March 19, 1946. D. W. SCHNEIDER 2,397,053

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Filed Aug. 27, 1941 10 Sheets-Sheet 1

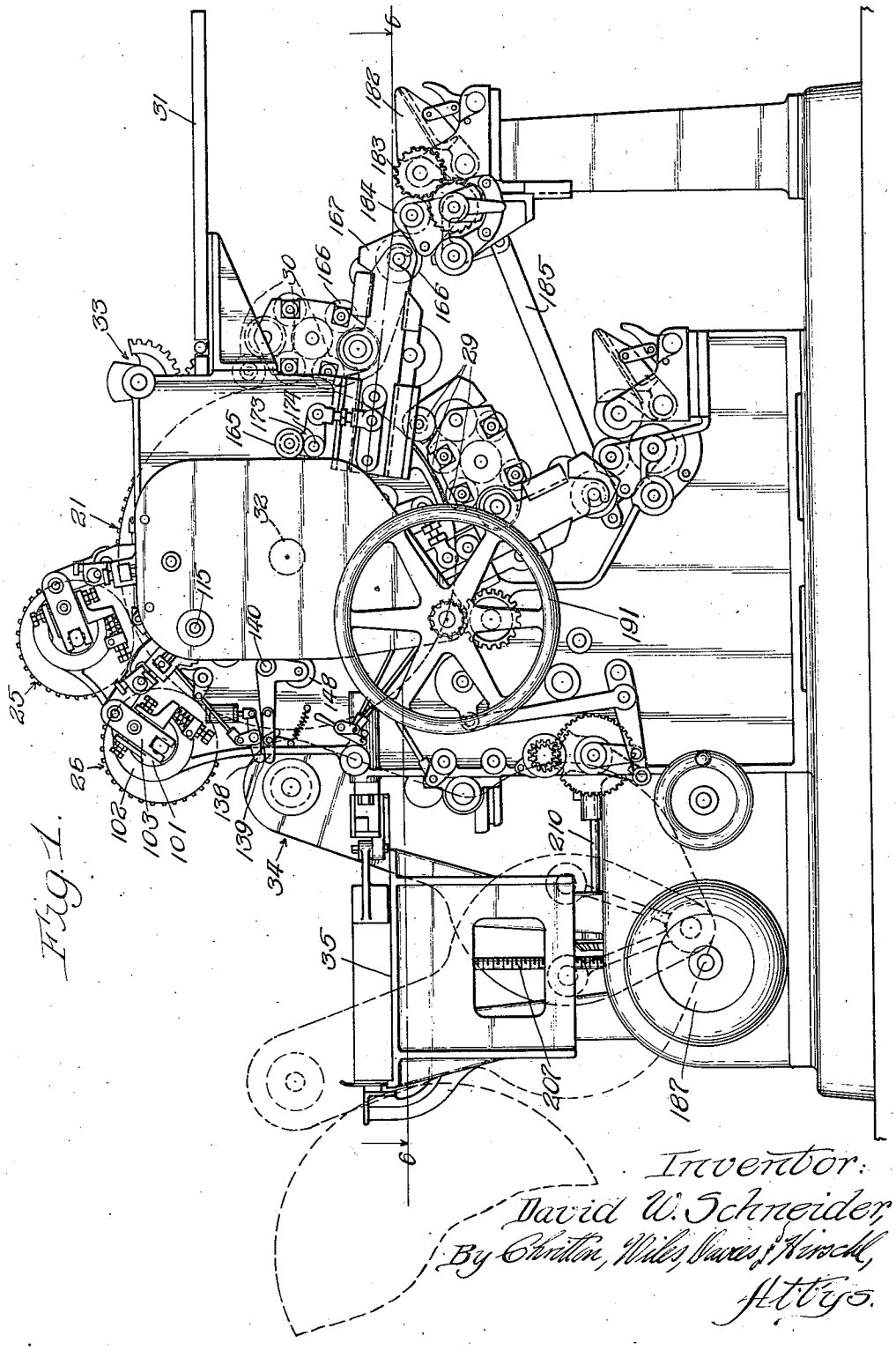


Fig. 1.

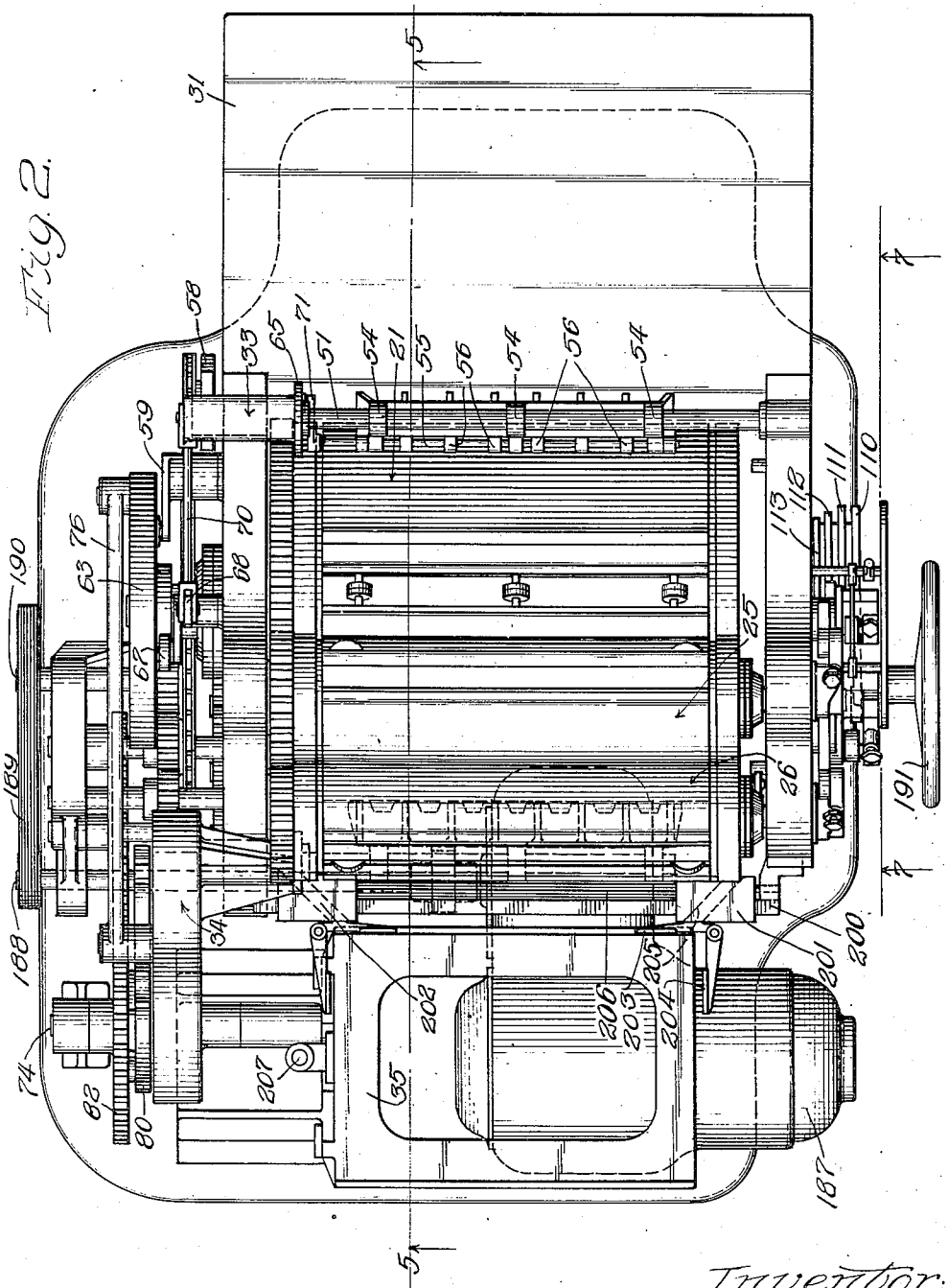
Inventor:
David W. Schneider,
By Chrittton, Wiley, Davies & Kinscll,
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March 19, 1946. D. W. SCHNEIDER 2,397,053

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Filed Aug. 27, 1941 10 Sheets-Sheet 2

Fig. 2.



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March 19, 1946. D. W. SCHNEIDER 2,397,053

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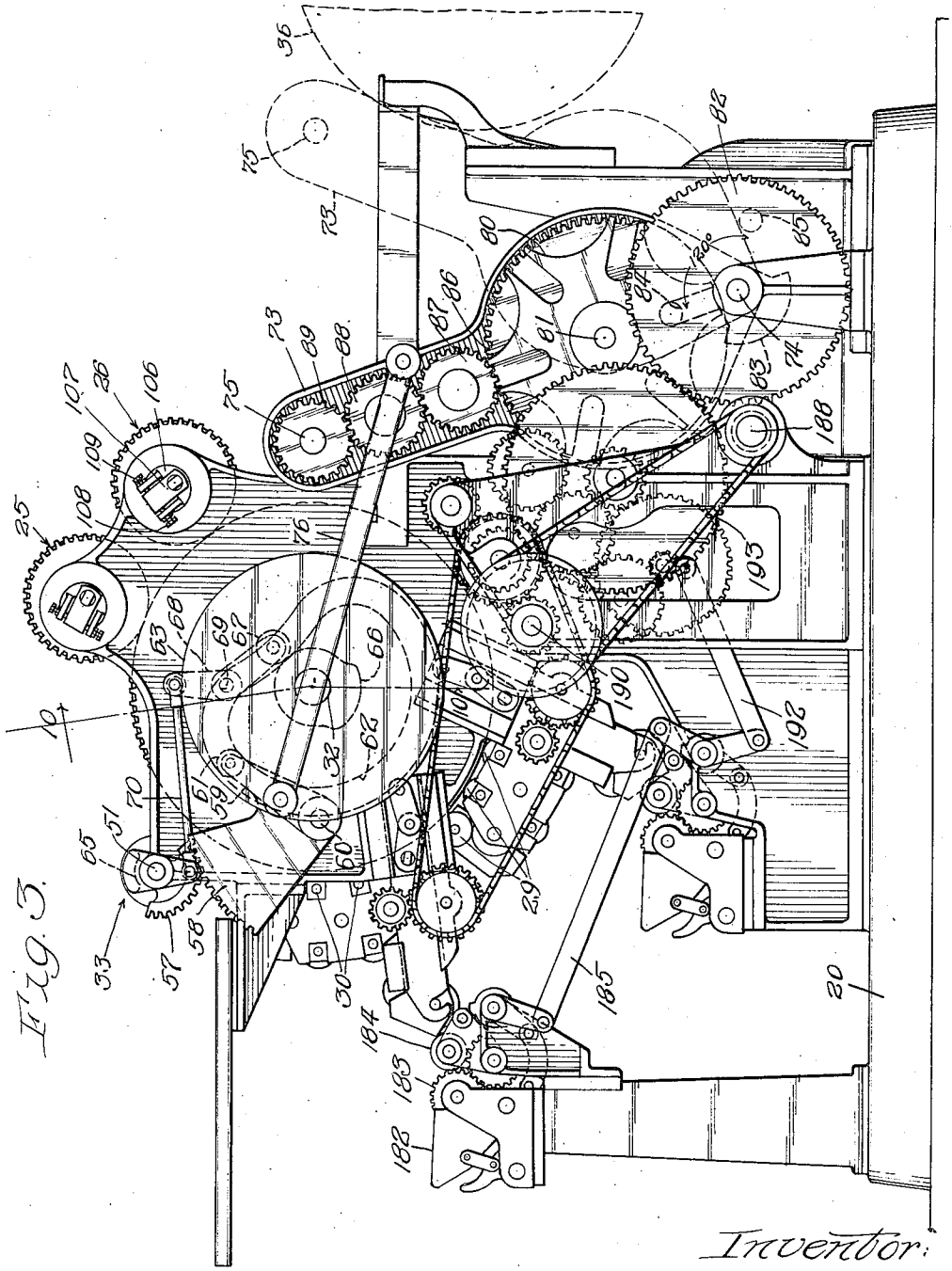


