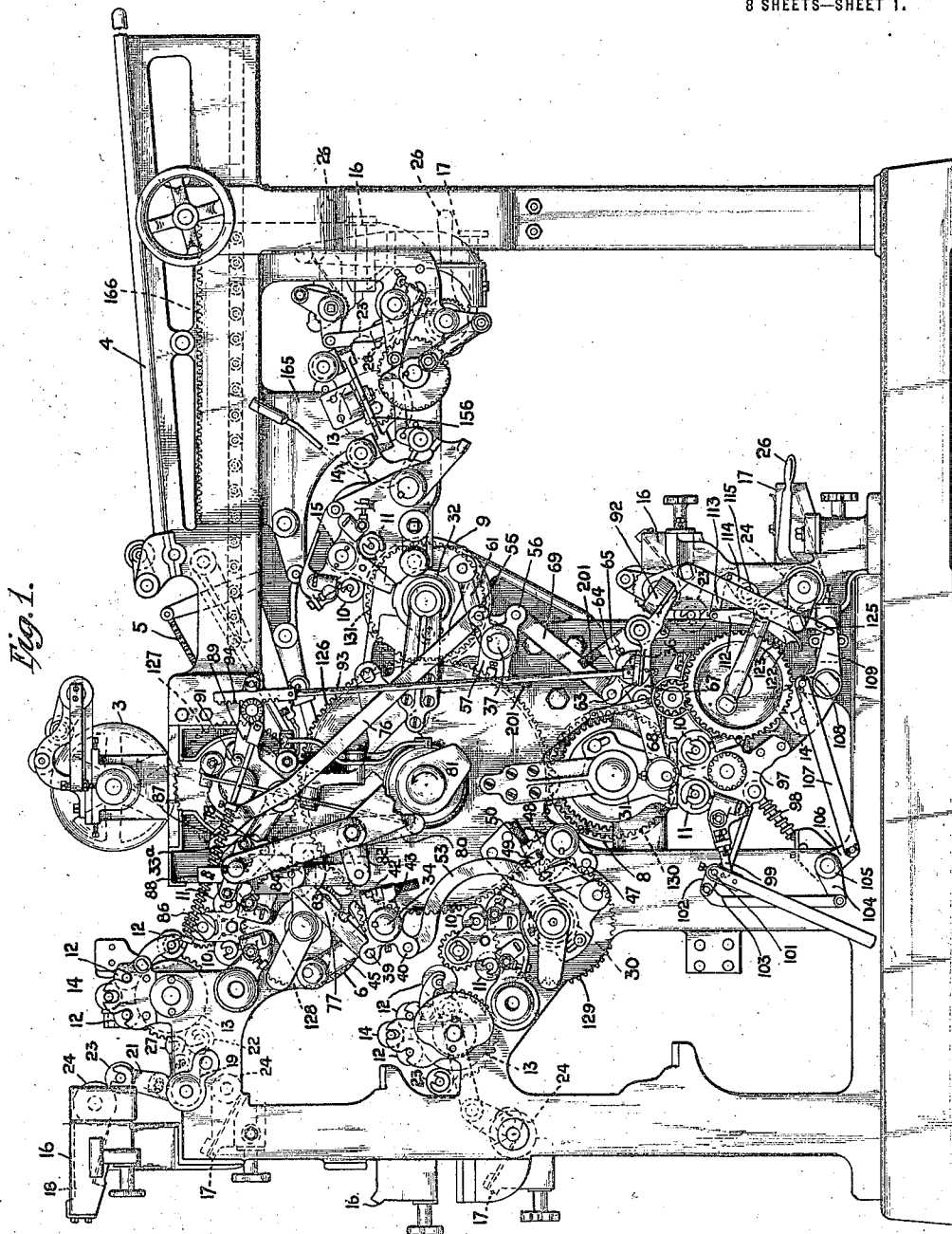
W. L. GREEN.
PRINTING MACHINE.

APPLICATION FILED MAY 18, 1918. RENEWED APR. 18, 1922.

1,436,653.

Patented Nov. 28, 1922.

8 SHEETS—SHEET 1.



WITNESSES.

C. Mitchell

Warren L. Green, INVENTOR

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his ATTORNEY.

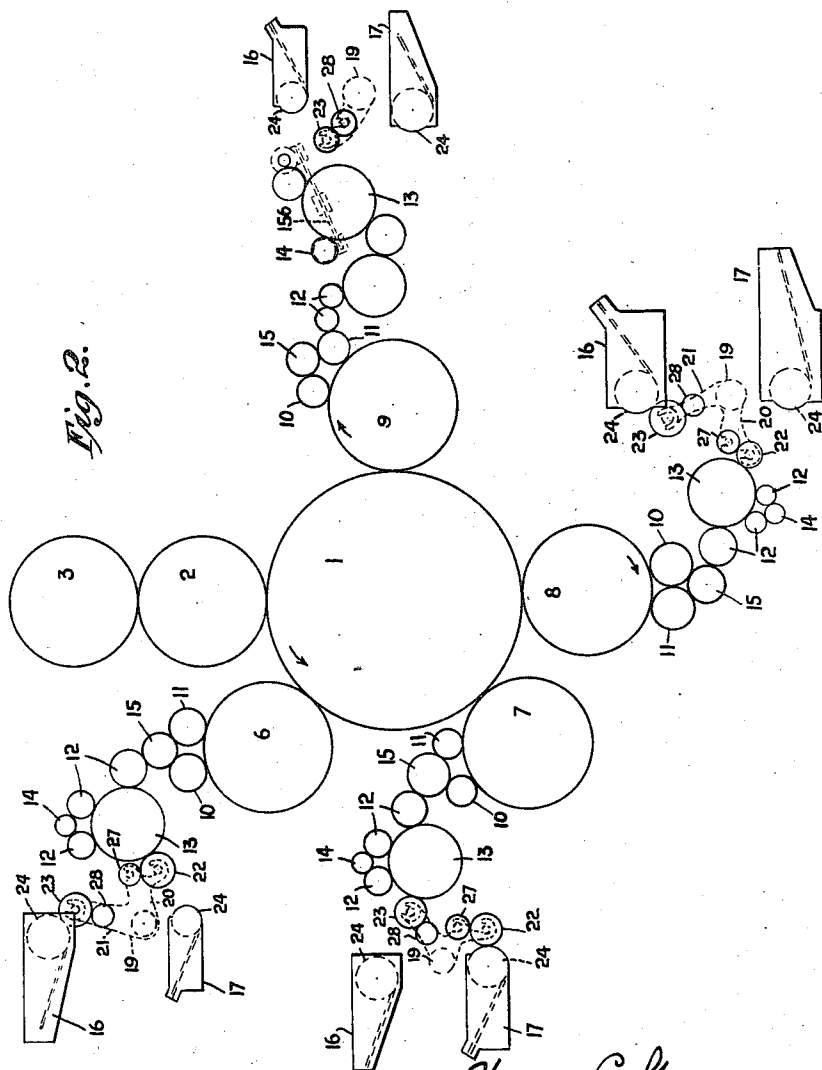
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8 SHEETS—SHEET 2.



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8 SHEETS—SHEET 3.

Fig. 3.

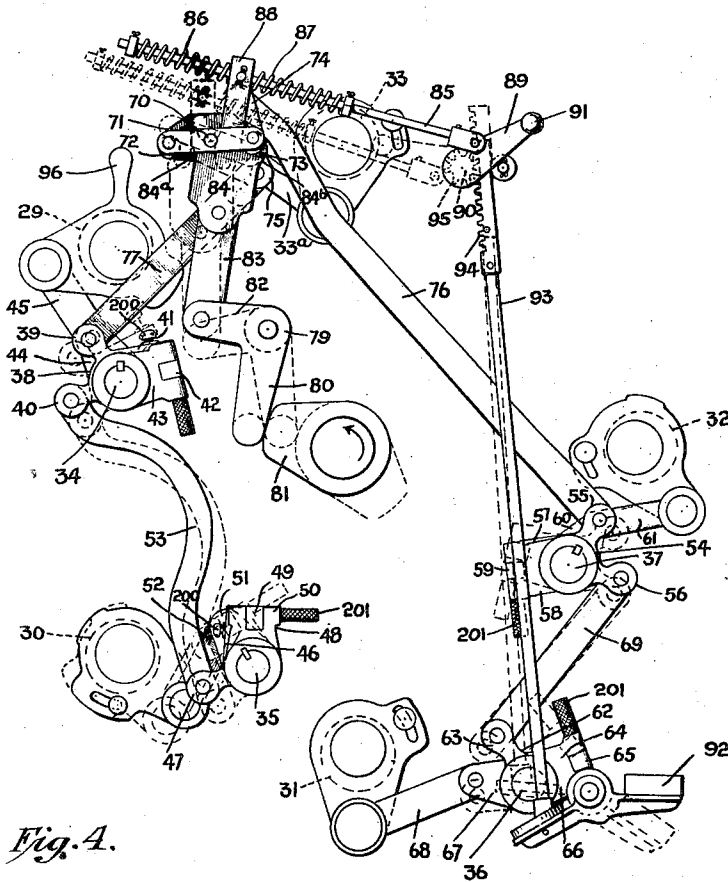
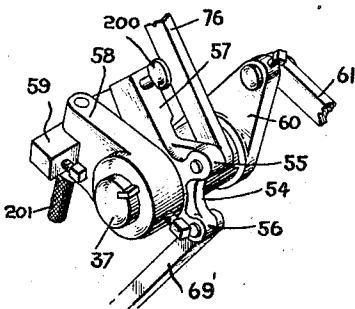


Fig. 4.



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8 SHEETS—SHEET 4.

Fig. 12.

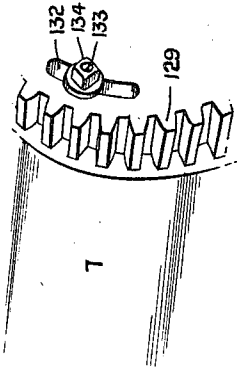


Fig. 5.

