

May 12, 1936.

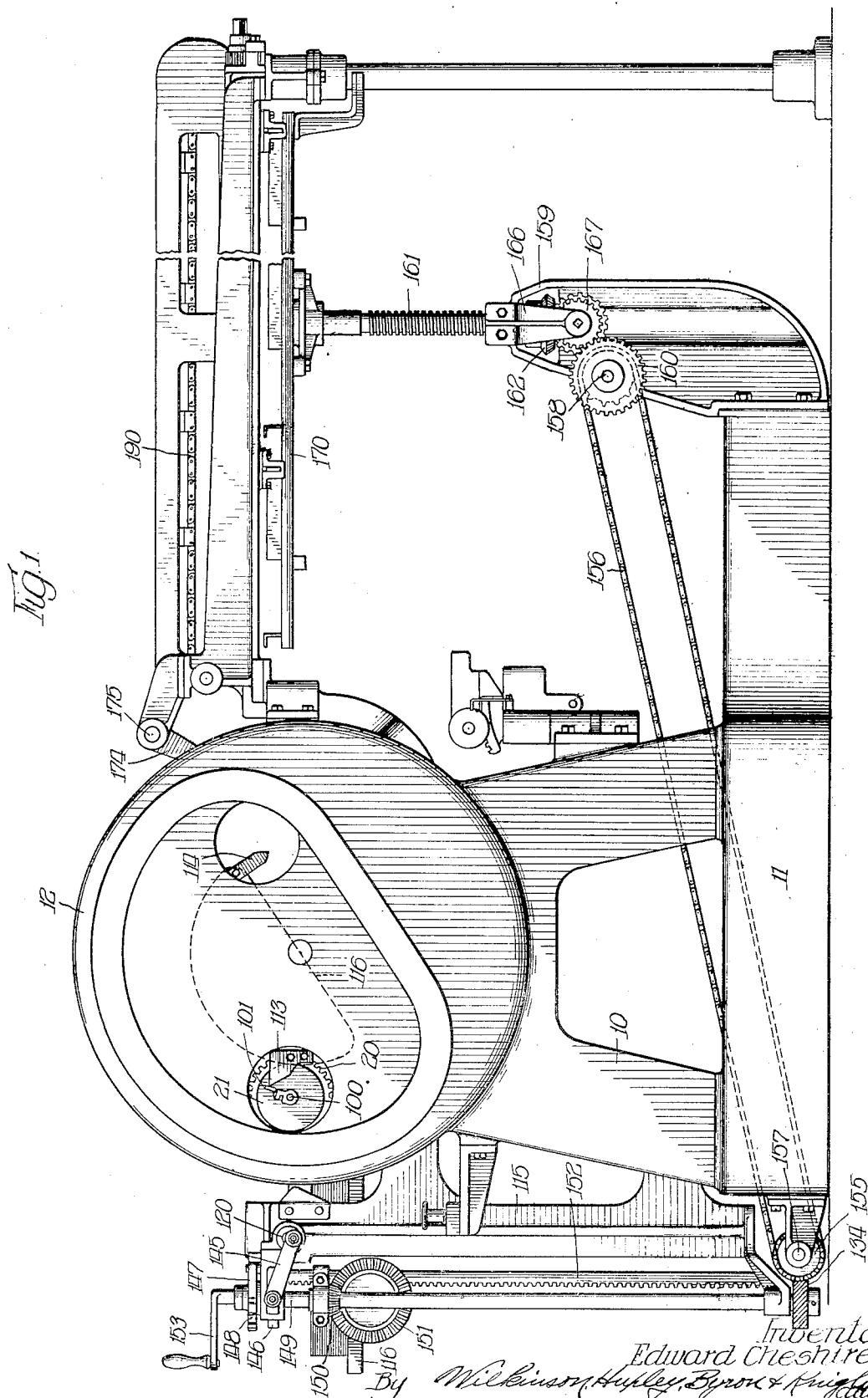
E. CHESHIRE

2,040,686

PLANETARY PRINTING PRESS

Filed April 8, 1931

6 Sheets-Sheet 1



May 12, 1936.