Fig. 3.

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March 19, 1946. D. W. SCHNEIDER 2,397,053

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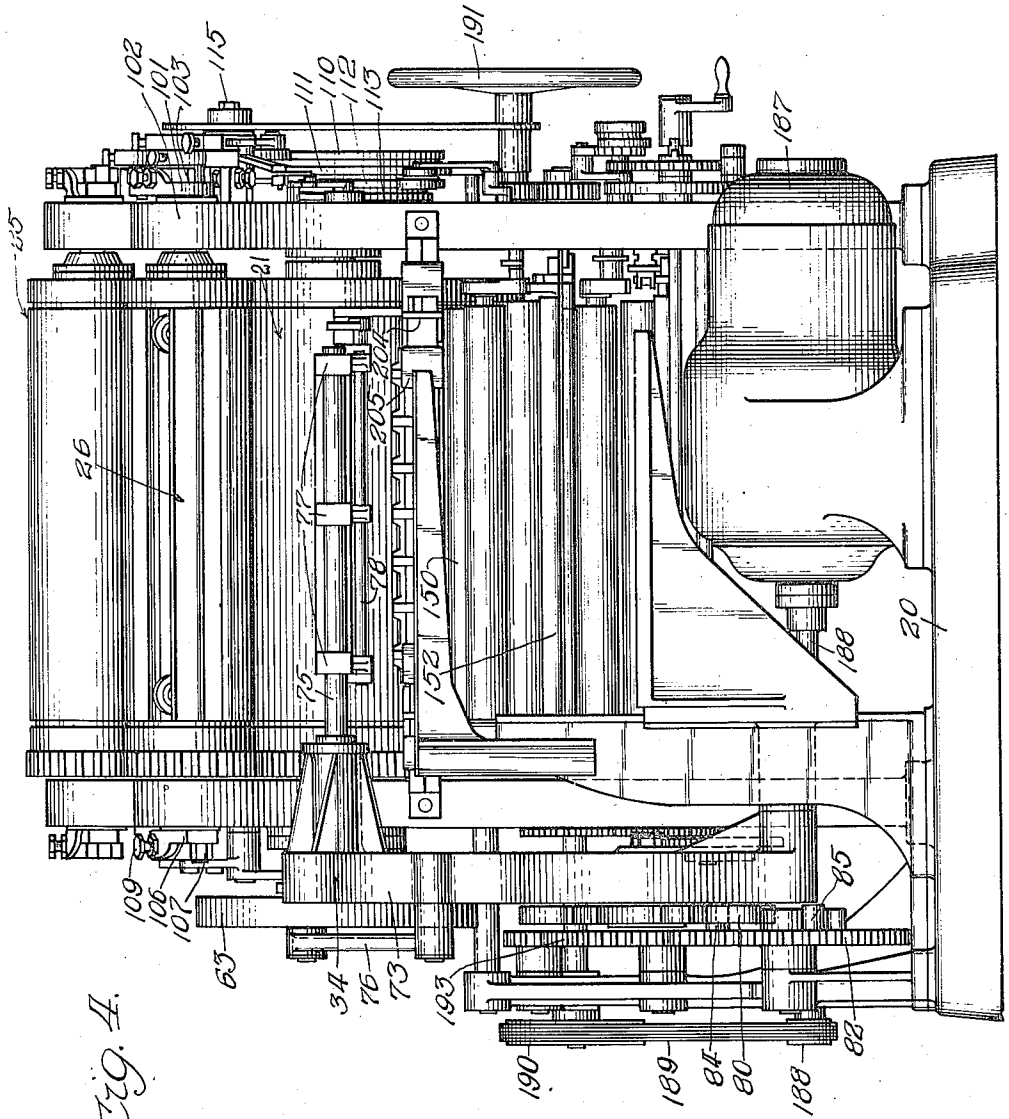


Fig. 4.

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March 19, 1946. D. W. SCHNEIDER 2,397,053

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Filed Aug. 27, 1941 10 Sheets-Sheet 5

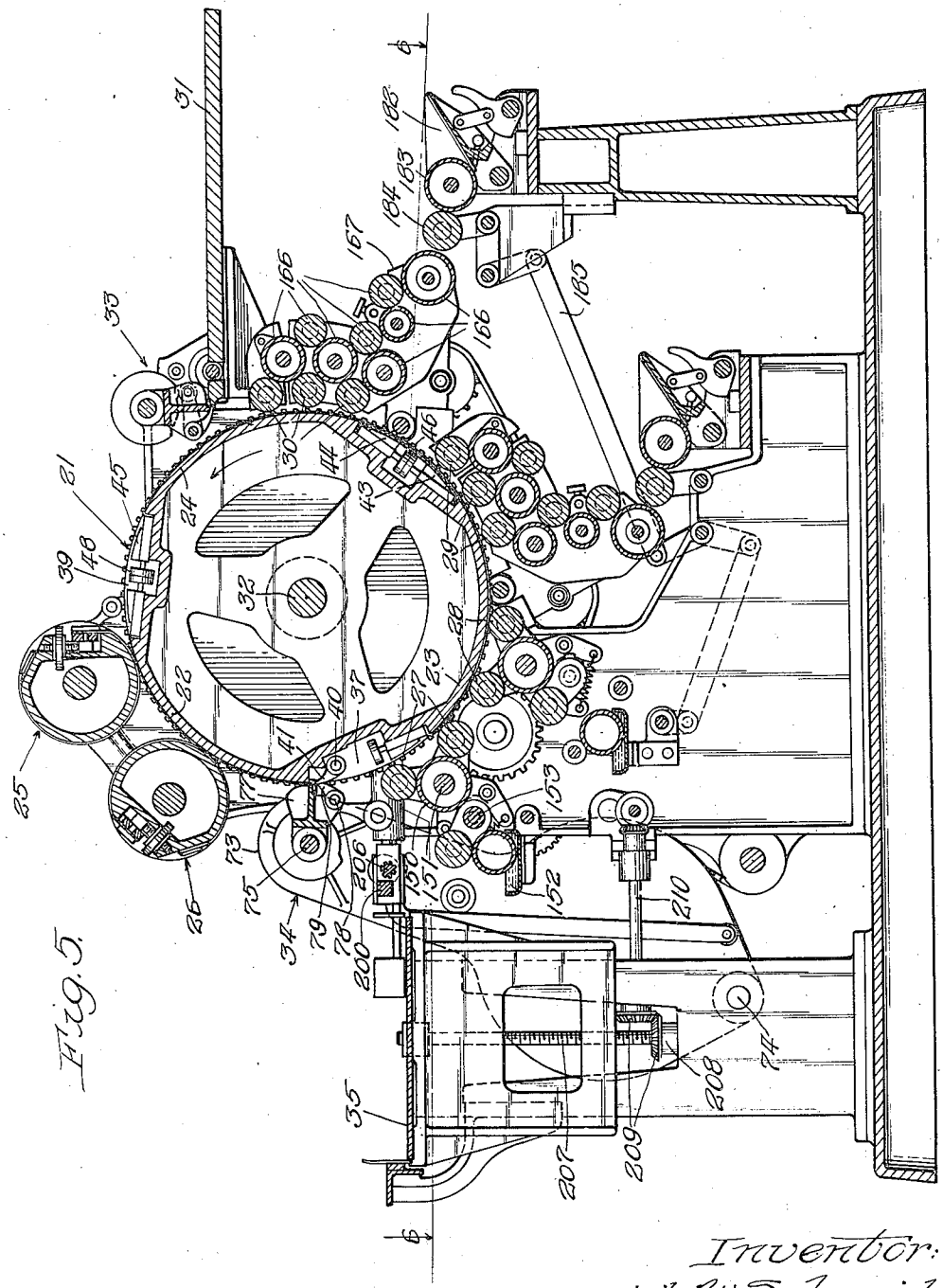


Fig. 5.