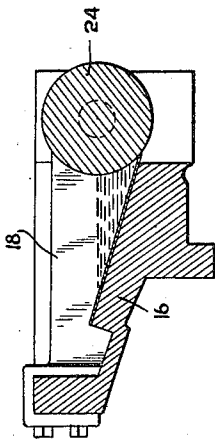
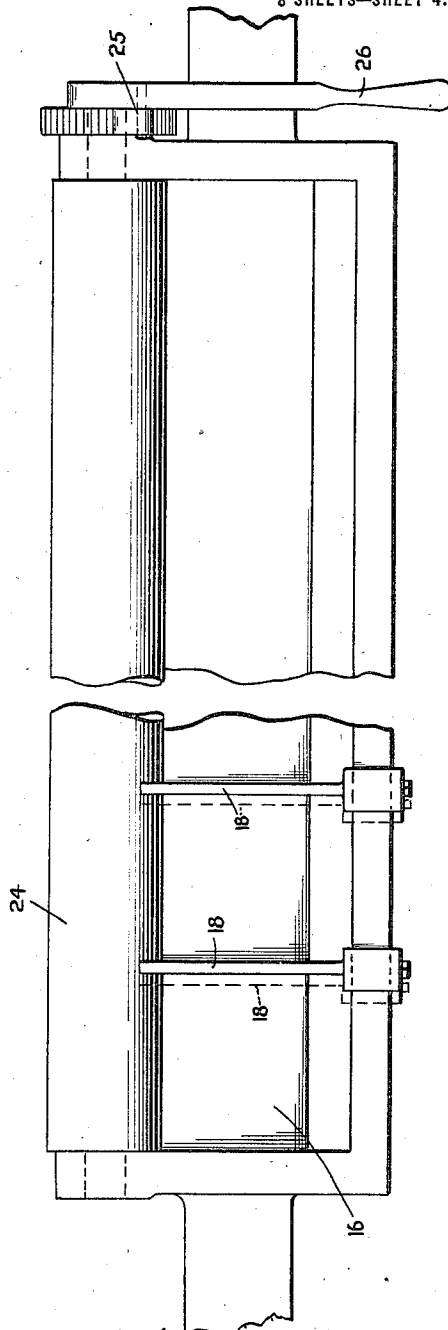


Fig. 6.



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8 SHEETS—SHEET 5.

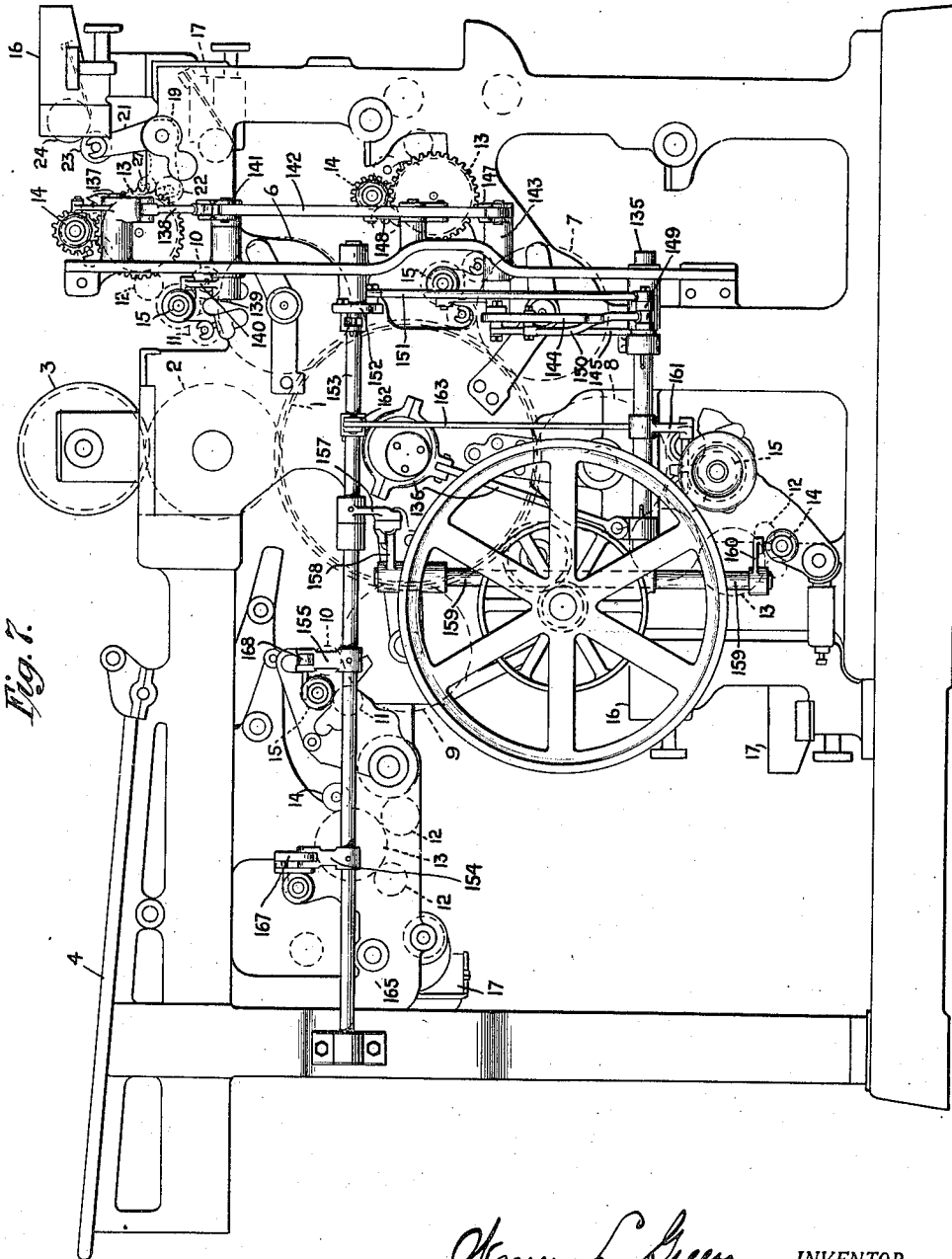


Fig. 7.

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8 SHEETS—SHEET 6.

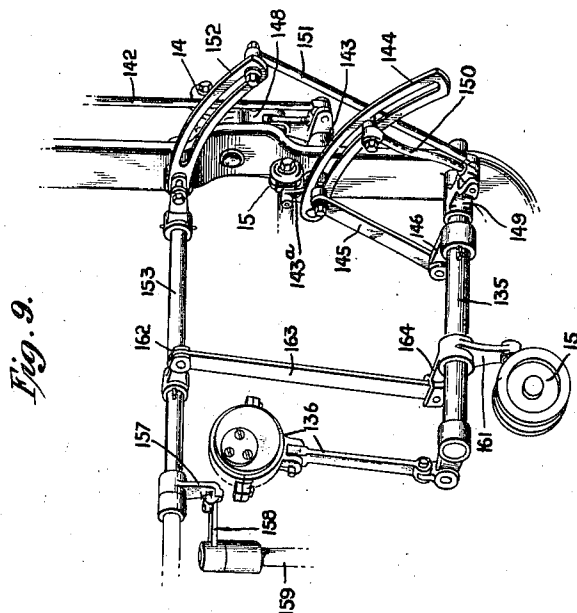
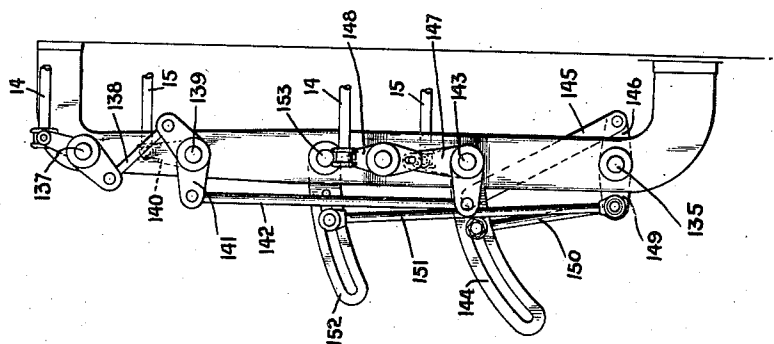


Fig. 9.

Fig. 8.



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8 SHEETS—SHEET 7.

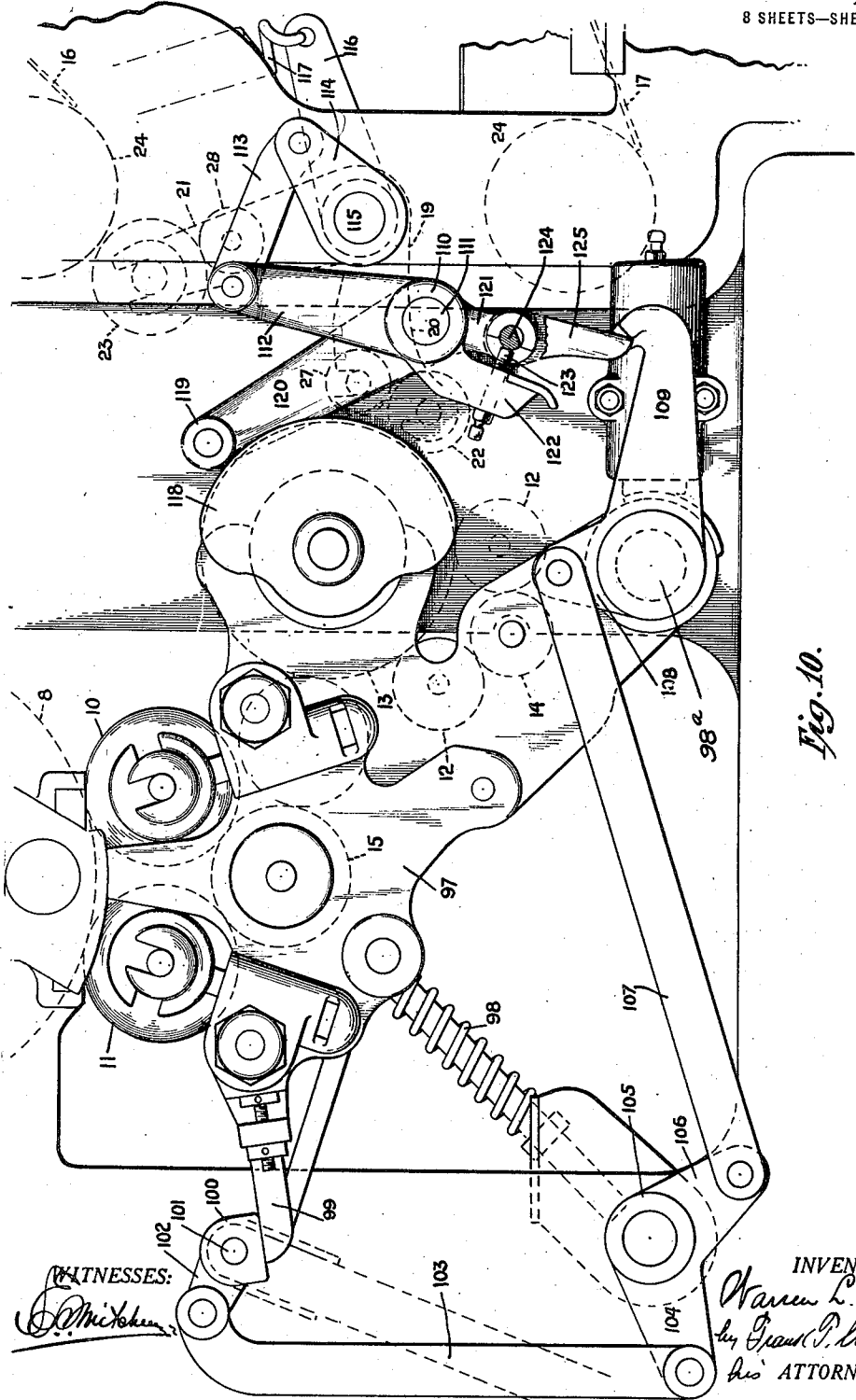


Fig. 10.