E. CHESHIRE

2,040,686

PLANETARY PRINTING PRESS

Filed April 8, 1931

6 Sheets-Sheet 2

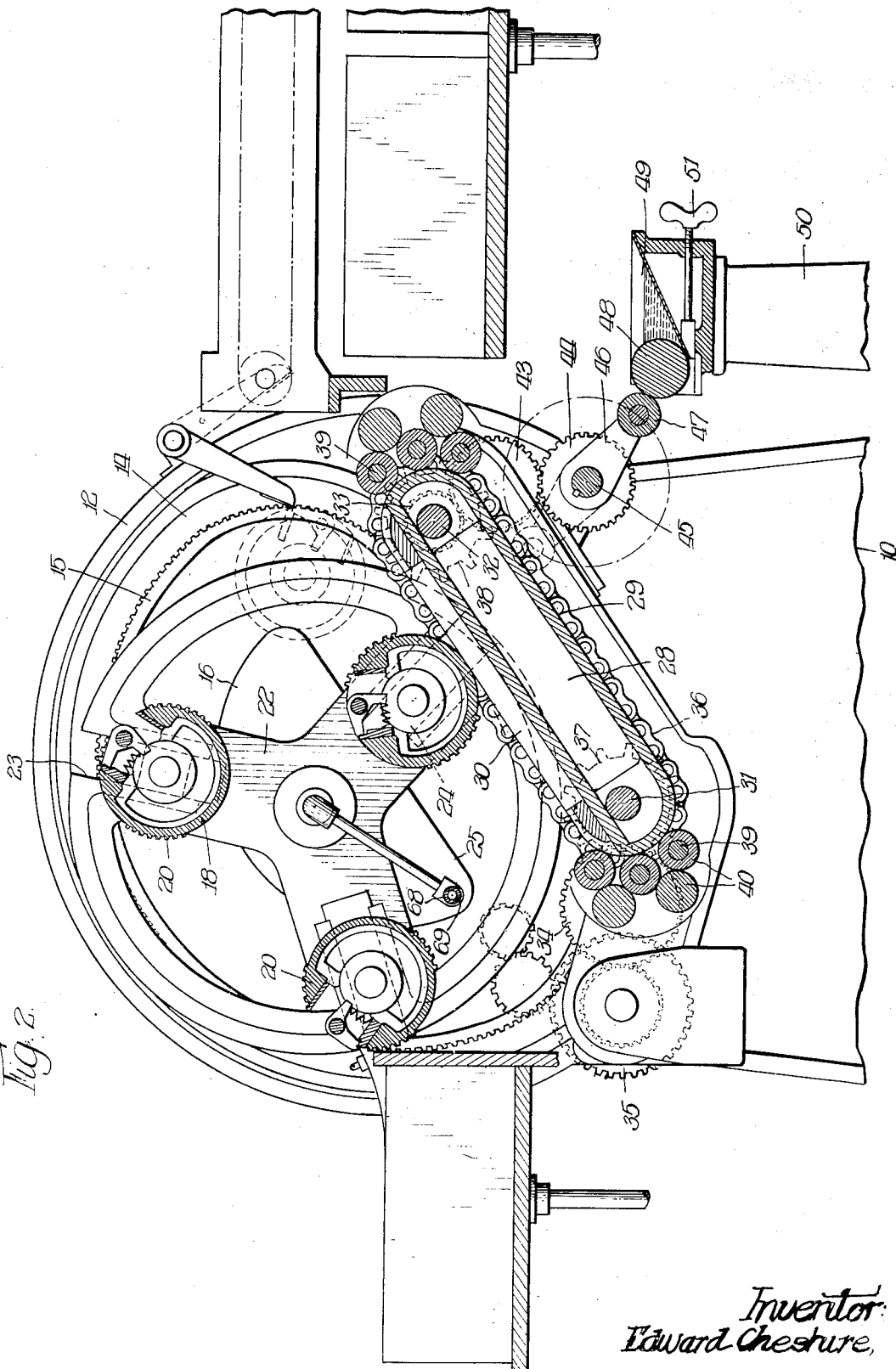


Fig. 2.