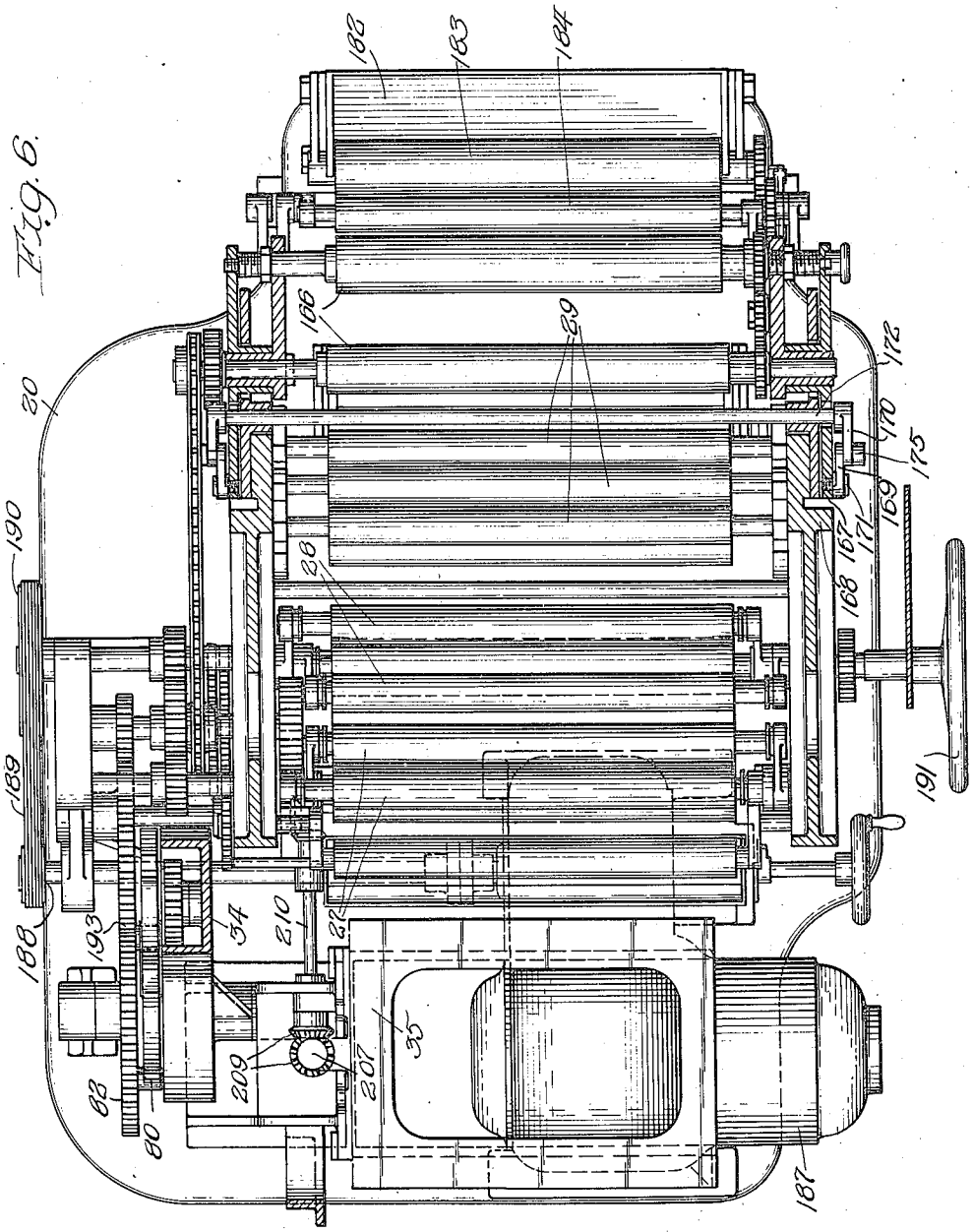
Inventor:
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March 19, 1946. D. W. SCHNEIDER 2,397,053

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Fig. 6.



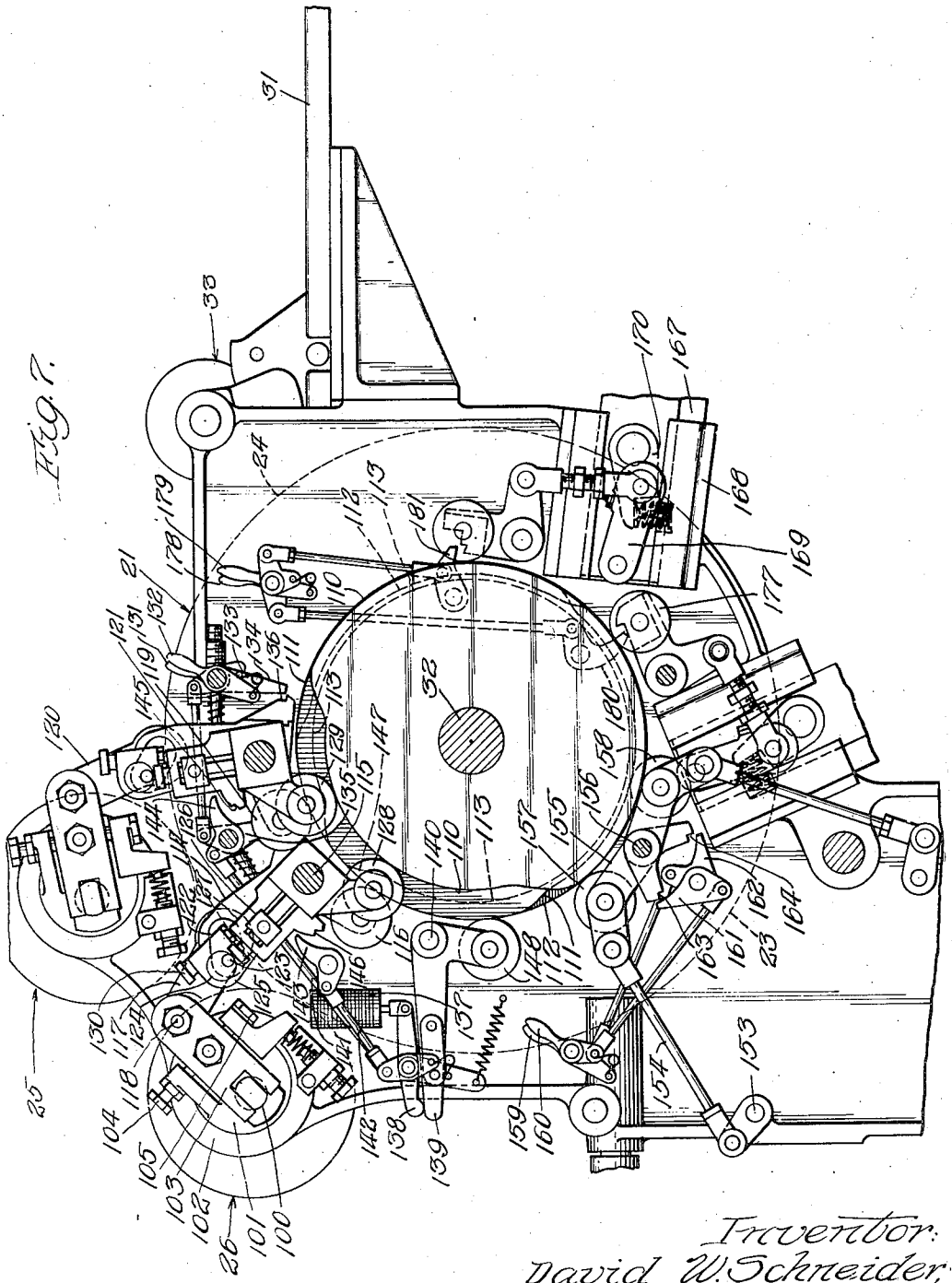
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March 19, 1946. D. W. SCHNEIDER 2,397,053

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Filed Aug. 27, 1941 10 Sheets-Sheet 7

Fig. 7.



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March 19, 1946. D. W. SCHNEIDER 2,397,053

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Fig. 9.

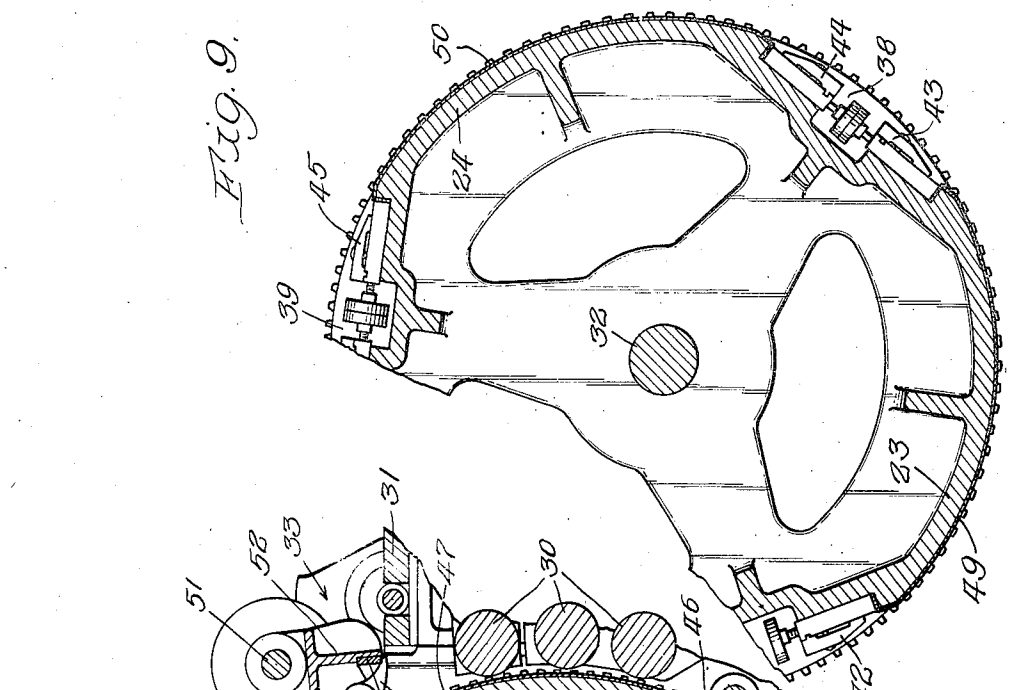
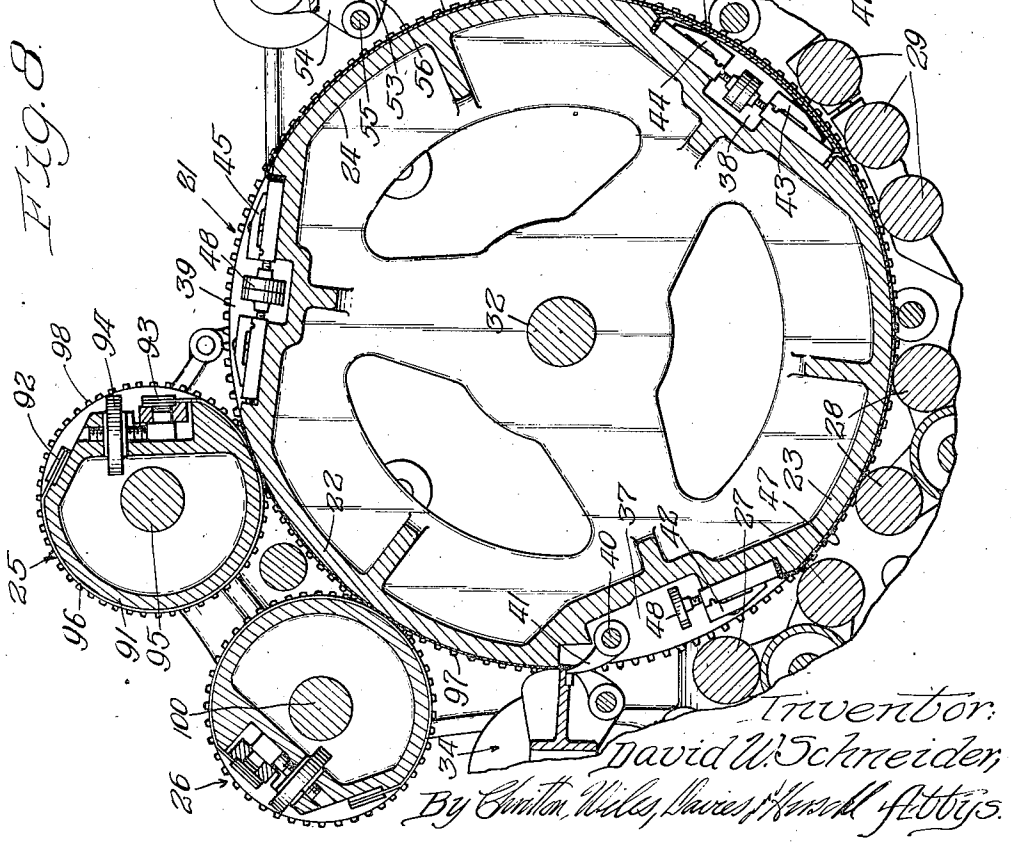