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8 SHEETS—SHEET 8.

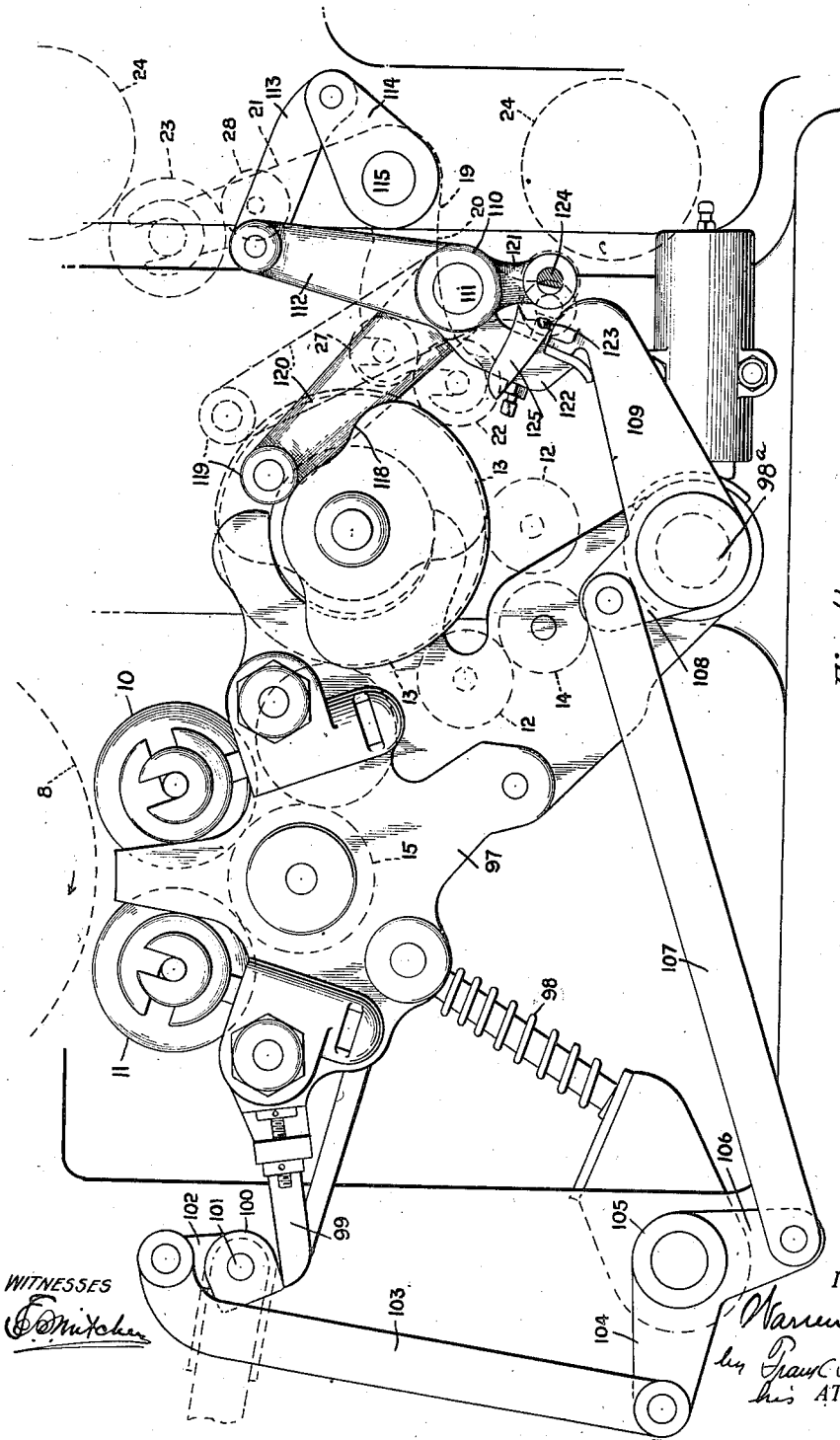


Fig. 11.

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UNITED STATES PATENT OFFICE.

WARREN L. GREEN, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN BANK NOTE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

PRINTING MACHINE.

Application filed May 18, 1918, Serial No. 235,293. Renewed April 18, 1922. Serial No. 555,231.

To all whom it may concern:

Be it known that I, WARREN L. GREEN, a citizen of the United States, residing at the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in Printing Machines, of which the following is a specification, reference being had therein to the accompanying drawings, which form a part thereof.

My invention relates to printing machines, and more particularly to rotary, multicolor presses wherein the various colors are collected upon one cylinder, so as to permit the making of an imprint in a plurality of colors at a single impression.

Heretofore in presses of this general type, as in the form of press patented by me May 21, 1912, No. 1,027,384, it has been the practice to group a plurality of planographic transfer cylinders, each having associated therewith a wetting and an inking mechanism, about a cylinder carrying an ordinary offset blanket. With this type of press, however, it has proven extremely difficult to produce work wherein the portions of a design in one color meet other portions of the design of another color, owing to the tendency of the wet surface of the planographic surface upon succeeding transfer cylinders to spread the ink previously applied to the collecting cylinder, in a manner to blend the colors at the line of demarcation between different colors upon the collecting cylinder, or smudge the inked portions of the design previously transferred to said collecting cylinder.

In a machine made in accordance with my present invention, I am enabled to make an imprint in a plurality of colors at a single impression, and to transfer different portions of the complete design in different colors to the collecting cylinder, preparatory to the making of the impression, with all portions of the design in exact register, and without having the colors of one portion of the design merge into those of another portion of the design, or having a break in the continuity of the design. I also avoid a blending of the colors about the

line of demarcation between portions of the design, and the spreading of the inked portion of the design transferred by one cylinder, or the formation of a smudge by the non-printing portion of the plate upon another cylinder.

The construction of the press is such that a plurality of colors, to an indefinite number, may be applied to the plate upon any design cylinder, thus permitting an imprint to be made in any desired number of colors, the number of transfer cylinders placing no limitation upon the range of colors which may be used.

While a press embodying my invention is so constructed as to avoid the blending of the colors along the line of demarcation of differently colored portions of the design, it is sometimes desirable to have a blended effect in the imprint, and to meet this condition, the press is so constructed as to permit inks of different colors, forming different portions of the design, to be blended to a predetermined, uniform extent in a manner to ensure absolute uniformity in the color effects of all impressions made during a run of the press.

The machine is so constructed that any design cylinder may be withdrawn from, and held out of the operative relation to the collecting cylinder, so as to permit the use of any desired number of design cylinders, according to the needs of any particular run of work.

I also provide a special throw-out mechanism operatively connected with all of the design cylinders, which may be used to simultaneously withdraw all of said cylinders from the operative relation to the collecting cylinder, to prevent excessive inking of said collecting cylinder, or to properly condition the plates upon the design cylinders.

Means may also be provided whereby the inking rolls associated with each design cylinder, may be thrown out of the operative relation to their cylinder, and the doctor roll will, simultaneously with the movement of the inking rolls, be held out of the operative relation to the distributing rolls, thus

preventing the accumulation of ink, in excess of that required, upon said distributing and said inking rolls.

When the blending of inks is required, or when such blending is not required, I have experienced difficulty in securing the proper cutting of the ink, to meet which condition I so construct the doctor roll mechanism as to secure an adequate cutting of the ink without such vibratory movement as would tend to blend inks of different colors.

Machines made in accordance with my invention possess other desirable and novel characteristics, which will more fully appear hereinafter.

The invention consists in the novel features of construction and combination of parts hereinafter set forth and described, and more particularly pointed out in the claims hereto appended.

Referring to the drawings:—

Fig. 1 is a side view of a printing machine embodying my invention;

Fig. 2 is a diagrammatical view showing the printing couple, the collecting mechanism, and the various design cylinders, and their associating inking mechanisms;

Fig. 3 is a detailed view of the throw-out mechanism;

Fig. 4 is a detailed view of the coupling mechanism whereby any design cylinder may be maintained out of the operative relation to the collecting cylinder;

Fig. 5 is a transverse section of one of the ink founts;

Fig. 6 is a plan view of one of said founts, showing its associated fount in dotted lines;

Fig. 7 is a view of the other side of the machine showing the blending mechanism;

Fig. 8 is an end view of said mechanism as seen from the right of Fig. 7;

Fig. 9 is a perspective view of a portion of said mechanism as seen from the left of Fig. 7;

Fig. 10 is a detailed view of the inking mechanism associated with one of the design cylinders, the inking rolls being shown in the operative relation to the plate upon said cylinder and the doctor roll mechanism operative;

Fig. 11 is a similar view with the inking rolls out of the operative relation to the design cylinder and the doctor roll mechanism inoperative; and

Fig. 12 is an end view of the registering mechanism for one of the design cylinders.

Like numerals refer to like parts throughout the several views.

In the embodiment of my invention shown in the accompanying drawings, I employ a printing couple consisting of a collecting cylinder 1, provided with the usual rubber blanket or other offset printing surface, and having associated therewith an impression cylinder 2, and a delivery cylinder 3.

The sheets of paper are fed from the feed shelf 4 by means of an ordinary feeding mechanism, a portion of which is shown at 5.

Grouped about the cylinder 1, are a plurality of design cylinders, four of said cylinders, 6, 7, 8 and 9, being used in the machine shown in the drawings. Each of these cylinders 6, 7, 8 and 9 is adapted to have a printing plate mounted thereon, each plate bearing only a portion of the design to be printed, the aggregate of the designs upon the several printing plates constituting the complete design.

To ensure the transfer of the portion of the design upon each plate to the blanket upon the cylinder 1, without interference with the design transferred by a preceding plate or plates to the said cylinder, by the non-printing portion of succeeding plates, each of the plates upon the cylinders 6, 7, 8 and 9 bears its portion of the full design, in relief. The necessity for a damping mechanism associated with each design cylinder is thus dispensed with, and an undesired blending of the inks of different colors at their line of demarcation upon said cylinder 1, as the result of wear upon the printing plate, or pressure from the uninked portion thereof upon a previously inked portion of the flexible offset blanket, is avoided. While I have shown four design cylinders, any desired number may be employed, the variation in the number of said cylinders being merely a matter of design in the press.