Inventor:
Edward Cheshire,

By Wilkinson, Huxley, Byrom & Knight

May 12, 1936.

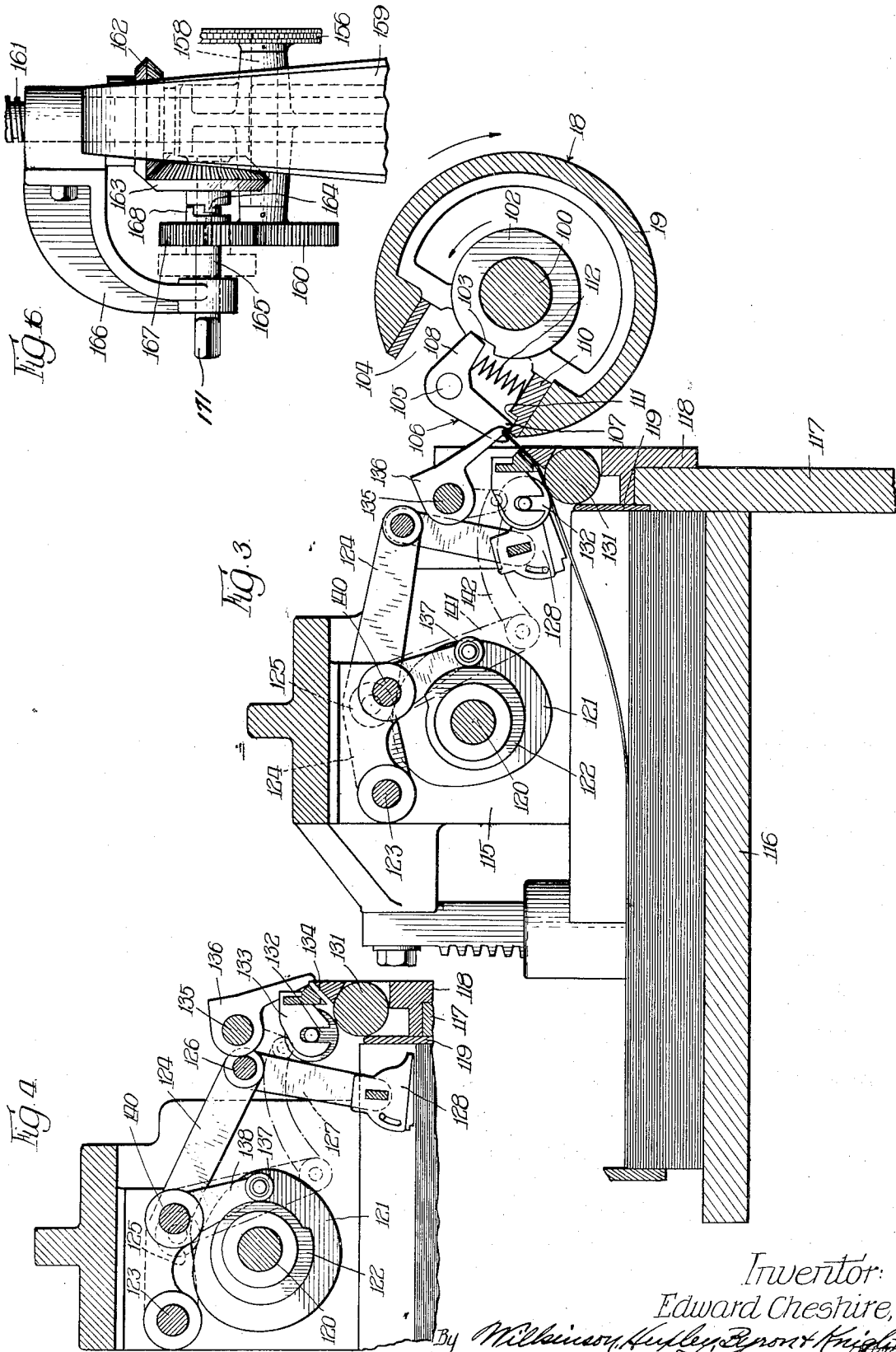
E. CHESHIRE

2,040,686

PLANETARY PRINTING PRESS

Filed April 8, 1931

6 Sheets-Sheet 3



Inventor:
Edward Cheshire,
Lutley, Bynon & Knight
attys.

May 12, 1936.

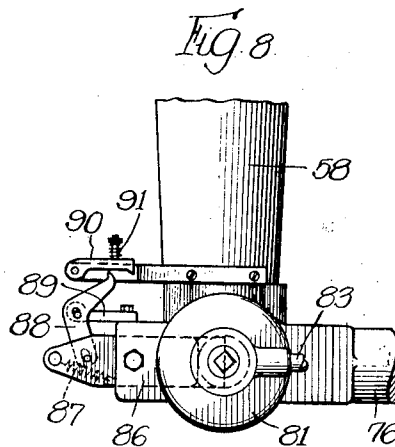
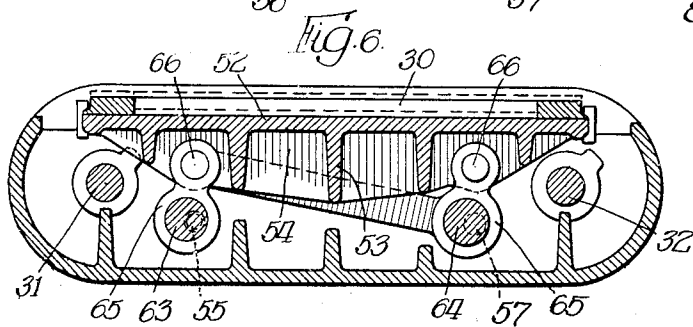
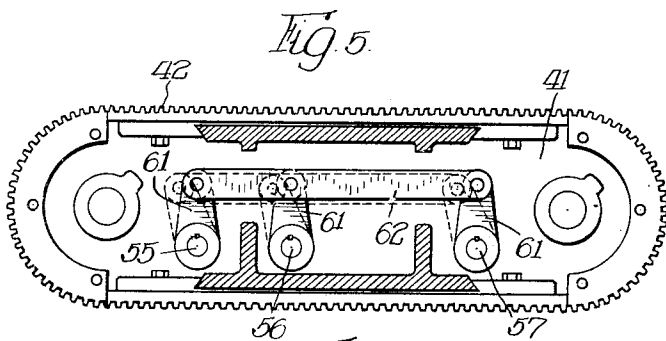
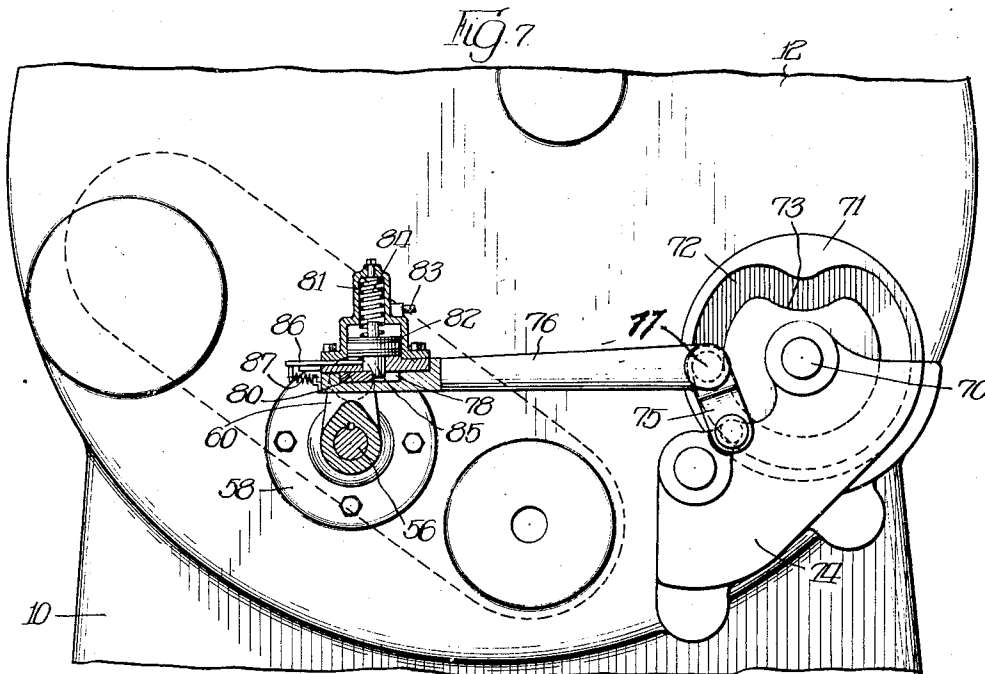
E. CHESHIRE