Fig. 8.



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March 19, 1946. D. W. SCHNEIDER 2,397,053

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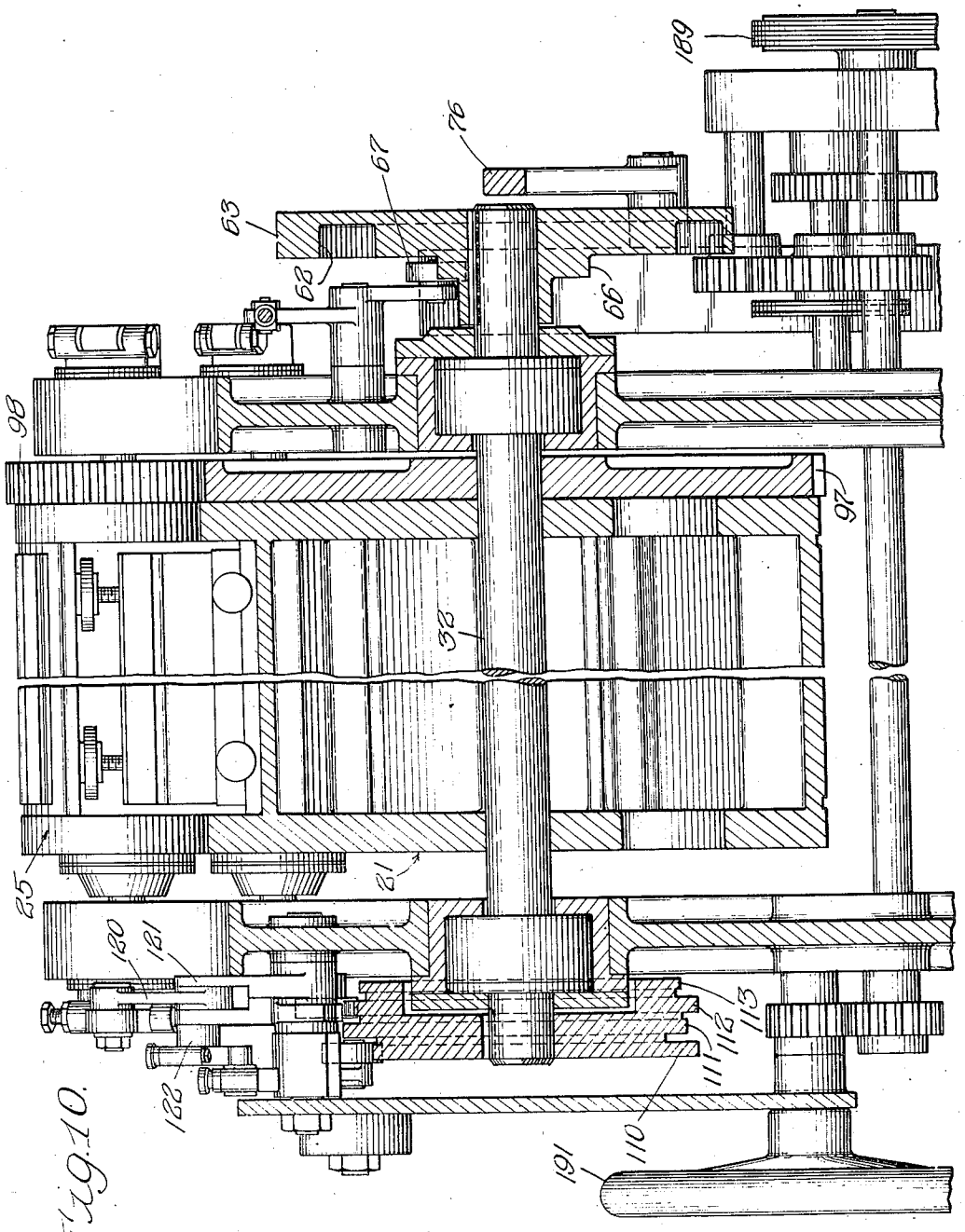


Fig. 10.

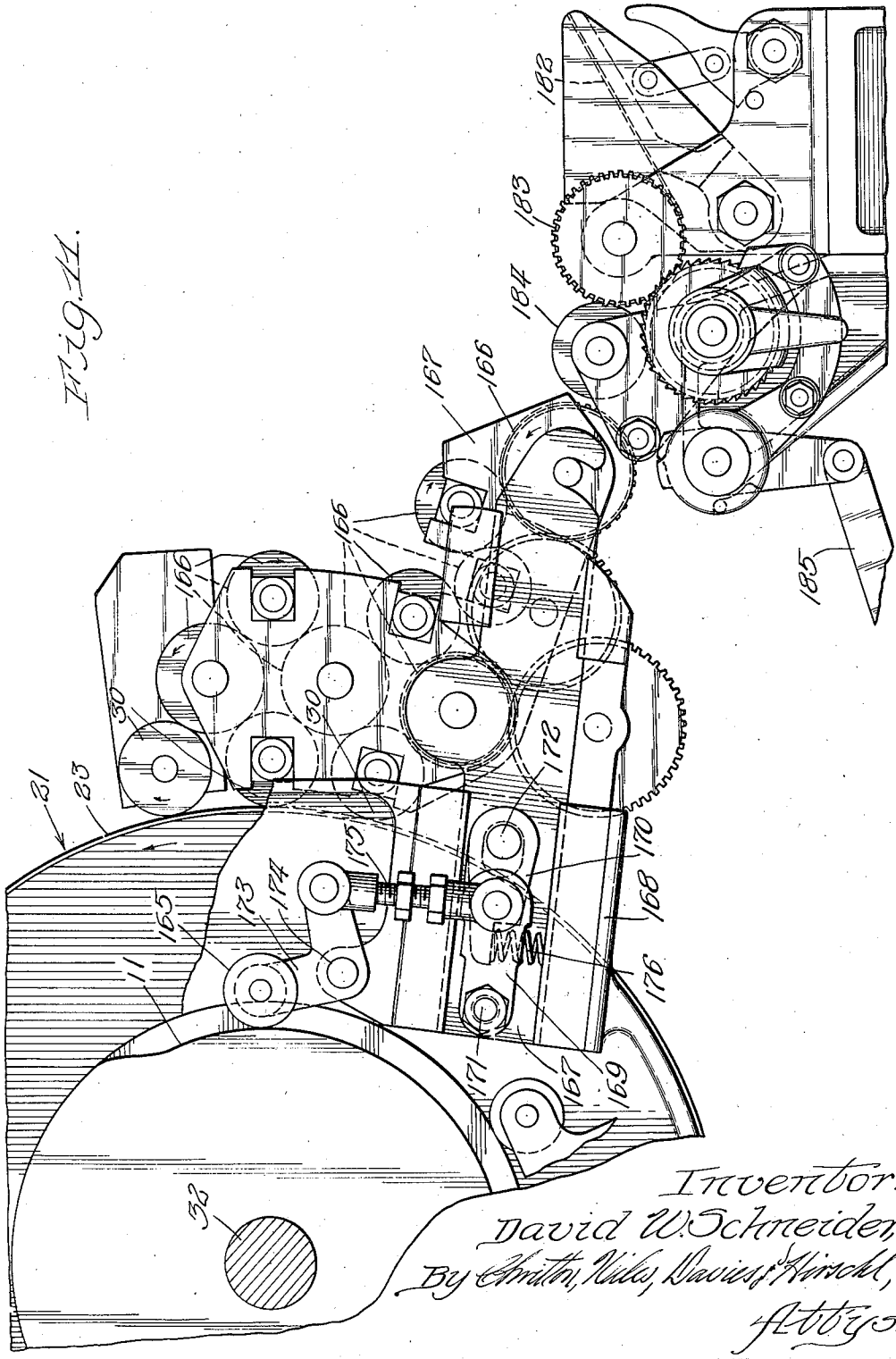
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March 19, 1946. D. W. SCHNEIDER 2,397,053

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Filed Aug. 27, 1941 10 Sheets-Sheet 10

Fig. 4.