Associated with each of the cylinders 6, 7, 8 and 9, is an inking mechanism, consisting of an ink fount or founts and distributing rolls, doctors rolls adapted to apply ink from said fount to said distributing rolls, and inking rolls adapted to receive ink from said distributing rolls and apply it to the plate upon the design cylinders. It is desired to note that no wetting mechanism is required in a press embodying the essential characteristics of my invention. The essential of all these mechanisms is the same, although the arrangement of the various rolls may differ according to the requirements presented in different types of machines. In the accompanying drawings, three different arrangements of the rolls of these inking mechanisms is shown, although it is not my intention to limit myself to the use of different arrangements, or of any particular arrangement, of rolls. Since the essentials of all these inking mechanisms is the same, a description of but one of them will be entered into, the corresponding parts of the other mechanisms being indicated by similar reference numerals.

The inking mechanism associated with each design cylinder, comprises inking rolls 10 and 11 adapted to apply ink to the printing surface of the plate upon its cylinder, said inking rolls having associated there-

with a plurality of composition distributing rolls 12, co-operating with a metallic distributing roll 13, receiving the ink from the doctor roll; and vibrator rolls 14 and 15, one of which bears directly upon the inking rolls 10 and 11, and the other of which acts upon one or more of the ink distributing rolls. The vibrator rolls 14 and 15, as will more fully appear hereinafter, may be utilized to mix the inks in a manner to secure a blended effect upon the imprint at the line of demarcation between differently colored portions of the design. When a blended effect is not desired in the output, said rolls 14 and 15 act merely as distributing rolls, and have no vibratory movement, unless only one color is being applied to the plate on the design cylinder.

Mounted adjacent each distributing roll 13 is a plurality of ink founts 16 and 17, said founts being of the usual construction, but capable of being divided into a plurality of compartments by means of one or more adjustable partitions 18, when it is desired to ink the plate upon a design cylinder with inks of different colors. The number of colors with which a plate may be inked is limited only by the requirements of a particular run of work. I employ two ink founts, because with a single fount it would be impossible to bring the edges of the inks of different colors together upon the distributing and inking rolls, by reason of the width of the partitions 18. With two founts, however, by staggering said partitions in one fount with the partitions in the associated fount, and by filling only the alternate compartments of each fount, ink of one color may be applied to a part of the distributing and inking rolls, with one or both edges in exact alinement with ink of a different color applied to the adjoining portion of said rolls.

Mounted intermediate the founts 16 and 17, is an oscillatory frame 19 having divergent arms 20 and 21, each carrying a doctor roll, 22—23, said doctor rolls being adapted to alternately engage a distributing roll as 13. By this construction the ink from both founts 16 and 17 will be applied to the distributing roll 13 in a manner usually employed. The doctor rolls 22 and 23 engage the feed roll 24 carried by each ink fount. This feed roll is intermittently turned by the pawl and ratchet mechanism 25, actuated by the crank and lever mechanism 26.

Associated with each of the doctor rolls 22 and 23 and bearing constantly thereon, is a roll 27—28, the function of which is to cut the ink while it is upon the doctor roll and before it is applied to the distributing rolls.

Each of the design cylinders 6, 7, 8 and 9 is so mounted as to be capable of move-

ment toward and from the collecting cylinder 1, to bring the plates upon said cylinder into, or out of, engagement with the blanket upon said collecting cylinder, the usual manner of mounting said cylinders being in eccentric bushings. The impression cylinder 2 is similarly mounted with relation to said collecting cylinder. The various eccentric bushings which are old and well known in this art, and not therefore shown in detail, each carry a crank arm, the crank arms upon the bushings for the cylinders 6, 7, 8 and 9 being indicated respectively at 29, 30, 31 and 32, and the crank arm for the bushing of the impression cylinder 2 being indicated at 33. The various bushings 29, 30, 31 and 32 are connected by a crank and link system, by means of which the turning of any of these bushings will simultaneously actuate the bushings of all design cylinders which are in use. This crank and link system includes a crank associated with each design cylinder, means being provided whereby this crank may, or may not, at the option of the pressman be made operative as to its cylinder. In this manner any number of design cylinders may be used in running the press, the remaining cylinders being brought and maintained out of the operative relation to the collecting cylinder, in a position when it or they will not be affected by the functionings of the machine in relation to the other design cylinders which are in the operative relation.

The crank and lever system above referred to is so constructed as to be either manually, or power, actuated, and it may be used during the make-ready to bring the proper number of design cylinders into operation, or while the press is running, to throw the design cylinders, which are operative, away from the collecting cylinder simultaneously with the separation of the impression cylinder and said collecting cylinder. To secure the last named result, said crank and lever system is connected with the crank arm 33 by the link 33^a.

The detailed mechanism for accomplishing the above results comprises oscillatory shafts 34, 35, 36 and 37 mounted respectively adjacent the cylinders 6, 7, 8 and 9. Idly mounted upon the shaft 34 is a fitting 38 having crank arms 39 and 40 and a forked projection 41, adapted to receive a pivotal coupling link 42, carried by a forked crank arm 43 keyed to the shaft 34. The shaft 34 also has thereon a crank arm 44 connected by a link 45 with the crank arm 29, carried by the eccentric bushing for the design cylinder 6. The shaft 35 has idly mounted thereon a fitting 46 having a crank arm 47 thereon and a crank arm 48 similar to crank arm 41, and connected by means of the lock lever 49 with a crank arm 50 keyed to said shaft 35. Said shaft also carries a crank

arm 51 connected by means of the link 52 with the eccentric bushing 30 for the design cylinder 7. The crank arms 40 and 47 are connected by means of a lever 53 in a manner to cause the fittings 38 and 46 to move in unison. The shaft 37 has idly mounted thereon a fitting 54 similar to the fitting 38 and having the crank arms 55, 56 and 57, the shaft 37 having keyed thereto a crank arm 58 connected with the arm 57 by means of the coupling link 59, and a crank arm 60 connected with the crank arm 32 of the bushing of the cylinder 8, by means of the link 61. The shaft 36 has idly mounted thereon, a fitting 62 similar to the fitting 46 and having the crank arms 63 and 64, the latter of which is adapted to be connected by the coupling link 65 with a crank arm 66 keyed to the shaft 36. Said shaft carries a crank arm 67, connected by means of the link 68 with the crank arm 31 of the bushing for the cylinder 7. The crank arms 56 and 63 are connected by the link 69 so as to cause the fittings 54 and 62 to always move in unison. The various coupling links 42, 49, 59 and 65 are connected with their co-operating forked crank arms by means of set screws as 200, and the adjustable pivot screw 201, by means of which the said links are held against movement when disconnected from their associated idler fitting.

Mounted upon a shaft 70 adjacent the impression cylinder 2, is a rocking plate 71 having adjacent the opposite ends thereof impact rolls 72 and 73, and carrying projections 74 and 75, the former of which is connected by the link 76 with the crank arm 55, and the latter of which is connected by the link 77 with the crank arm 39. The shaft 70, upon which the plate 71 is keyed, or otherwise secured, is provided with a crank arm 78, connected with the crank arm 33 of the eccentric bushing for the impression cylinder 2, by the link 33^a, in a manner to cause the impression cylinder to have movement toward or away from the collecting cylinder simultaneously with the corresponding movement of the various design transfer cylinders. Adjacent the shaft of the collecting cylinder is a bell crank lever 79, one arm 80 of which is acted upon by a cam 81 upon the shaft of said collecting cylinder, and the other arm 82 of which is connected by the link 83 with a thrust member 84, having oppositely disposed shoulders 84^a—84^b, adapted to be brought into the operative relation to either of the rolls 72 and 73 by a pivotal movement of said thrust member, to impart the desired actuating movement of the plate 71. The thrust member 84 is actuated by a rod 85 carrying opposed springs 88 and 87 bearing upon opposite sides of the extension 88 of the thrust member 84, and connected with a crank arm 89 mounted upon the shaft 90, said crank arm 89 having an operating han-

dle 91 and being connected with a foot lever 92 by a rod 93, carrying a rack 94 meshing with a pinion 95 upon said shaft 90. By this construction the position of the thrust member 84 may be varied with relation to the plate 71 by hand actuation of the pinion 95, or by the actuation of the foot lever 92. When said plate is so actuated, the power applied to the collecting cylinder is utilized for shifting the various design cylinders and the impression cylinder. To permit the natural shifting of these cylinders, I provide the crank arms of one of the eccentric bushings, as 29, with an operating handle 96.

By the crank and link system above described, all of the design cylinders which are operated in relation to the collecting cylinder, and the impression cylinder, may be simultaneously and instantly thrown out of the operative relation to said collecting cylinder, so as to prevent the transfer of the design to the collecting cylinder when an impression is not to be made, and to prevent offsetting upon the impression cylinder. This may be accomplished without stopping the press, thus permitting the design cylinders to be operated in relation to their inking mechanisms to properly condition the plates thereon prior to the initiation of a run. This mechanism may also be used in the event that a sheet is not fed to the press during a run thereof. While the crank and link mechanism operates as a unit, the mechanism described permits the selective use of different design cylinders, since means are provided whereby any of said design cylinders may be connected with, or disconnected from, said link and lever system at will.

The various inking and distributing rolls associated with each design cylinder, are mounted in a pivotal frame, adapted to have movement in synchronism with the movements of the design cylinder toward, or from, the collecting cylinder 1.

In Figs. 10 and 11, I have shown detailed views of this mechanism, and in connection therewith have illustrated means whereby said inking and distributing rolls, in addition to having movement with their design cylinder, may have movement independently thereof, to discontinue the inking of the plate upon the design cylinder. I have also shown means whereby simultaneously with the withdrawal of the inking rolls from engagement with the plate upon the design cylinder, the doctor rolls will be made inoperative as to the distributing rolls, so as to prevent the accumulation of ink upon the inking rolls during that interval when the plate is not being inked. In Fig. 1 of the drawings, I have shown this mechanism applied to only the inking mechanism for the design cylinders 8 and 9, it being under-

stood, however, that the same mechanism may be applied to the other design cylinders.

The frame carrying the inking and distributing rolls is indicated at 97, this frame being pivoted upon the shaft 98^a. In the lowermost inking mechanism, shown in detail in Figs. 10 and 11, it is necessary to apply the ink to the plates at the bottom of the cylinder 8, and some means normally holding the inking rolls 10 and 11 in engagement with said plate, is, therefore, necessary. Where the position of the design cylinder, however, is such as to permit the ink to be applied adjacent the top of the cylinder, gravity may be relied upon to maintain the engagement between the inking rolls and the plate.