2,040,686

PLANETARY PRINTING PRESS

Filed April 8, 1931

6 Sheets-Sheet 4



Inventor:
Edward Cheshire,

By *William H. Hubby, Byron & Knight*

May 12, 1936.

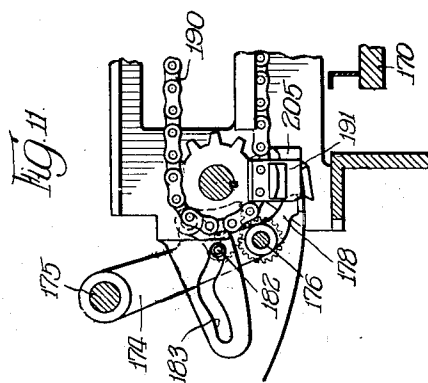
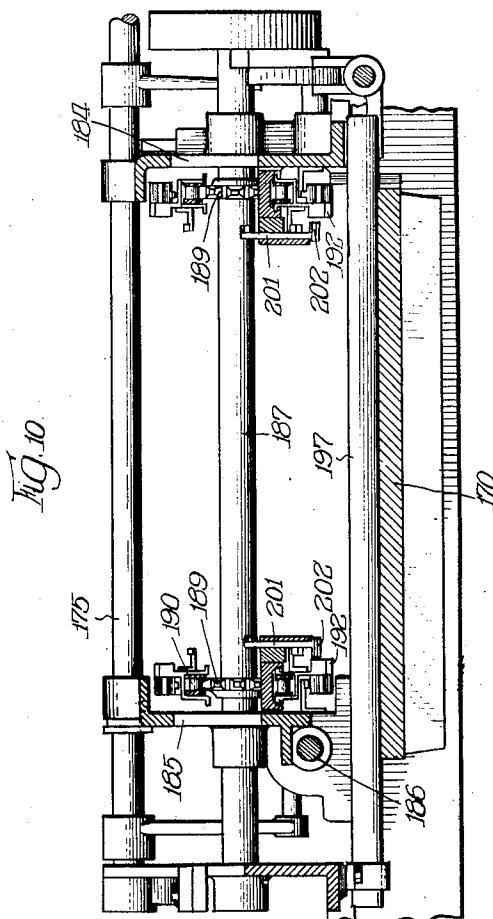
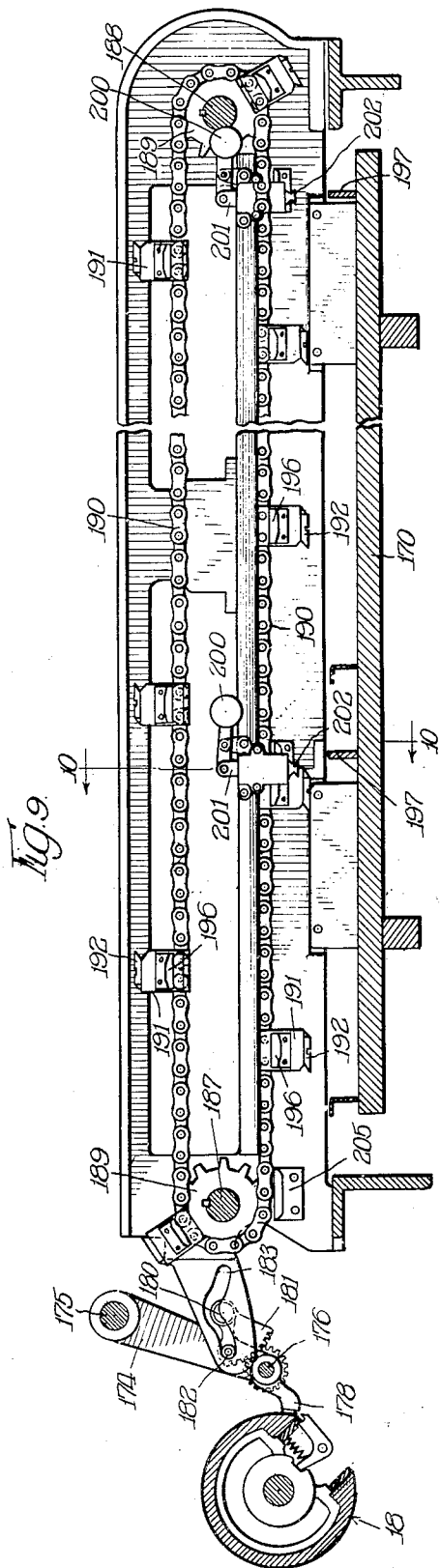
E. CHESHIRE

2,040,686

PLANETARY PRINTING PRESS

Filed April 8, 1931

6 Sheets-Sheet 5



Inventor:
Edward Cheshire,
By *McKinstry, Hulley, Byron & Knight*

May 12, 1936.