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Patented Mar. 19, 1946 2,397,053

UNITED STATES PATENT OFFICE

2,397,053

PRINTING PRESS

David W. Schneider, Chicago, Ill.

Application August 27, 1941, Serial No. 408,510

21 Claims. (Cl. 101—137)

This invention relates to a printing press, and more particularly to an improved press for multi-color work.

One feature of this invention is that it provides a plurality of impression sections and a paper-receiving section on a single cylinder; another feature of this invention is that it provides a different offset roll for transferring ink from each impression section of the cylinder to the sheet of paper; yet another feature is that separate inking sets and separate dampening sets, where appropriate, are used for each impression section of the cylinder; still another feature is the provision of a high-speed multi-color press which insures perfect registry of the different imprints at all times, and which prevents undesired mixing of inks or discoloration of dampening water; a further feature of this invention is the provision of improved mechanism for moving the dampening and inking sets and the offset rolls toward and away from the main cylinder, together with means for rendering these operative and inoperative as desired; yet a further feature of this invention is the provision of feed mechanism with sheet-gripping elements which oscillate in an arc intersecting the circumference of the main cylinder, and which are synchronized with movement of the cylinder periphery; still another feature is the provision of improved sheet delivery mechanism adapted to remove a sheet from the main cylinder in approximately a horizontal plane through the axis of the cylinder, such a delivery mechanism being particularly adapted to deliver sheets from the cylinder of one such press as is here disclosed to the cylinder of another similar press; other features and advantages of this invention will be apparent from the following specification and the drawings, in which:

Figure 1 is an elevational view of a side of the press herein termed the front; Figure 2 is a top plan view of the press; Figure 3 is a rear elevational view of the press from the opposite side of that shown in Figure 1; Figure 4 is an elevational view of the press from the delivery end; Figure 5 is a vertical sectional view along the line 5—5 of Figure 2; Figure 6 is a horizontal sectional view just below the delivery table, along the line 6—6 of Figure 5; Figure 7 is a detail vertical view, principally in elevation, along the line 7—7 of Figure 2, this view particularly showing the mechanism for moving the dampening and inking sets and the offset rolls toward and away from the main cylinder; Figure 8 is a fragmentary vertical sectional view of the main cylinder and associated parts showing a cylinder plate covering both impression sections of the cylinder; Figure 9 is a fragmentary vertical sectional view of the main cylinder showing separate plates on each of the impression sections; Figure 10 is a partial sectional view along the line 10—10 of Figure 3; and Figure 11 is a detail view of one of the inking sets, in vertical section.

Present commercial multicolor presses have many defects and objections, particularly in the necessity of many careful adjustments to insure registry of impressions by different inks, in occasional mixture of inks, in undesirable sharp curvature bends in the handling of freshly printed sheets, in the delivery of sheets from one press to another where more colors are to be printed than can be handled by a single press, and the like. My press overcomes these and a number of other objections in present presses, and enables rapid automatic multi-color printing at high speed. In view of the complexity of such a press as that here disclosed, I will first give a brief general description of its arrangement and operation, and then describe various particular portions and arrangements of the press separately.

General description

Referring now more particularly to Figure 5, it will be seen that a base 20 provides a unitary bed supporting pedestals and frame members which in turn support the various operating elements of the press, these supporting members not being hereafter described.

A main cylinder here indicated in general as 21 is here shown as having its periphery divided into three equal sections here identified as 22, 23 and 24. The section 22 is adapted to receive and support the sheet of paper being printed; and the sections 23 and 24 are impression sections adapted to support printing plates which may be separate, or formed in a single plate, each of these impression sections being adapted to receive different ink.

Spaced circumferentially around the main cylinder 21 immediately adjacent its periphery and adapted to be moved toward and away from the cylinder are two offset rolls here identified as 25 and 26, duplicate dampening sets comprising the rolls 27 on the one hand and 28 on the other hand, and duplicate inking sets comprising the rolls 29 on the one hand and 30 on the other hand. A plurality of cams and associated followers (better seen on Figure 7) move these

various elements toward and away from the main cylinder 21 in such order that the rolls 27 contact the plate on the section 24 to dampen it, then this plate passes under the rolls 28 without being touched by them and is engaged by the rolls 29 to ink it, then passing under the rolls 30 without touching them and being engaged by the offset roll 25 to transfer its ink thereto. The plate on the section 23, on the other hand, is dampened by the rolls 28, inked by the rolls 30, and transfers its ink to the offset roll 26, not touching any of the elements which engaged the plate on the section 24.

A feed table 31 is approximately parallel to but slightly above a horizontal plane through the axis of the shaft 32 on which the main cylinder 21 rotates. This table is adapted to receive sheets to be printed, feed mechanism here indicated in general as 33 removing one sheet at a time from this table and delivering it to the sheet-carrying section 22 of the main cylinder as this section of the cylinder reaches a certain position in its rotation. The sheet of paper is then carried on up over the top of the main cylinder and is engaged by both offset rolls 25 and 26 to transfer the different inks thereto. Delivery mechanism, here indicated in general as 34, moving approximately in a horizontal plane through the axis of the main cylinder, is adapted to remove the printed sheet from the cylinder and deliver it to a sheet-receiving table 35. By placing both offset rolls above a horizontal plane through the axis of the main cylinder the sheet may be fed to and removed from such cylinder with the same (the printed) side always up, without any sharp bends in its travel, and with its delivery in such a way that it can readily be fed to the cylinder of another similar press if three or four color work is desired. That is, as is represented in Figure 3, the delivery from the press here being described can be directly to the cylinder of a succeeding press, the cylinder of such succeeding press being shown in dotted lines in Figure 3 and indicated as 36.

The main cylinder

Referring now more particularly to Figure 8, it will be seen that the main cylinder 21 has three depressions or cut-away portions around its periphery, here indicated as 37, 38 and 39, these being equally spaced. These depressions or gaps are adapted to have gripping elements mounted therein, and to provide space for certain movements of the sheet feeding and delivery grippers. These grippers move below the line of the periphery of the cylinder when feeding a sheet to and delivering it from the cylinder, and the feeding fingers also pass below the line of the periphery, through a depression different from the one associated with their feeding movement, in returning to their initial position. The depressions also provide space for movement of the dampening, inking, and offset rolls toward and away from the impression sections, without mixing the inks.

The depression 37 has mounted therein on a rotatable shaft 40 a plurality of sheet-gripping fingers 41, these fingers being adapted to be lifted up from the cooperating surface of the cylinder before they come adjacent the feeding mechanism 33 and to close down upon the forward edge of a sheet of paper as it is delivered to the cylinder by the feeding means. These fingers hold the sheet of paper on the paper section 22 as it rotates under the offset rolls 25 and 26, and then open just as they reach the position shown in Figure 8 to enable the forward edge of the sheet to be gripped by the delivery mechanism 34 and removed from the cylinder. Rotation of the shaft 40 is effected in the desired manner by conventional cam means.

The depressions also contain plate-gripping members here identified as 42, 43, 44 and 45. In the arrangement shown in Figure 8 the grippers 43 and 44 are inactive, the depression 38 being bridged by a removably inserted plate 46 providing a continuation of the periphery of the cylinder over this depression. A single metal plate 47 overlies the sections 23 and 24 of the cylinder and the intermediate bridging plate 46, the plate 47 being held in position by having its ends gripped by the elements 42 and 45. These may be conveniently operated by manual means. The elements 42 and 45 may be tightened on the ends of the plate by appropriate means, as a screw driver, and then the desired tension put in the plate by manually rotatable means, as the knobs 48. The single plate will be understood to comprise two different impression sections appropriately located with respect to each other, the spacing between registering points on the two sections of the plate being exactly one-third of the circumference of the outer surface of the plate as it lies along the periphery of the cylinder. By having the separate impressions on the two portions of the plate all of the advantages of this press in two-color work are secured; yet by the use of a single plate proper registry of the impressions can be obtained in the manufacture of the plate and this proper registry cannot be lost during the printing operation. Any slight shifting of the sheets of paper between successive feeding operations does not affect the registry of the two colors, but merely their position with respect to the margin; and if the plate has been properly made it may be fastened in place on the cylinder quickly and easily, the two impression sections being already in proper registry with respect to each other.

My cylinder is adapted, however, to use two separate plates for the two separate impression sections if desired, as shown in Figure 9. In the arrangement shown in this view the bridging plate 46 has been removed, and a plate 49 lies over the section 23 of the cylinder, its ends being gripped by the elements 42 and 43; while a separate plate 50 overlies the section 24, its ends being gripped by the elements 44 and 45. In this arrangement the two plates must, of course, be carefully registered when they are brought in position on the cylinder; but once this registry has been attained the operation and advantages are similar to those previously discussed.

Sheet feeding mechanism

Referring now more particularly to Figures 2, 3, 5, 8 and 10, the sheet-feeding mechanism, which has heretofore merely been generally identified as 33, will be specifically described. Referring first more particularly to Figure 8, a rotatable shaft 51 is parallel to the main shaft 32 about which the cylinder rotates, and is about equally spaced from the forward edge of the feed table 31 and from the periphery of the cylinder. Rotatable with the shaft 51 and carried by it is a member 52 having a gripping block 53 at its edge furthest from the shaft 51, and a plurality of brackets 54 spaced along the shaft 51, as may

be best seen in Figure 2. These brackets 54 rotatably support a shaft 55, this shaft in turn carrying spaced gripping fingers 56.