In the inking mechanism shown in Figs. 10 and 11, the frame 97 is forced toward the design cylinder 8 by the spring 98, the movement of said frame to withdraw the inking rolls from engagement with the plate, being against the tension of said spring. Hence this spring will serve to raise the frame 97 when it is desired to bring the inking rolls into engagement with the plate. Carried by the frame 97 is a projection 99 with which the cam 100 co-operates, the rotation of this cam forcing the frame 97 downwardly or permitting the frame to be raised by the spring 98 according to the direction of the rotation of the cam. The shaft 101 upon which the cam 100 is mounted and with which it turns, has mounted thereon a crank arm 102 connected by means of the link 103 with one arm 104 of a bell crank lever 105, the other arm, 106, of which, is connected by the link 107 with a crank arm 108 connected with and adapted to impart movement to the top arm 109 to arrest or permit oscillatory movement of the frame 19 carrying the doctor rolls, simultaneously with the withdrawal or advance of the inking rolls from, or to their operative relation with the plate upon the design cylinder.

The frame 19 is actuated by means of a lever 110, loosely mounted upon the shaft 111, the long arm 112 of this lever being connected by the link 113 with a crank 114 keyed, or otherwise secured to the shaft 115 carrying the frame 19. Said shaft 115 also has a crank arm 116 acted upon by a spring 117, adapted to oscillate the frame 19 in one direction.

Carried by and rotatable with the roll 13 is a cam 118 against which the wheel 119 carried by the lever 120 is adapted to bear. The heel 121 of the lever 120 is adapted to operatively engage the short arm 122 of the lever 110, and thus impart oscillatory movement to the frame 19 against the tension of the spring 117.

To permit the adjustment of the doctor

rolls with relation to the roll 13, I provide the arm 122 with an adjustable impact member 123 adapted to engage the swivel 124 mounted in the heel 121 of the lever 120, one side of which swivel is flattened as shown. This swivel carries an actuating arm 125 adapted to be engaged by the stop arm 109, for the purpose of imparting a partial revolution to the swivel 124, when said arm is actuated to arrest or permit movement of the doctor roll. By the construction above described, the frame 19 carrying the doctor rolls 22—23, receives movement in one direction through an actuating mechanism deriving its power from one source, and in the other direction through an actuating mechanism deriving its power from another source, said mechanisms being normally engaged one with the other, means being provided whereby both the said mechanisms may be simultaneously made in-operative as to each other and as to the said oscillatory frame, to prevent the actuation of the doctor roll frame. The flattened portion of the swivel 124 affords clearance whereby when the stop lever 109 is positioned in the normal path of movement of the lever arm 122, said arm is permitted such movement as will bring the doctor roll 23 out of engagement with the roll 24 of the inking fount 16, and the doctor roll 22, out of engagement with the distributing roll 13, in a manner which will more fully appear hereinafter.

The collecting roll 1, the impression roll 2 and the various design cylinders 6, 7, 8 and 9 are driven in unison by a planetary gear system including the gears 126, 127, 128, 129, 130 and 131. To permit the different portions of the design carried by the design cylinders 6, 7, 8 and 9 respectively to be brought into accurate register, these cylinders are adjustably mounted in relation to their respective gears, as shown in Fig. 12 of the drawings, in which one of the transfer cylinder gears as 129, is shown as having a segmental slot 132, through which a stud 133 carried by the transfer cylinder 7 projects, said stud carrying a lock nut 134, by means of which the cylinder may be set in any adjusted relation to said gear.

While I contemplate a structure wherein the different colors entering into the imprint of the completed design may have a sharp line of demarcation between them and yet be in perfect register, so as to form a complete, continuous design without interruption of the lines, nevertheless I provide means whereby, if desired, the inks adjacent this line of demarcation may be blended to a predetermined extent, the manner of blending the inks being such as to secure uniformity, and substantially the same color effects, in all imprints made. To secure this blending effect, I provide means whereby inks of different colors, after being deposited by a doc-

tor roll or rolls, upon a distributing roll, will, adjacent the line of demarcation between the different colors, be mixed upon the distributing rolls before being applied to the plates upon the transfer cylinder. To secure this result, I use vibrator rolls co-operating with the distributing rolls, and provide means whereby the axial movement of these rolls may be controlled and varied, so as to determine the width of the area in which the inks will be mixed to secure the desired blended effect in the imprint. I find that it is desirable to use a vibrator roll acting in conjunction with the inking rolls in addition to the vibrator roll acting in conjunction with the distributing rolls, as by twice working the ink when mixing it, more uniform results are secured.

I have heretofore described the relation of the blending rolls to other rolls of the inking mechanism, and will now describe the actuating means for these blending rolls and the mechanism by which the width of the blended portions of the design, may be varied and controlled.

Mounted at one side of the machine, is a rock shaft 135 which is continuously oscillated by the eccentric strap and link mechanism 136. Acted upon by the shaft 135 is a transmission system operatively connected with the various vibrator rolls associated with the several design cylinders 6, 7, 8 and 9. This transmission mechanism is so constructed as to permit a differential movement to the vibrator rolls associated with the several design cylinders, adjustable means controlling the oscillatory movement of the crank shafts connected with said vibrator rolls being provided. Mounted adjacent the roll 14, associated with the design cylinder 6, is a crank shaft 137, one arm of which carries a stud engaging a grooved wheel upon the shaft of said roll, and the other arm of which is connected by the link 138 with a crank shaft 139, having an arm 140 connected with the vibrator roll 15, and another arm 141 connected by the link 142 with a crank shaft 143, receiving movement from the shaft 135 through a slotted segment 144, connected by a link 145 with an arm 146, carried by said shaft 135. Said link 145 is adjustable in the slot of the segment 144 to vary the oscillatory movement of the crank shaft 143 with a constant movement of the arm 146. The shaft 143 has two arms, one of which, 143^a, operatively engages a grooved wheel carried by the shaft of the roll 15 associated with the transfer cylinder 7, and the other of which, 147, engages one arm of a rocking lever 148, the other arm of which lever engages a grooved wheel carried by the vibrator roll 14 associated with said design cylinder.

Idly mounted upon the shaft 135 is a fitting 149, connected by a link 150 with the

segment 144, this link being adjustable in the length of said segment. Extending from said fitting 149 is a second link 151, adjustably connected with a segment 152, carried by a rock shaft 153. This rock shaft has mounted thereon two crank arms, 154 and 155, the first of which is operatively connected with a grooved wheel, the shaft of which is connected with one arm of a lever 156, the other arm of which lever is connected to a grooved wheel carried by the vibrator roll 14, associated with the design cylinder 9. The arm 155 is operatively connected with a grooved wheel carried by the vibrator roll 15, associated with said design cylinder.

The shaft 153 also carries a crank arm 157 pivotally connected with a crank arm 158 carried by a vertical rock shaft 159, having an arm 160 operatively connected with a grooved wheel carried by the vibrator roll 14, associated with the design cylinder 8. The shaft 135 carries a crank arm 161 operatively engaging a grooved wheel carried by the vibrator roll 15, associated with the design cylinder 8. With this construction the arm 161 will always impart movement to the roll 15 which it engages, so that a blended effect could not be secured in the portion of the design carried by the plate upon the cylinder 8. To avoid this condition, if desired, the arm 161 may be actuated from the shaft 153 by means of a crank arm 162 upon said shaft and a link 163, connecting said crank arm with an arm 164, carried by the crank arm 161, said crank arm 161 being idly upon the shaft 135.

The ink founts, the doctor rolls, the distributing and inking rolls co-operating with the cylinder 9, are mounted upon a carriage 165 movable toward and from the collecting cylinder by the rack and gear mechanism 166 (see Fig. 1), the hooks 167 and 168 being employed to permit the disengagement of the arms 154 and 155 from the vibrator rolls actuated thereby to permit this movement of the carriage 165. This movement of the carriage 165 is to facilitate the make-ready of the press by permitting ready access to the transfer cylinder 9.

In Fig. 1 of the drawings, I have shown a mechanism for throwing the inking and doctor rolls out of operation, associated with the design cylinder 9, which mechanism is similar to that shown associated with the cylinder 8, but differs therefrom in minor details necessary in the adaptation of this mechanism to the detailed construction of the particular inking mechanism. Similar mechanisms associated with the cylinders 6 and 7 are not illustrated in order to avoid undue complexity in the drawing.

I have not included in the description various details of construction of mechanisms which were either old or well known in the

art, or are merely matters relating to the design of a machine embodying the invention, capable of wide variation according to the general layout of the machine, since these matters come within the province of the skilled machine designer.

The operation of the herein described machine is substantially as follows:—

Each of the design cylinders 6, 7, 8 and 9 to be used in applying the complete ink design to the collecting cylinder 1, has mounted thereon a printing plate, or sheet, bearing only a portion of the design to be printed. The design upon each printing plate is in relief, an acid etched plate having a shallow etch, having been found suitable, since it is merely necessary to have the inked portions of these plates raised sufficiently from the uninked portions, to avoid the exertion of such pressure upon the rubber, or other offset surface upon the cylinder 1, as will spread, or smudge, ink previously applied to said surface, or pick up such ink from said surface in a manner to result in an imperfect imprint. In this manner the cylinders 6, 7, 8 and 9 or any grouping of these cylinders which may be desired with a particular run of work, may be used to successively transfer different portions of the design in inks of distinctive colors upon the cylinder 1, so that when the completed design in ink upon the blanket upon said cylinder 1, reaches the printing position with relation to the impression cylinder 2, an imprint bearing the complete design in a plurality of colors may be made at a single impression.

To secure the desired degree of perfection of work, it is essential that the portion of the design upon the plate on each of the cylinders 6, 7, 8 or 9, be in absolute register with the portions of the design upon the other cylinders, this register in the form of the invention shown, being secured by means of the circumferential movement of each cylinder, 6, 7, 8 or 9, with relation to its driving gear, which is permitted by the slot and stud connection 132—133—134 between each cylinder and its gear. It is apparent, however, that other mechanisms for securing register may be employed.

While the length of the design is limited by the diameter of the design cylinders, by having the collecting cylinder of relatively greater diameter than said design cylinders, the blanket upon said collecting cylinder may be inked a plurality of times with each rotation of the printing couple, thus avoiding a double inking of the plates upon the design cylinders.