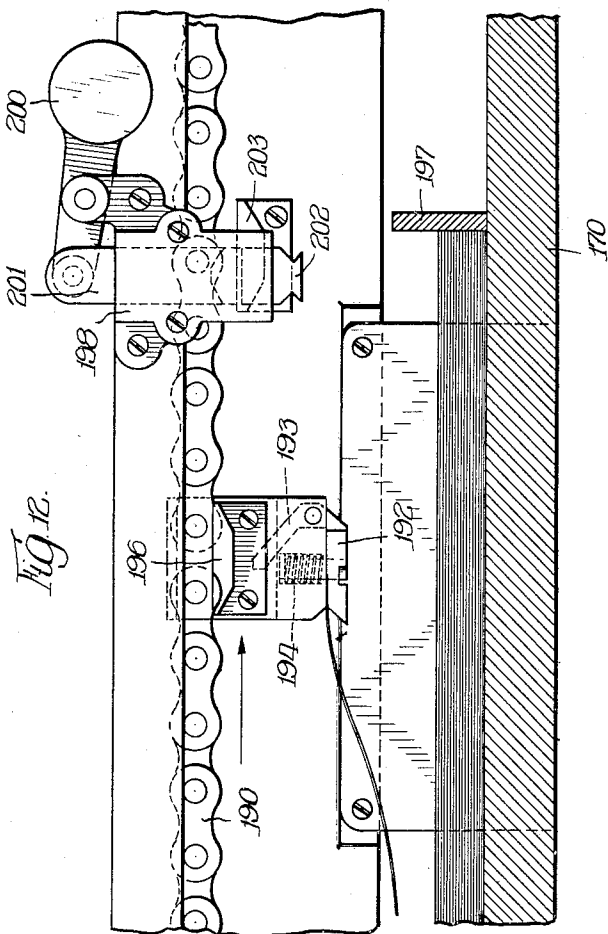
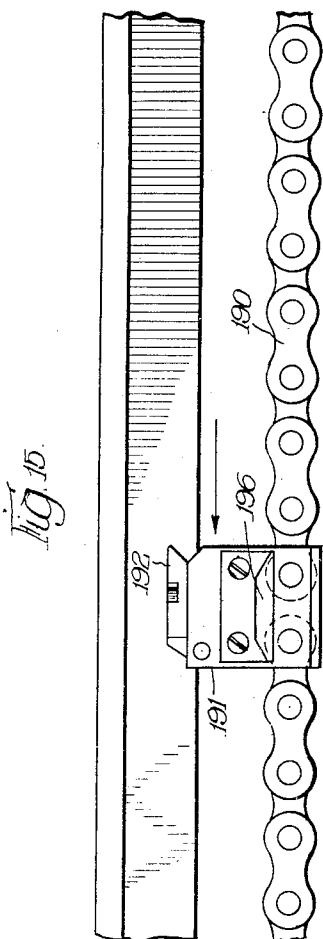
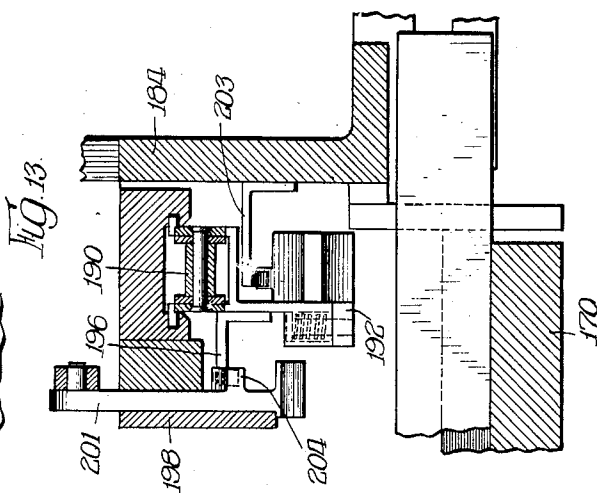
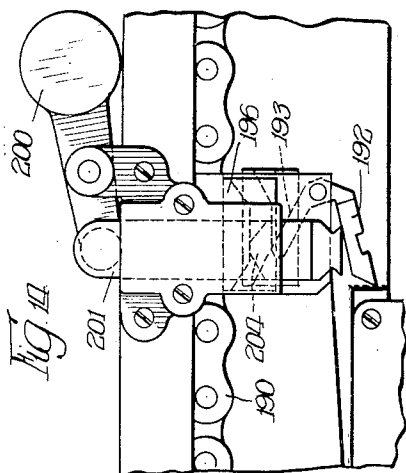
E. CHESHIRE

2,040,686

PLANETARY PRINTING PRESS

Filed April 8, 1931

6 Sheets-Sheet 6



Inventor:
Edward Cheshire,
By *Wilkinson, Hupley, Byron & Knight*
attys

UNITED STATES PATENT OFFICE

2,040,686

PLANETARY PRINTING PRESS

Edward Cheshire, East Cleveland, Ohio, assignor
to Miehle Printing Press & Manufacturing
Company, Chicago, Ill., a corporation of Illi-
nois

Application April 8, 1931, Serial No. 528,500

37 Claims. (Cl. 101—270)

The invention relates to the art of printing presses and has reference more particularly to a planetary type of printing press employing a plurality of impression cylinders adapted to travel in a continuous path.