Referring now more particularly to Figure 3, it will be seen that the shaft 51 carries a sector gear 57 engaging another sector 58 having integral therewith or fastened thereto an arm 59, these last mentioned two parts being rotatable together about the axis 60. The outer end of the arm 59 carries a roller 61 received by a groove 62 in a wheel-like member 63 mounted on and rotatable with the main shaft 32 (this wheel member and cam groove being shown in section on the right side of Figure 10). The shape of this cam groove is such that the feeding mechanism stands still in the position shown in Figure 8, gripping the forward edge of a sheet, until the forward end of the paper receiving portion of the main cylinder approaches, then the shaft 51 is rotated to cause the fingers to move to the left and upwardly at a rate preferably accelerating to the peripheral speed of rotation of the cylinder to bring the forward edge of the sheet under the gripping fingers 41 on the cylinder, which thereupon closes upon it. The feeding fingers 56 thereupon continue on upwardly, releasing their grip upon the paper. It will be noted that the distance of the gripping ends of the fingers 56 from the shaft 51 is such that their arc of movement intersects the periphery of the cylinder to bring the edge of the sheet down into the proper position to be gripped by the fingers 41, the upward movement of the feeding fingers taking place in the depression 37 in the periphery of the cylinder so that there is no interference between the fingers and the cylinder.

The feeding fingers are held in the upward end of their movement just long enough to allow the depression 39 to approach, whereupon the cam groove 62 operates through the linkage previously described to cause the fingers to move back down to their initial position shown in Figure 8, this backward swing taking place through the depression 39 so that interference with the cylinder is again avoided.

Referring now more particularly to Figure 3, it will be seen that a cam 65 is concentric with and rotatable about the shaft 51, its movement being independent of that of the shaft and being controlled by a cam surface 66 through its effect upon a cam following roller 67 (which parts may be seen in section in Figure 10). A bell-crank 68 pivotally mounted about the axis 69 carries the roller 67 at one end and has its other end connected by a rod 70 to the cam 65. As may be best seen in Figure 2, a follower 71 carried by the shaft 55 engages the cam 65, so that movement of this cam effects opening and closing movement of the fingers 56 to grip and release a sheet. The cam 65 has two arcuate surfaces of different radius, so that one surface opens the feeding fingers and the other closes them. The arrangement of these surfaces and the movement effected by the cam surface 66 is such that when the feeding fingers return to the position shown in Figure 8 they are open, and then after they have reached such position and stopped in it movement of the cam 65 causes them to close upon a sheet in proper position on the feed table. They remain closed during the upward portion of their swing until the forward edge of the paper has been brought under and gripped by the cylinder fingers 41, whereupon they open and stay open during the remainder of their upward swing and their downward return swing. This desired sequence of movements is readily effected by having the cam 65 in one position during upward movement of the fingers, rotating it slightly and keeping it in such rotated position until the feeding fingers have returned to and stopped in the position shown in Figure 8, and then rotating it back to its initial position to close the fingers.

It will be apparent that this feed mechanism will deliver sheets of substantially any size to a cylinder in proper registry with the forward end of the printing section. The sheets may be fed into proper position adjacent the forward edge of the feed table 31 by hand, by any appropriate conventional automatic feed mechanism, or by the delivery mechanism of another similar press; or the sheets may pass directly from the delivery means of one press to the feed fingers of a succeeding press.

Sheet delivery mechanism

As has been mentioned before in the brief initial general description of the press, the sheet delivery mechanism is adapted to take a sheet from the paper-carrying section of the main cylinder and deliver it to a sheet-receiving table, or to the feeding fingers of a succeeding press where two presses are operating on the same sheets. In describing the delivery mechanism reference will be had particularly to Figures 2, 3, 4 and 5.

Referring first to the rear view of the press (Figure 3), it will be seen that an upwardly extending arm 73 is mounted to oscillate about a shaft 74 parallel to the axis of rotation of the main cylinder, this shaft being located low enough that the upper end of the arm 73, and more particularly the shaft 75 rotatably carried thereby, moves substantially in a horizontal plane through the axis of the cylinder, one terminal position of this shaft being as shown in full lines in Figure 3 and the other terminal position of the arm and shaft being as shown in dotted lines in that view. The arm is oscillated back and forth between these positions in synchronism with the rotation of the main cylinder by a connecting rod 76.

As may be better seen in Figures 4 and 5, the shaft 75 extends across the face of the main cylinder 21, parallel and fairly close to it when the arm is at the inner end of its swing. The shaft 75 has mounted on it and rotatable with it sheet gripping elements arranged in general like those of the feeding mechanism, so that they will not be described in excessive detail. It is believed sufficient to say that brackets 77 carry a shaft 78 on which are mounted for rotation therewith gripping fingers 79 adapted to cooperate with a gripping edge. The shaft 75 and the gripping means carried thereby rotate clockwise (speaking with respect to the position shown in Figure 5), traveling somewhat slower than the peripheral speed of the cylinder as they approach the position shown in Figure 5, and then accelerating somewhat to preferably just equal the speed of the cylinder. Cam means for opening and closing the gripping fingers is provided, this being similar in operation to that described in connection with the feeding mechanism, except that the cam is always stationary. The arrangement is such that the fingers 79 are just closing onto the sheet in the position shown in Figure 5, and retain their grip as the gripping elements swing on down and the arm 73 swings across to the dotted line position shown in Figure 3, whereupon the delivery fingers release the sheet. The

connecting rod drive of the arm 73 causes it to slow up and be standing stationary at the ends of its movement where the sheet is gripped and released; and the drive arrangement which effects rotation of the gripping fingers and associated elements on the shaft 75 is so arranged that these parts are traveling at high speed at what may be termed their three o'clock and eight o'clock positions, but shortly thereafter decelerate and travel at a relatively slow speed while the arm is moving from one terminal position to another.

This particular motion is desirable in that it enables the fingers to rotate always in one direction, imposing less strain on the mechanism than an oscillating motion, enables them to be traveling at substantially the same rate of speed as the peripheral speed of the cylinder, yet by slowing them up keeps the fingers well below the shaft as the sheet is being carried across, so that the delivery action is practically a straight line.

This particular motion may be achieved in any desired manner, here being effected by a star wheel drive. As may be best seen in Figure 3, a star wheel 80 rotatably mounted on the arm 73 by the stub shaft 81 is adapted to be driven by a drive wheel 82 having thereon a sector 83 and pins 84 and 85 of the type usually associated with star wheels. The motion of the star wheel 80 is transmitted to the shaft 75 by any appropriate means, here shown as the gears 86, 87, 88 and 89. By the use of a slotted star wheel with a pin and sector drive rapid rotation is effected when the parts are in the position shown in Figure 3, with a very much reduced rate of rotation as the pins are moving into or out of the slots and an even slower rotation (due only to the movement of the arm 73) when the sector is in engagement with any particular arcuate portion of the star wheel.

It will be understood that the delivery mechanism here shown and described by me is particularly advantageous in removing sheets from a rotating cylinder and delivering them flat upon a delivery table or to the feed table or feeding fingers of a succeeding cylinder. That is, this delivery mechanism is an improvement over present conventional chain delivery mechanisms and is adapted for use with cylinder presses of any type, not merely the particular multicolor press which I am here disclosing.

Apparatus for jogging a pile of sheets to keep the sheets properly aligned is also included in my press, and in describing it I have reference particularly to Figures 2 and 5. It will be noted that a square bar 200 extends across the delivery side of the press, this bar serving as a mounting rail on which blocks 201 and 202 are slideably splined so that they can be adjusted toward or away from each other depending upon the width of the sheet of paper being printed. Each block carries a pair of jogging arms, as 203 and 204, carried by an angularly disposed rack 205 engaging a long pinion 206. The fact that this pinion extends parallel to the square mounting bar 200 and for its entire length enables the blocks and racks to be moved to any desired position while maintaining operative relation between the racks and this pinion. The pinion is operated by appropriate drive means synchronized with the main cylinder of the press, so that the jogging arms move back away from the paper pile as each sheet is being printed and delivered to the pile; and then move forward at an angle to line the newly delivered sheet up with the remainder of the pile while the plates are being inked.

The delivery mechanism also includes means, best seen in Figure 5, for lowering the delivery table 35 as the printing progresses. The table is supported at a desired level by a rod 207 threadably engaged in an internally threaded rotatable member 208, this latter being rotated at a slow speed in synchronism with the printing by appropriate means including the gears 209 and the shaft 210 connecting to the drive means of the press. By the use of this arrangement the table is slowly dropped as the sheets are delivered thereto, so that the top of the pile of sheets is always approximately at the same level.

Offset rolls

In describing the construction and operation of the offset rolls 25 and 26 reference will be had particularly to Figures 3, 7, 8 and 10. Referring first to Figure 8, it will be seen that the offset rolls, heretofore merely indicated in general as 25 and 26, are duplicates of each other, and therefore only one will be described in detail.

Describing the roll 25 as representative, it will be seen to comprise a substantially cylindrical metal portion 91 provided with clamping and adjusting means 92, 93 and 94 lying within the arc of its circumference, the whole being rotatable on the shaft 95. The clamping means 92 and 93 are adapted to grip the edges of a blanket 96 of rubber or similar material adapted to transfer the ink from the plates to the paper, manual actuation of the means 94 enabling tightening of the blanket on the operating face of the roll. The outer diameter of the roll and its associated blanket are arranged to be exactly one-third of the outer or effective diameter of the main cylinder with the impression plate or plates in place thereon; and the rolls are geared to rotate in synchronism with and at the same peripheral speed as the main cylinder. The means here shown for accomplishing this comprise a main gear 97 on the main cylinder 21 and a gear 98 attached to the roll 25.

Referring now more particularly to Figure 7, it will be seen that means is provided for moving the rolls 25 and 26 toward and away from the cylinder 21 at desired periods during its revolution. Inasmuch as the means for supporting and moving the rolls duplicate each other only one will be described in detail, that associated with the roll 26 being this time described. The roll is mounted for rotation about the shaft 100, this shaft being supported in a circular end plate 101 rotatable in an annular bearing portion 102 of the frame, the centers of rotation of the shaft 100 and of the plate 101 being eccentric. A lever arm 103 is movable to a limited extent with respect to the circular plate 101 which is adapted to be locked in position with respect thereto by movement of the studs 104 and 105. It will be seen that with a given position of the arm 103 movement of the studs enables initial adjustment of the position of the end of the shaft 100, and thus of that end of the roll 26 with respect to the main cylinder; and that movement of the arm 103 by cam means to be described, by rotation of the plate 101 in its annular bearing 102 of the frame causes movement of the shaft 100, and thus of the roll, toward and away from the cylinder.