While the press is in operation, each of the frames 19 is oscillated, the doctor rolls 22 and 23, respectively, being brought into engagement with the ink roll 24 of its founts 16 or 17, and into engagement with

the distributing roll 13, thus alternately applying ink from said founts 16 and 17 to said distributing roll. The ink applied to this roll is worked by the various distributing rolls 12 and vibrator rolls 14 and 15, before being applied to the inking rolls 10 and 11, preparatory to the inking of the plate by said inking rolls. When separated portions of the plate are to be inked, or when only a single color is to be used, the vibrator rolls 14 and 15 may be actuated to secure a better working of the ink, but when the colors used have their edges joined, and it is not desired to blend the inks of these colors in the imprint, or upon the inking rolls, the transmission mechanism actuating the vibrator rolls is so set as to avoid movement of said rolls. The rolls 27 and 28 associated with the doctor rolls 22 and 23 are provided to cut the ink while it is on the doctor roll and before application to the roll 13, to ensure an adequate working of the ink when the vibrator rolls are stationary.

By the use of a cameo printing plate, or a printing plate bearing the design in relief, I not only avoid interference with the previously inked portions of the ink design upon the blanket carried by the cylinder 1, but am also enabled to dispense with the wetting mechanism used in connection with the press described in my Letters Patent above referred to.

While, if desired, a press made in accordance with my invention may be used so that each design cylinder has applied there-to ink of only one color, nevertheless I may multiply the number of colors used with each design cylinder indefinitely by providing the ink founts with partitions 18 in any desired number, said partitions defining the width of the inked area of the roll 24. These partitions 18 must, however, be arranged to harmonize with the color scheme of the plate upon the design cylinder. The colors applied to the roll 24 of each fount, however, and transferred therefrom to the distributing rolls by the doctor roll, would of necessity be separated by a well defined uninked line of a width coinciding with that of the partition. By using two founts, however, and applying the ink therefrom to the distributing rolls in the manner described, I am enabled, by staggering the partitions 18 of one fount 16, with relation to those of the other fount 17, and filling only the alternate compartments of said founts with ink, to bring the edge of the inked portion of one doctor roll into exact alinement with the edge of the inked portion of the other doctor roll, or into exact register, so as to have the edge of the ink of one color applied to the roll 13, coincide with the edge of the ink of the other and adjoining color, or colors. In this manner the plate upon any design

cylinder may, if desired, be continuously inked from side to side thereof, there being a sharp line of demarcation between the different colors, but no uninked portion at this point. Of course it is understood that only a fragmentary portion of the design need be applied to any plate, and that the portion of the design where the edges of the colors meet need not be great. Since the same arrangement of founts is used with each of the design cylinders, it is apparent that the number of colors which may be used may be multiplied indefinitely to meet the requirements of a great range of work.

It is apparent that with the different colors joining in the manner above described, the use of vibrator rolls in connection with the distributing and inking rolls, is not possible, unless a blending of the inks is desired.

When operating a press, it is sometimes necessary to separate the collecting cylinder and the impression cylinder to prevent offsetting upon the impression cylinder. It is also desirable to separate the design cylinders from the collecting cylinder to prevent piling of ink upon said collecting cylinder when an impression is not being made, or to properly condition the plates upon the design cylinder during the make-ready. To meet this condition, I provide the throw-out mechanism described, by means of which the various design cylinders can be separated from the collecting cylinder simultaneously with the movement of the impression cylinder out of engagement with said collecting cylinder, this mechanism being so constructed as to be timed with the operative interval of the printing couple and to be capable of being actuated from the shaft of the collecting cylinder. The bell crank lever 80 receives one complete oscillation from the cam 81 during each full rotation of the collecting cylinder 1, and imparts one direct and return reciprocation of the link 83 and the thrust member 84, carried thereby. Assuming that the parts are in the position shown in Fig. 3, the printing couple will be in the inoperative relation to each other and the reciprocation of the thrust member 84 will have no operative effect upon the rocking plate 71. When it is desired to bring the impression cylinder and the various design cylinders into the operative relation to the collecting cylinder, it is merely necessary to actuate the pinion 95 by means of the hand crank 91 or the foot lever 92, thus thrusting the rod 85 toward said plate 84, the spring 87 being tensioned by this movement of said rod in the event that the plate 84 be in a position where the side thereof will engage the roll 72. By this means the rod 85 may be actuated at any point of the rotation of the collecting cylinder, and the thrust member 84 will become operative with relation to the plate 70 only at a certain definite point of the rotation of said cylinder. As the thrust member 84 descends and the side thereof clears the roll 72, the spring 87 will rock said thrust member so that one of the shoulders 84^a thereon will pass beneath the roll 72, and upon the next upward reciprocation of said thrust member, impart the desired oscillatory movement to the plate 71. With this movement of said plate, the eccentric bushing will be turned by the link and crank connection 33, between said bushing and said shaft, and simultaneously with this movement, the various cranks 29, 30, 31 and 32, upon the various design cylinder bushings, will be turned by the power applied through the links 45, 53, 76 and 69, and the crank connections between them and said bushing cranks. If it be desired to move the impression cylinder and the various design cylinders out of the operative relation to the collecting cylinder, the hand crank 91 or foot lever 92 will be actuated in the opposite direction, thus tensioning the spring 86 and bringing the other shoulder 84^b upon the thrust member 84 into engagement with the roll 73, and turning the plate 71 in the opposite direction with a resultant reversal of the operation above described.

With some work the use of some of the design cylinders is unnecessary, and the throw-out mechanism above described is so constructed as to be capable of being disconnected from any eccentric bushing crank, without varying its operative relation to the others, and thus permit that design cylinder from which it is disconnected to remain out of the operative relation, when the other cylinders are restored to this relation. In Fig. 4, I have shown a perspective view of the coupling means between the link and crank system of the throw-out mechanism, and the means transmitting power therefrom to the eccentric bushing for actuating a design cylinder. If it be desired to permanently cut out any design cylinder, it is merely necessary when all of the cylinders are in the operative relation, to disconnect the coupling link as 59, from the forked crank arm as 57, and swing this member 59 from between the arm of said forked crank, so that the fitting as 54 thereafter will rock idly upon the shaft 39 and will impart no movement thereto. If it be desired, however, to use a design cylinder which has thus been permanently thrown out of the operative relation, it is merely necessary to actuate the link and crank mechanism to throw out all of the gears, which will bring the forked crank arm, as 57, in a relation to the crank arm 58, where the coupling link 59 may be inserted between the arms of said forked crank arm and locked in this position, so that upon a subsequent actua-

tion of this mechanism, the arm 58 will move in unison with the arm 57 and thus actuate the crank arm 60, to transmit power through the link 61 to the bushing 32. While I have
 5 described this operation in connection with only one of the design cylinders, the relation of any of the design cylinders to the collecting cylinder may be controlled in the same manner, as each of the cylinders has
 10 a similar mechanism associated therewith.

When a design cylinder is separated from the collecting cylinder by the crank and link mechanism above described, it is sometimes desirable to discontinue the inking of the
 15 plate upon said cylinders during this interval. Under this condition the pressman will merely actuate the cam 100, which cam will move the frame 97 and its contained rolls away from the design cylinder by engage-
 20 ment with the projection 99. As the shaft 101 of said cam turns, it will, through the crank 102, link 103, lever 104, link 107, and crank arm 108, raise the stop arm 109, moving it in the path of the arm 122, and under
 25 some condition engage this arm and actually impart movement thereto. As the stop arm 109 is thus actuated, it will, through the arm 125, turn the swivel 124 to present the flattened portion thereof toward the adjustable
 30 stop 123, thus providing clearance between said stop and said swivel, so that with the limit of movement of the stop arm 109, the doctor roll 23 will be out of contact with the fount roll 24, and the doctor roll 22 will be
 35 out of contact with the ink distributing roll 13. When the parts are so positioned, the cam 118 will continue to oscillate the lever 120—121, but this oscillation of said lever will have no operative effect upon the lever
 40 112—122, and thus impart no movement to the doctor rolls. When it is desired to resume the feeding of ink, the cam 100 is turned in the reverse direction, thus permitting the frame 97 to have movement toward
 45 its design cylinder, and moving the stop arm 109 out of the path of movement of the lever arm 122, thus permitting the re-establishment of the operative relation between the heel 121 of the lever 120 and said lever
 50 arm 122. Thereafter with the continued rotation of said cam 118, the rise of said cam will, through the lever 122—112, link 113 and crank arm 114, impart a timely oscillation to the frame 19 against the tension of
 55 the spring 117, this spring imparting a return reciprocation to its frame 19 and holding the roll 119 in the operative relation to the fall of said cam. By this mechanism the continued inking of the plate upon the design
 60 cylinder, while it is inoperative in relation to the collecting cylinder, is prevented, and the accumulation of ink upon the various distributing and inking rolls is also prevented.

65 As heretofore stated, a press made in ac-

cordance with my invention may be used to make an impression in a plurality of colors, the line of demarcation between the different colors being clearly defined and distinct, and yet have these different colors in abso-
 70 lute register. A machine embodying my invention, however, may also be provided with the blending mechanism herein shown and described, which will mix the ink of adjoining colors to secure a blended effect
 75 of these colors in the final impression. The blending mechanism herein shown and described is so constructed as to adapt the machine to both classes of work, it being also possible to control the character and extent
 80 of the blended portions of the imprint.

While the machine is in operation, the link and eccentric mechanism 136 is constantly actuated, imparting movement to the rock shaft 135. As the shaft 135 os-
 85 cillates, it will impart an oscillatory movement to the segment 144, the extent of this oscillation, however, being determined by the distance between the point of connection of the arm 145 with, and the axis of
 90 rotation of, said segment. As said segment oscillates, it will, through the crank 147, upon the shaft 143, oscillate the lever 148, which will impart vibratory movement to the roll 14, associated with the distributing
 95 rolls of the design cylinder 7, and through the crank 146 impart oscillatory movement to the vibrator roll 15, associated with the inking rolls 10 and 11 of said design cylinder, but in the reverse direction. By ad-
 100 justing the point of connection between the link 145 and the segment 144, so as to increase the distance between said point of connection and the axis of movement of said segment, the quantity of this move-
 105 ment may be gradually reduced until it is merely sufficient to take up lost motion of the various mechanisms, thus imparting no movement to said vibrator rolls. By the
 110 variable adjusting of the arm 145 with relation to the segment 144, the quantity of vibratory movement of said vibrator rolls may be regulated, thus not only controlling the tonal effects in the blending, but also
 115 the width of the blended portion.

The link 142 and the cranks 137 and 139 and 141, and the link 138 will impart movement to the vibrator rolls 14 and 15, associated with the cylinder 6, similar to that
 120 imparted to the corresponding rolls associated with the cylinder 7.