The bearing plate 101 is connected to a similar plate 106 in the frame at the other end of the roll, as may be seen in Figure 3, this serving to support the shaft of the roll 26 at its other end and having

associated therewith an arm 107 and adjustment studs 108 and 109. Adjustment of these studs enables adjustment of this other end of the roll, so that it may be properly lined up with respect to the cylinder; and movement of the arm 103 rotates both end members 101 and 106 to effect movement of the roll toward and away from the cylinder. It will be understood that this movement is relatively small, never more than a very few hundredths of an inch, so that it can be accomplished with great precision by the eccentric means just described.

Mounted on the main shaft 22 at one end of the cylinder are a plurality of cams shown in outline in Figure 7 and in cross section at the left side of the shaft in Figure 10. These cams are four in number and are here identified as 110, 111, 112 and 113, although not all of them are associated with the offset rolls, one (113) serving to reset safety mechanism.

A bell-crank 114 is pivoted about a shaft 115 in the frame, carrying a cam following roller 116 at one end and making connection at its other end with a link 117, this link and one arm of the bell-crank 114 operating as a toggle. That is, these two toggle elements are pivotally connected together in their center and the element 117 is pivotally connected at 118 to the arm 103, so that downward movement of the roller 116 (toward the shaft 22) straightens the toggle, causes outward movement of the end of the arm 103 connected thereto, counter-clockwise rotation of the member 101 (speaking with respect to the position shown in Figure 7), and downward movement of the roll 26 into engagement with whatever section of the main cylinder 21 is beneath it at that time. The roller 116 rides on the cam 111, and this has a raised portion completely around it except for the section corresponding to the impression section 23 of the main cylinder. Thus whenever the impression section 23 is beneath the offset roll 26 inward movement of the roller 116 to the lower portion of the cam (the roller always being urged toward the cam surface by a spring) causes the offset roll 26 to move down to pick up ink from this impression section; and whenever the impression section 23 is not under the offset roll 26 the raised portion of the cam 111 holds the roller 116 and the toggle elements in the position shown in Figure 7.

The arrangement in connection with offset roll 25 duplicates this toggle arrangement, the roller 119 engaging the surface of the cam 112 and moving the toggle elements 120 and 121 to move the offset roll down to pick up ink whenever the impression section 24 of the main cylinder is beneath it.

Each offset roll has associated with it separate means for moving the roll down to engage a sheet of paper on the paper section of the cylinder to deliver to it the ink which it has picked up from the impression sections, this arrangement being particularly described in connection with offset roll 26. The previously mentioned toggle elements 114 and 117 are movably connected by eccentric bearings on a bearing member rotatably mounted in the two toggle elements and having integral therewith an arm 122. This arm is rotatable about a stud shaft 123 eccentrically located in a worm gear element 124 in an element 125 connected by a link to a plate 126 adapted to be adjustably fastened in desired position in a guideway in the upwardly extending arm of a bell-crank 127 also pivotally mounted about the shaft 115 and carrying a roller 128 at its other end. This arrangement forms another toggle operated by the roller 128 to rotate the arm 122 and thus vary the relation between the eccentric bearings connecting the previously described toggle including the elements 114 and 117. The arrangement is such that inward movement of the roller 128 (toward the shaft 22) straightens the secondary toggle which then operates and tends to rotate the arm 122 clockwise, this moving the eccentric in such a way as to move the upper end of the arm 103 counter-clockwise, and thus bring the offset roll 26 down toward the main cylinder.

The roll 25 is provided with a similar secondary toggle arrangement operating through an eccentric to change the position between the main toggle links 120 and 121, this secondary toggle being operated by the roller 129, both the rollers 128 and 129 operating on the cam 110. This cam has its depressed portion corresponding to the paper carrying section of the main cylinder, so that as this passes under the offset rolls they are both dropped to transfer their ink to the sheet of paper. That is, the main toggles operate from separate cam surfaces to drop their respective offset rolls into engagement with the impression sections from which they pick up ink; and both of the secondary toggles operate from the same cam surface to drop both rolls into engagement with the sheet on the paper-carrying section of the cylinder.

Rotation of the worm gear element 124 by a worm adapted to be manually rotated by the knob 130 serves to vary the position of the eccentric arm 122, and thus to vary the terminal positions of the offset roll in inner and outer positions. When the main toggle operates to move the offset roll into engagement with the plate it is brought down until it is resting tightly against the cylinder; but where the paper is being printed some provision as to the terminus of the inward movement must be made, since adjustments must be made for different thicknesses of paper. This arrangement enables adjustment, in the particular press I am describing, of about twenty thousandths of an inch with respect to the inner position of the offset roll when it is operated by the secondary toggle. Adjustments for greater thicknesses of paper can be made by removing a mat or thin plate normally underneath the paper on the surface of the paper-carrying section of the cylinder. In order not to throw the relative distances of the secondary toggle parts out of proper relation with respect to each other the adjustment by means of the movable plate 126 is provided, and this plate must be moved whenever the worm gear element 124 is rotated.

Manual and automatic latch means are provided in conjunction with the offset roll operating mechanism to enable the printer to latch these rolls out of action manually if desired, and to automatically keep them from coming down upon the paper section of the cylinder if a sheet of paper is not present thereon. Movement of the small handles 131 and 132 (still referring to Figure 7) clockwise operates through springs (as the spring 133) to move latches 134 and 135 in to engage cooperating shoulders, as 136, on the main toggle arms. The spring connection is used so that if the handle is moved at a time when the latch element will not engage the latch shoulder the force will merely be stored in the spring

until the cam operation has moved the parts into proper latching position; and similarly, if the handle is moved back in the other direction when the offset rolls would otherwise fall into engagement with the cylinder, the pressure between the latch and its shoulder keeps this from taking place until the cam has again assumed the weight of the offset rolls, the spring then moving the latch element to inoperative position.

Automatic means for latching the offset rolls away from the paper section of the main cylinder are provided in the form of a solenoid 137 adapted to be energized by contacts on the feed gripping fingers, so that if no sheet is present when these close a circuit is completed through the solenoid which acts through the lever 138 to trip the bell-crank 139 and rotate it counterclockwise about its shaft 140, the associated linkage being such as to cause it to remain in such position until reset, and to operate through the rods 141 and 142 to rotate the latch elements 143 and 144 into engagement with the cooperating latch surfaces, as the shoulders 145 and 146. These latch the secondary toggles in such position that the rollers 128 and 129 do not drop down, and thus the offset rolls do not drop into engagement with the paper carrying section. As soon as the paper-carrying section has passed, a raised hump 147 in the cam 112 forces the roller 148 out and resets the bell-crank 139 to the position shown in the drawings, unlatching the secondary toggle arrangements. If a sheet is properly supplied to the cylinder on its next revolution the rolls will, therefore, drop down and effect the desired transfer of ink to the sheet; but if no sheet is present the solenoid 137 will again be energized to actuate the latching means.

Dampening and inking mechanism

In describing the dampening and inking mechanism reference will be had particularly to Figures 5, 7 and 11. It will be recalled from the general description given at the beginning of this specification that the dampening mechanism comprises two sets of rolls identified as 27 and 28 (see Figure 5), and the inking mechanism comprises two sets of rolls identified as 29 and 30. The rolls 27 are in engagement with a supply roll 150, the rolls 27 being mounted on levers pivotal about the same shaft 151 on which the supply roll is mounted. Appropriate supply means are arranged to transfer water, where such is desired, from a trough 152 to the dampening rolls 27 through intermediate rolls; and the dampening rolls are moved toward and away from the main cylinder by rotation of their supporting arms about the shaft 150, such rotation being accomplished through rotation of the control shaft 153 connected to these supporting arms by appropriate linkage.

Referring now more particularly to Figure 7, the control shaft 153 will be seen to be connected by a link and a rod 154 to one end of a rigid bent arm 155 pivoted about the shaft 156 carried in the frame of the press, and carrying the roller 157 adapted to operate in engagement with the cam 112, inward movement of the roller 157 when the lowered surface of the cam is beneath it causing the dampening rolls 27 to engage the impression section 24 of the cylinder, these dampening rolls never engaging any other part of the cylinder. The other set of dampening rolls 28 are similarly mounted and actuated, these latter rolls being actuated by engagement of the roller 158 with the cam 111. It will be noted that in the position of the parts shown in Figure 7 the lowered section of the cam 111 is beneath the roller 158, this roller having moved toward the shaft 32 and the dampening rolls 28 having thereby been brought into engagement with the impression section 23 of the cylinder beneath them.

As in connection with the mechanism for operating the offset rolls, manual means for latching the dampening rolls out of action is provided in the form of the two small hand levers 159 and 160. These operate through springs and rods, when desired, to move the latch elements 161 and 162 into engagement with the cooperating shoulders 163 and 164. These dampening rolls are provided to enable use of plates of the lithographic type; and where such plates are not used the dampening rolls are latched out of action and only the inking sets operate.

Now referring back to Figure 5, it will be seen that there are two duplicate inking sets comprising the rolls 29 on the one hand and the rolls 30 on the other hand. The set comprising the inking rolls 30 is shown in more detail in Figure 11, and its parts will be described as representative of both sets. In this Figure 11 the cylinder has been rotated somewhat to bring the lower portion of the cam 111 beneath the roller 165, so that the rolls 30 are shown in their operative position inking the impression section 23 of the main cylinder. The inking rolls 30 and distributing rolls 166 are all mounted in an inking set frame 167 slideable toward and away from the main cylinder in the guide 168 mounted on the frame of the press. Toggle elements 169 and 170 pivotally connect the inking roll frame (at 171) to a shaft 172 carried by the main frame of the press. When the toggle elements 169 and 170 are in straight or aligned position, as shown in Figure 11, the inking set frame is in its innermost position in the guide member 168 and the rolls 30 are in engagement with the appropriate impression section of the main cylinder; whereas when the toggle elements are bent, as shown in Figure 7, the inking set frame 167 is moved to the right and the rolls 30 are out of engagement with the main cylinder. The roller 165 is carried on one end of a bell-crank 173 pivotally mounted on the shaft 174 and connected by adjustable linkage 175 to the center connection of the toggle elements 169 and 170. A spring 176 tends to urge these elements straight and to keep the roller 165 in contact with its cooperating cam surface.