The link 150 adjustably connected with the segment 144 and with the idler fitting 149 mounted upon the shaft 135, is utilized to transmit vibratory movement to the vi-
 125 brator rolls associated with the design cylinders 8 and 9, since as said fitting 149 oscillates, oscillatory movement will be imparted through the link 151 to the segment 152, and the shaft 153 carrying said seg-
 130

ment. The extent of the oscillatory movement of the shaft 153 may be controlled by the adjustment of the links 150 and 151, or both of them, towards or from the axis of rotation of the segments to which they are connected. By moving the link 150 away from the axis of movement of the segment 144, the quantity of movement of the fitting 149 will be increased and by moving said link toward said axis the quantity of movement will be diminished. By moving the link 151 toward the axis of movement of the segment 152, the quantity of oscillatory movement of the shaft 153 will be increased, while by moving said link away from said axis this movement will be diminished. By moving the link 150 toward the axis of the segment 144 to the full extent and by moving the link away from the axis of the segment 152 to the full extent, practically no movement will be imparted to the shaft 153.

As the shaft 153 oscillates, it will, through the connections described, impart vibratory movement, through the cranks 154 and 155 and the lever 156 associated with the former, to the vibrator rolls 14 and 15 associated with the cylinder 9, but in opposite directions. Simultaneously with this movement, the crank 157 will oscillate the shaft 159 and impart vibratory movement to the roll 14 associated with the design cylinder 8, similar movement being imparted to the roll 15 associated with this cylinder, either by means of the crank 161, or the cranks 162 and 164, carried respectively by the cranks 153 and 155, and connected by the link 163. If desired, the link 145 may be disconnected from the segment 144 and thus avoid any movement of the various vibrator rolls.

In the accompanying drawings, I have shown the various mechanisms entering into the machine as having a definite relation to each other, but this showing relates merely to the adaptation of my invention to a particular design of press, and may be varied to adapt the invention to different designs of presses without departing from the spirit and scope of the invention. In actual practice, I have found that a press made in accordance with the invention as herein shown and described, gives highly satisfactory results, and produces a uniform quality of work, even when the blending mechanism is used, the tonal effects of a large number of impressions being substantially identical in every detail, and a continued run of the press not having a tendency to vary such effects.

It is not my intention to limit the invention to the details of construction shown in the accompanying drawings, it being apparent that such may be varied to adapt the invention to different classes of multicolor

work, or to different designs of machines without departing from the spirit and scope of the invention.

Having described the invention what I claim as new, and desire to have protected by Letters Patent, is:—

1. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, a plurality of design cylinders each having a printing plate bearing a portion of the complete design in relief thereon a portion of the design on each of said plates being in register with the portions of the design upon the other plates, and an inking mechanism associated with each of said design cylinders embodying therein a doctor roll, and non-vibrating distributing and inking rolls, whereby during each rotation of said collecting cylinder, the plates upon said design cylinders will successively apply different portions of the complete design in inks of different colors to, and the uninked portions of said plates will be held out of engagement with, said offset printing surface.

2. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, a plurality of design cylinders each having a printing plate bearing a portion of the complete design in relief thereon, a portion of the design on each of said plates being in register with the portions of the design upon the other plates, said design cylinders being so mounted as to maintain the plates thereon in continuous engagement with said offset printing surface, and an inking mechanism associated with each of said design cylinders embodying therein a doctor roll, and non-vibratory distributing and inking rolls, whereby during each rotation of said collecting cylinder, the plates upon said design cylinders will successively apply different portions of the complete design in inks of different colors to, and the uninked portions of said plates will be held out of engagement with, said offset printing surface.

3. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders each having a printing plate bearing a portion of the complete design in relief thereon a portion of the design on each of said plates being in register with the portions of the design upon the other plates, each of said design cylinders having associated therewith non-vibratory inking rolls, non-vibratory distributing rolls applying ink thereto, an ink fount, and a doctor roll adapted to convey ink from said ink fount to said distributing rolls, whereby during each rotation of said collecting cylinder,

the plates upon said design cylinders will successively apply different portions of the complete design in inks of different colors to, and the uninked portions of said plates will be held out of engagement with, said offset printing surface.

4. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon a portion of the design on each of said plates being in register with the portions of the design upon the other plates, and an inking mechanism associated with each of said design cylinders, embodying therein means adapted to apply inks of different colors to the plate on any design cylinder, whereby the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

5. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon, a portion of the design on each of said plates being in register with the portions of the design upon the other plates, each of said design cylinders having associated therewith non-vibratory inking rolls, adapted to apply ink to the plates upon said design cylinders, non-vibratory distributing rolls, a fount adapted to contain inks of different colors, and a doctor roll adapted to convey the inks to said distributing rolls, whereby inks of different colors may be applied to the plate on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

6. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon a portion of the design on each of said plates being in register with the portions of the design upon the other plates, each of said design cylinders having associated therewith non-vibratory inking rolls, adapted to apply ink to the plates upon said design cylinders, non-vibratory distributing rolls, a plurality of ink founts, each having a plurality of compartments therein, alternating with the ink containing compartments of the other fount, and a doctor roll associated with each of said founts, adapted to convey the inks to said distributing rolls, whereby inks of different

colors may be applied to the plate on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

7. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon a portion of the design on each of said plates being in register with the portions of the design upon the other plates, and an inking mechanism associated with each of said design cylinders, embodying therein means adapted to apply inks of different colors to the plate on any design cylinder, and means whereby adjacent edges of the inks of different colors may be blended before application to said plate, whereby the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

8. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon a portion of the design on each of said plates being in register with the portions of the design upon the other plates, each of said design cylinders having associated therewith non-vibratory inking rolls, adapted to apply ink to the plates upon said design cylinder, non-vibratory distributing rolls, a fount adapted to contain inks of different colors, a doctor roll adapted to convey the inks to said distributing rolls and means whereby the edges of adjacent portions of the inks applied to said inking rolls may be blended, whereby inks of different colors may be applied to the plate on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

9. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon a portion of the design on each of said plates being in register with the portions of the design upon the other plates, each of said design cylinders having associated therewith non-vibratory inking rolls, adapted to apply ink to the plates upon said design cylinder, non-vibratory distributing rolls, a fount adapted to contain inks of different colors, a doctor roll adapted to convey the inks to said distribut-

ing rolls, and means whereby the adjacent edges of the inks of different colors, applied to said distributing rolls, may be blended, whereby inks of different colors may be applied to the plate on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

10 10. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon a portion of the design on each of said plates being in register with the portions of the design upon the other plates, each of said design cylinders having associated therewith non-vibratory inking rolls, adapted to apply ink to the plates upon said design cylinders, non-vibratory distributing rolls, a fount adapted to contain inks of different colors, a doctor roll adapted to convey the inks to said distributing rolls, and means whereby the adjacent edges of the inks of different colors, applied to said distributing rolls and said inking rolls respectively, may be blended, whereby inks of different colors may be applied to the plate on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

35 11. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon a portion of the design on each of said plates being in register with the portions of the design upon the other plates, each of said design cylinders having associated therewith non-vibratory inking rolls, adapted to apply ink to the plates upon said design cylinders, non-vibratory distributing rolls, a fount adapted to contain inks of different colors, a doctor roll adapted to convey the inks to said distributing rolls, and a vibrator roll associated with said distributing rolls and adapted to blend the adjacent edges of the inks of different colors applied thereto, whereby inks of different colors may be applied to the plate on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

60 12. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete

design in relief thereon a portion of the design on each of said plates being in register with the portions of the design upon the other plates, each of said design cylinders having associated therewith non-vibratory inking rolls, adapted to apply ink to the plates upon said design cylinders, non-vibratory distributing rolls, a fount adapted to contain inks of different colors, a doctor roll adapted to convey the inks to said distributing rolls, a vibrator roll associated with said distributing rolls and adapted to blend the adjacent edges of the inks of different colors applied thereto, and means whereby the reciprocatory movement of said vibrator roll may be varied, whereby inks of different colors may be applied to the plate on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

13. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon a portion of the design on each of said plates being in register with the portions of the design upon the other plates, each of said design cylinders having associated therewith non-vibratory inking rolls, adapted to apply ink to the plates upon said design cylinders, non-vibratory distributing rolls, a fount adapted to contain inks of different colors, a doctor roll adapted to convey the inks to said distributing rolls, and a vibrator roll associated with said inking rolls adapted to blend the adjacent edges of the ink applied thereto, whereby inks of different colors may be applied to the plate on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

14. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon, a portion of the design on each of said plates being in register with the portions of the design upon the other plates, each of said design cylinders having associated therewith non-vibratory inking rolls, adapted to apply ink to the plates upon said design cylinders, non-vibratory distributing rolls, a fount adapted to contain inks of different colors, a doctor roll adapted to convey the inks to said distributing rolls, a vibrator roll associated with said inking rolls adapted to blend the adjacent edges of the ink applied thereto, and means whereby the amount of reciprocatory movement of

said vibrator roll may be varied, whereby inks of different colors may be applied to the plate on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

15. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon a portion of the design on each of said plates being in register with the portions of the design upon the other plates, each of said design cylinders having associated therewith non-vibratory inking rolls, adapted to apply ink to the plates upon said design cylinders, non-vibratory distributing rolls, a fount adapted to contain inks of different colors, a doctor roll adapted to convey the inks to said distributing rolls, and a plurality of vibrator rolls associated with said inking rolls and said distributing rolls respectively, and adapted to blend the adjacent edges of the inks of different colors applied thereto, whereby inks of different colors may be applied to the plate on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

16. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon a portion of the design on each of said plates being in register with the portions of the design upon the other plates, each of said design cylinders having associated therewith non-vibratory inking rolls, adapted to apply ink to the plates upon said design cylinders, non-vibratory distributing rolls, a fount adapted to contain inks of different colors, a doctor roll adapted to convey the inks to said distributing rolls, a plurality of vibrator rolls associated with said inking rolls and said distributing rolls respectively, and adapted to blend the adjacent edges of the inks of different colors applied thereto, and means whereby the amount of reciprocatory movement of said vibrator rolls may be varied, whereby inks of different colors may be applied to the plate on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

17. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cyl-

inder associated therewith, and a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon, a portion of the design on each of said plates being in register with the portions of the design upon the other plates, each of said design cylinders having associated therewith non-vibratory inking rolls, adapted to apply ink to the plates upon said design cylinders, non-vibratory distributing rolls, a fount adapted to contain inks of different colors, a doctor roll adapted to convey the inks to said distributing rolls, a plurality of vibrator rolls associated with said inking rolls and said distributing rolls respectively, and adapted to blend the adjacent edges of the inks of different colors applied thereto, and means whereby said vibrator rolls are simultaneously reciprocated in opposite directions, whereby inks of different colors may be applied to the plate on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

18. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon, a portion of the design on each of said plates being in register with the portions of the design upon the other plates, each of said design cylinders having associated therewith non-vibratory inking rolls, adapted to apply ink to the plates upon said design cylinders, non-vibratory distributing rolls, a fount adapted to contain inks of different colors, a doctor roll adapted to convey the inks to said distributing rolls, and a non-vibratory roll bearing upon said doctor roll and adapted to cut the ink thereon, whereby inks of different colors may be applied to the plate on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

19. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, a plurality of design cylinders each having a printing plate bearing a portion of the complete design in relief thereon a portion of the design on each of said plates being in register with the portions of the design upon the other plates, means whereby said design cylinders respectively may be circumferentially adjusted to secure register of the plate carried by any of said cylinders with the plates upon the other cylinders, and an inking mechanism associated with each of said

design cylinders embodying therein a doctor roll, and non-vibratory distributing and inking rolls, whereby during each rotation of said collecting cylinder, the plates upon
 5 said design cylinders will successively apply different portions of the complete design in inks of different colors to, and the uninked portions of said plates will be held out of engagement with, said offset printing surface.
 10 face.

20. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, a plurality of
 15 design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon, a portion of the design on each of said plates being in register with the portions of the design upon
 20 the other plates, an inking mechanism associated with each of said design cylinders, whereby the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset
 25 printing surface, and means whereby said impression cylinder and said design cylinders may be simultaneously moved into, or out of, the operative relation to said collecting cylinder.

30 21. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, a plurality of design cylinders, each having thereon a
 35 printing surface bearing a portion of the complete design in relief thereon, a portion of the design on each of said plates being in register with the portions of the design upon the other plates, an inking mechanism associated with each of said design cylinders,
 40 whereby the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface, and means whereby any of said design cylinders may be moved, and
 45 maintained, out of the operative relation to said collecting cylinder.

22. A printing machine embodying therein a collecting cylinder having an offset
 50 printing surface thereon, an impression cylinder associated therewith, a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon, a portion
 55 of the design on each of said plates being in register with the portions of the design upon the other plates, an inking mechanism associated with each of said design cylinders, whereby the plates upon said design cylinders
 60 will successively apply the inked portions of the design thereon to said offset printing surface, a crank and lever mechanism and operative connections between said mechanism and said impression cylinder,
 65 and between said mechanism and each of

said design cylinders, whereby said impression cylinder and said design cylinders may be simultaneously moved into, or out of, the operative relation to said collecting cylinder.

70 23. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, a plurality of design cylinders, each having thereon a
 75 printing surface bearing a portion of the complete design in relief thereon, an inking mechanism associated with each of said design cylinders, whereby the plates upon said design cylinders will successively apply the
 80 inked portions of the design thereon to said offset printing surface, a crank and lever mechanism, operative connections between said mechanism and said impression cylinder, and between said mechanism and each
 85 of said design cylinders, whereby said impression cylinder and said design cylinders may be simultaneously moved into, or out of, the operative relation to said collecting cylinder, and a coupling mechanism between
 90 said crank and lever mechanism and said design cylinders respectively, whereby any of said design cylinders may be operatively connected with, or disconnected from, said crank and lever mechanism.

95 24. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, a plurality of design cylinders, each having thereon a
 100 printing surface bearing a portion of the complete design in relief thereon, an inking mechanism associated with each of said design cylinders, whereby the plates upon said design cylinders will successively apply the
 105 inked portions of the design thereon to said offset printing surface, a crank and lever mechanism, operative connections between said mechanism and said impression cylinder, and between said mechanism and each
 110 of said design cylinders, whereby said impression cylinder and said design cylinders may be simultaneously moved into, or out of, the operative relation to said collecting cylinder, and actuating means for said crank
 115 and lever mechanism, comprising an oscillatory plate operatively connected with said crank and lever mechanism, a reciprocatory thrust member, means whereby said thrust member may be brought into relation to said
 120 plate, to rock it in either direction, and means acting in synchronism with said collecting cylinder, imparting a timely reciprocation to said thrust member.

125 25. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, a plurality of design cylinders, each having thereon a printing
 130 surface bearing a portion of the complete design in relief thereon, an inking

mechanism associated with each of said design cylinders, whereby the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface, means adapted to impart movement to said impression cylinder and each of said design cylinders, toward or from said collecting cylinder, and an actuating mechanism adapted to act simultaneously and similarly on all of said last named means, comprising a shaft having two cranks mounted adjacent each of said design cylinders, a cranked idler fitting mounted upon each of said shafts, a detachable coupling adapted to connect one of the cranks upon said shaft with one of the cranks upon said idler fitting, connections between the other crank upon said shaft and said means respectively, an oscillatory plate, a reciprocatory thrust member, means whereby said thrust member may be brought into relation to said plate, to rock it in either direction, means acting in synchronism with said collecting cylinder, imparting a timely reciprocation to said thrust member, and a plurality of levers operatively connected with said oscillatory plate and said idler fittings respectively, and said oscillatory plate, and said means for imparting movement to the impression cylinder.

26. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon, a portion of the design on each of said plates being in register with the portions of the design upon the other plates, an inking mechanism associated with each of said design cylinders, and embodying therein inking rolls, distributing rolls, adapted to apply ink to said inking rolls, an ink fount and a doctor roll adapted to convey ink from said fount to said distributing rolls, whereby the plates upon said design cylinders will successively apply the inked portion of the design thereon to said offset printing surface, means whereby said design cylinders may be moved into, or out of, the operative relation to said collecting cylinder, and means whereby the inking rolls may be moved into, or out of, the operative relation to the plate upon their design cylinder.

27. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon, a portion of the design on each of said plates being in register with the portions of the design upon the other plates, an inking mechanism asso-

ciated with each of said design cylinders, and embodying therein inking rolls, distributing rolls, adapted to apply ink to said inking rolls, an ink fount and a doctor roll adapted to convey ink from said fount to said distributing rolls, whereby the plates upon said design cylinders will successively apply the inked portion of the design thereon to said offset printing surface, means whereby said design cylinders may be moved into, or out of, the operative relation to said collecting cylinder, means whereby the inking rolls may be moved into, or out of, the operative relation to the plate upon their design cylinder, and means whereby said doctor roll may be moved into, or out of, the operative relation to the distributing rolls simultaneously with the movement of said inking rolls into, or out of, the operative relation to the plate upon the design cylinder.

28. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders each having thereon a printing surface bearing a portion of the complete design in relief thereon, a portion of the design on each of said plates being in register with the portions of the design upon the other plates, each of said design cylinders having associated therewith non-vibratory inking rolls adapted to apply ink to the plates upon said design cylinders, non-vibratory distributing rolls, a plurality of ink founts, each having a plurality of compartments therein alternating with the ink containing compartments of the other fount, a doctor roll associated with each of said founts adapted to convey the inks to said distributing rolls, and means whereby the edges of adjacent portions of the inks applied to said inking rolls, may be blended, whereby inks of different colors may be applied to the plates on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

29. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders each having thereon a printing surface bearing a portion of the complete design in relief thereon, a portion of the design on each of said plates being in register with the portions of the design upon the other plates, each of said design cylinders having associated therewith non-vibratory inking rolls adapted to apply ink to the plates upon said design cylinders, non-vibratory distributing rolls, a plurality of ink founts, each having a plurality of compartments therein alternating with the ink containing compartments of the other fount, a

doctor roll associated with each of said founts adapted to convey the inks to said distributing rolls, and means whereby the edges of adjacent portions of the inks applied to said distributing rolls, may be blended, whereby inks of different colors may be applied to the plates on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

30. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders each having thereon a printing surface bearing a portion of the complete design in relief thereon a portion of the design on each of said plates being in register with the portions of the design upon the other plates, each of said design cylinders having associated therewith non-vibratory inking rolls adapted to apply ink to the plates upon said design cylinders, non-vibratory distributing rolls, a plurality of ink founts, each having a plurality of compartments therein alternating with the ink containing compartments of the other fount, a doctor roll associated with each of said founts, adapted to convey the inks to said distributing rolls, and means whereby the edges of adjacent portions of the inks applied to said distributing rolls and said inking rolls respectively, may be blended, whereby inks of different colors may be applied to the plates on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

31. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon, each of said design cylinders having associated therewith non-vibratory inking rolls, adapted to apply ink to the plates upon said design cylinders, non-vibratory distributing rolls, a fount adapted to contain inks of different colors, a doctor roll adapted to convey the inks to said distributing rolls, a vibrator roll associated with said distributing rolls and adapted to blend the adjacent edges of the inks of different colors applied thereto, a transmission mechanism adapted to actuate the several vibrator rolls, and means whereby said transmission mechanism may be adjusted to impart a differential vibratory movement to different vibrator rolls, whereby inks of different colors may be applied to the plate on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

inders will successively apply the inked portions of the design thereon to said offset printing surface.

32. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon, each of said design cylinders having associated therewith non-vibratory inking rolls, adapted to apply ink to the plates upon said design cylinders, non-vibratory distributing rolls, a fount adapted to contain inks of different colors, a doctor roll adapted to convey the inks to said distributing rolls, a vibrator roll associated with said inking rolls and adapted to blend the adjacent edges of the inks of different colors applied thereto, a transmission mechanism adapted to actuate the several vibrator rolls, and means whereby said transmission mechanism may be adjusted to impart a differential vibratory movement to different vibrator rolls, whereby inks of different colors may be applied to the plate on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

33. A printing machine embodying therein a collecting cylinder having an offset printing surface thereon, an impression cylinder associated therewith, and a plurality of design cylinders, each having thereon a printing surface bearing a portion of the complete design in relief thereon, each of said design cylinders having associated therewith non-vibratory inking rolls, adapted to apply ink to the plates upon said design cylinders, non-vibratory distributing rolls, a fount adapted to contain inks of different colors, a doctor roll adapted to convey the inks to said distributing rolls, a vibrator roll associated with said distributing rolls and said inking rolls respectively, and adapted to blend the adjacent edges of the inks of different colors applied thereto, a transmission mechanism adapted to actuate the several vibrator rolls, and means whereby said transmission mechanism may be adjusted to impart a differential vibratory movement to different vibrator rolls, whereby inks of different colors may be applied to the plate on any design cylinder, and the plates upon said design cylinders will successively apply the inked portions of the design thereon to said offset printing surface.

In witness whereof I have hereunto affixed my signature this 29th day of April, 1918, in the presence of two subscribing witnesses.

WARREN L. GREEN.

Witnesses:

A. A. O'GRADY,
J. P. TREADWELL, Jr.