Now referring more particularly to Figure 7, the other inking set is similarly arranged and is moved toward and away from the main cylinder by the action of the roller 177 in its engagement with the cam surface 112. There is also provided in conjunction with these inking mechanisms hand levers 178 and 179 operating through springs and rods to move latch elements 180 and 181 into a position engaging cooperating shoulders and latching the inking sets out of operation when desired. If it is desired to do dry offset single color printing with this press it will be apparent that both dampening rolls, one offset roll and one inking set could be latched out, and the press would then operate with one impression section, one inking set, and one offset roll, or if single color lithographing were to be done, one set of dampening rolls, one inking set, and one offset roll would be latched out and the press would operate with the others.

Now referring back to Figure 5, it will be seen that ink is supplied from a fountain 182 in con-

ventional manner by a fountain roll 183, and is transferred from the fountain roll to the distributing roll by a roll 184 which is moved back and forth between the fountain roll 183 and the first distributing roll 186 by the action of the connecting rod 185. Adjustment of the rate of rotation of the fountain roll 183, or of the dwell of the roll 184 in contact therewith enables regulation of the amount of ink supplied to the first of the distributing rolls 186 and thus to the inking rolls 30, conventional mechanism for this purpose being shown in Figure 11.

The drive arrangement

Referring now more particularly to Figures 1, 2 and 3, it will be seen that a main drive motor 187 operates through appropriate reduction gearing, drive chains, and the like, to drive all of the various parts of the press in the desired synchronism. The shaft 188 is driven by the motor 187 through reduction gearing, this shaft operating through the belt 189 to drive the shaft 190. It will be noted that this shaft 190 has hand wheel 191 geared to one end of it, so that hand movement of the press may be effected when it is being set up or cleaned. It is not believed necessary to follow all of the drive connections in detail, it being apparent that different arrangements could be used so long as the same relative motions were obtained. It is believed sufficient to call attention particularly to Figure 3, and to state that the shaft 190, through appropriate connections, effects rotation of the main cylinder, which in turn effects rotation of the offset rolls and, through rotation of the cam element 63, effects movement of the delivery arm 73 and of the sheet-feeding mechanism; that the shaft 190 drives the inking rolls at a desired rate of speed and through appropriate linkage, such as the arm 195, and a similar arm 192 for the other inking set, effects transfer of ink from the fountain to the distributing rolls; and that it effects rotation, through the principal gears 62 and 193, of the gripping elements of the sheet delivery mechanism, and through other gears, of the sheet jogging mechanism on the delivery side.

In conclusion, it may be stated that I have devised and am here disclosing and claiming a multicolor press having many improvements over those now known and used. My press is very flexible, and may be used for a number of different types of printing, in either single or double color setups; and it is adapted to feed directly into a succeeding similar press where work is desired having more than two different applications of ink thereto.

While I have described and shown certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims.

I claim:

1. Sheet handling apparatus of the character described, including: a member pivotally mounted at one end; means for oscillating the member; a sheet gripping element rotatably mounted at the other end of the member; and means for continuously rotating the element and for causing it to grip a sheet and release it at predetermined positions.

2. Apparatus of the character described for delivering sheets from the rotating cylinder of a press, including: an arm pivotal about an axis parallel to that of the cylinder; means for oscillating the arm about said axis to move its other end toward and away from the cylinder; sheet gripping means rotatably mounted at the last mentioned end of the arm; and means for continuously rotating the gripping means and for causing it to grip a sheet and release it at predetermined positions of the member.

3. Apparatus of the character described for delivering sheets from the rotating cylinder of a press, including: an arm pivotal about an axis parallel to that of the cylinder; means for oscillating the arm about said axis to move its other end toward and away from the cylinder; a shaft carried by the last mentioned end of the arm, said shaft being parallel to the axis of movement of the arm; a plurality of sheet gripping elements rotatably carried by the shaft; and means for continuously rotating the elements and for causing them to grip a sheet and release it, this last mentioned means being synchronized with the means for oscillating the arm and with the rotation of the cylinder.

4. Apparatus of the character claimed in claim 2, wherein the said other end of the arm moves substantially in a horizontal plane through the axis of the cylinder, whereby a sheet may be readily delivered from one printing cylinder to another.

5. Apparatus of the character claimed in claim 19, wherein the peripheral speed of rotation of the gripping elements is about equal to that of the cylinder when the sheet is gripped, but is substantially slower immediately thereafter.

6. In a press of the character described having a rotatable printing cylinder, sheet feeding and delivery means enabling one such press to work directly into another such press for multicolor printing, this means including: a feeding table on one side of the cylinder and lying approximately in a horizontal plane through the axis of the cylinder; means for feeding sheets on said table to the cylinder; an arm on the other side of the cylinder pivotal about an axis parallel to that of the cylinder, the other end of the arm moving substantially in a horizontal plane through the axis of the cylinder; means for oscillating the arm to move said other end toward and away from the cylinder; and sheet gripping means on said other end adapted to grip a sheet on the cylinder and to release it when the arm is a substantial distance from the cylinder, whereby a sheet may be readily delivered from the press to the feed table of an adjacent similar press.

7. In a press of the character described having a rotatable cylinder having a paper carrying section and at least two circumferentially spaced depressions in its periphery, at least one of said depressions being at the front of said paper carrying section, sheet feeding means including: a source of sheets adjacent the cylinder; a shaft parallel to that of the cylinder; sheet gripping means rotatably mounted on said shaft, the arc of movement intersecting that of the periphery of the cylinder; and means for rotating the cylinder, oscillating said gripping means, and causing it to grip and release a sheet, these movements being synchronized to cause the gripping means to grip a sheet, swing upwardly through one of said depressions to feed the sheet to the cylinder, then swing downwardly through another of said depressions to return to initial position.

8. Apparatus of the character claimed in claim 7, wherein said cylinder carries, in said depres-

sions, means for gripping the end of a plate adapted to lie along a portion of said periphery.

9. In a press of the character described having a rotatable cylinder having at least one impression section and a section adapted to receive the sheet to be printed and an offset roll for transferring ink to the sheet being printed, throw-off means for the offset roll including: toggle means for cyclically moving the roll toward and away from the impression section; and separate means for cyclically moving the roll into and out of engagement with the sheet.

10. Apparatus of the character claimed in claim 9, wherein the last mentioned means comprises an eccentric.

11. In a press of the character described having a rotatable cylinder having at least one impression section and a section adapted to receive the sheet to be printed and an offset roll for transferring ink to the sheet being printed, throw-off means for the offset roll including: toggle means for cyclically moving the roll toward and away from the impression section; movable eccentric means connecting one of the toggle elements to the roll; and means for cyclically moving the roll into and out of engagement with the sheet.

12. Apparatus of the character claimed in claim 11, including means for adjusting the terminals of the movements of each of said means.

13. A press of the character described, including: single plate means mounted on the cylinder and providing two printing sections with registering points adapted to receive different inks and spaced a predetermined portion of the circumference of the cylinder; means for inking one of said sections; and means for inking the other of said sections with a different ink.

14. A press of the character described, including: single plate means mounted on the cylinder and providing two printing sections with registering points adapted to receive different inks and spaced 120° apart circumferentially of the cylinder; means for inking one of said sections; and means for inking the other of said sections with a different ink.

15. In a press having a rotatable cylinder having at least two impression sections and a section adapted to receive the sheet to be printed, separate means for inking each of the impression sections, and separate offset rolls for transferring the ink from each of said sections to the sheet being printed, throw-off means including: a cam for bringing one inking means and one roll into engagement with one impression section; another cam for bringing another inking means and roll into engagement with another impression section; and still another cam for bringing all of the rolls into engagement with a sheet being printed.

16. In a press having a rotatable cylinder having at least two impression sections and a section adapted to receive the sheet to be printed, separate means for inking each of the impression sections, and separate offset rolls for transferring the ink from each of said sections to the sheet being printed, throw-off means including: individual actuating means, including cam means, associated with each impression section for effecting inking of such section and transfer of its impression to its cooperating offset roll; and separate actuating means for causing all of said rolls to deliver the impressions to the sheet being printed, this actuating means including cam means, a cam follower, and a motion reducing connection between the cam follower and the rolls.

17. In a press of the character described having a rotatable cylinder having at least two impression sections adapted to be supplied with different inks and a section adapted to receive the sheet to be printed, each section comprising an equal portion of the circumference of the cylinder; offset rolls for transferring the ink from said impression section to the sheet being printed, the number of offset rolls being the same as the number of impression sections, means individual to each of said impression sections for inking such sections, and means individual to each of said impression sections for dampening such sections, actuating means including: a cam individual to each of said impression sections for effecting operation of the cooperating dampening and inking means and transfer of the impression to the cooperating offset roll; and a separate means for causing all of said rolls to deliver the impressions to the sheet being printed, this means including a separate cam, a cam follower, and a motion reducing connection between the cam follower and the rolls.

18. Apparatus of the character claimed in claim 17, wherein each of said cams has an operative section subtending the same angle as the section with which it is associated.

19. Apparatus of the character claimed in claim 16, wherein each of said cams has an operative section subtending the same angle as the section with which it is associated, the cams are all concentric with and rotatable with said cylinder, and the operative sections of the cams are all spaced similarly with respect to their respective cylinder sections.

20. In a press of the character described having a rotatable cylinder having two impression sections adapted to be supplied with different inks and a section adapted to receive the sheet to be printed, each section comprising an equal portion of the circumference of the cylinder, two offset rolls, one for transferring the ink from each of said impression sections to the sheet being printed, and means for rotating the cylinder and rolls, throw-off means including: three concentric cams rotatable together with said cylinder; motion reducing means actuated by the first of said cams for moving one roll toward and away from one of the impression sections; motion reducing means actuated by the second of said cams for moving the other roll toward and away from the other impression section; and motion reducing means actuated by the third of said cams, and distinct from both of the two last-mentioned means, for moving both rolls toward and away from the sheet receiving section.

21. Apparatus of the character claimed in claim 20, wherein each roll has toggle means and eccentric means associated therewith and operable to move it toward and away from the cylinder, one of these moving means being operated by one of the first two cams and the other by the third cam.

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