An object of the invention is to provide an improved type of planetary press having sheet registering means, which will function to accurately register a sheet on a certain cylinder with relation to the registered position of a sheet on any other cylinder. The construction permits the sheets to be run through the press in perfect register a plurality of times for process, i. e. multi-color work, making it unnecessary to feed a sheet to the same impression cylinder on which it has received its previous impression.

Another object of the invention is to provide novel feeding mechanism having means for positively controlling the feeding of a sheet of paper from the time it is removed from the pile until it is taken over by the sheet holding means of an impression cylinder.

Another object is to provide novel feeding mechanism having rocking gates adapted to guide the leading edge of the sheet being fed and to simultaneously align the edge and present the sheet to the cylinder grippers.

A yet further object is to provide improved mechanism for automatically moving the type bed out of printing relation with the cylinders when the latter fails to take a sheet to be printed.

Yet another object is to provide novel means for automatically raising the feed table and correspondingly lowering the delivery table as the stock is transferred from one to the other.

Another object is to provide novel delivery mechanism which will function to receive the printed sheets from the impression cylinders and automatically deposit the same in their respective receptacles, according to the cylinder from which the sheet was received.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation as will be more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings, which illustrate an embodiment of the invention and wherein like reference characters are used to designate like parts—

Figure 1 is an elevational view of the assembled press including the feeding and delivering mechanism, the same being constructed in accordance with the present invention;

Figure 2 is a transverse sectional view taken

substantially through the center of the press and showing the association of the impression cylinders with the printing bed and inking mechanism;

Figure 3 is a sectional view showing the construction of the feeding mechanism and the impression cylinders with the parts in operative position;

Figure 4 is a sectional view of the feeding mechanism with the parts in position for lifting a sheet of paper from the stack;

Figure 5 is a transverse sectional view taken through the printing bed;

Figure 6 is a transverse sectional view of the bed shown in Figure 5, showing the eccentrics for raising and lowering the bed plate;

Figure 7 is an elevational view, parts being shown in section of the tripping mechanism for the printing bed;

Figure 8 is a detail plan view of the same;

Figure 9 is a sectional view showing the delivery mechanism;

Figure 10 is a sectional view taken along the plane indicated by line 10—10 of Figure 9;

Figure 11 is a detail sectional view showing the position the delivery arms and shoes assume in presenting the printed sheet to the endless conveyor;

Figure 12 is an enlarged fragmentary elevational view showing the paper engaging members on the conveyor and the counterweight stops associated with the same;

Figure 13 is an end view of the parts shown in Figure 12;

Figure 14 is a fragmentary elevational view showing the parts in engagement to deliver the printed sheet to its proper receptacle;

Figure 15 is a fragmentary elevational view of the endless conveyor with paper engaging member secured thereto; and

Figure 16 is a fragmentary end view showing the operating mechanism for raising and lowering the delivery table.

More particularly describing the invention as herein illustrated, the printing mechanism is shown supported within spaced side frames 10, 10, mounted upon a base 11, the frames at their upper end formed to provide circular housings 12, 12, within which are located the planetary gears 14, 14 and the planetary cams 15, 15, the latter being located adjacent and to the outside of the gears. In alignment with each planetary cam 15 and also situated in each of the housings 12 is a cam plate 16, having a contour conforming to the planetary path of the cams 15. Adapted to rotate within the path formed by the cams 55

15 and 16 are a plurality of impression cylinders 18 having trunnions integrally formed on each end, to which are suitably secured gears 20, adapted to mesh with the planetary gears 14 respectively. Cam wheels 21 are also located on each trunnion adjacent the gears 20 and to the outside thereof, being thus situated in alignment with and engaging both of the cams 15 and 16. The travel taken by the cylinders therefore results from the contour of the cams 15 and 16, while the rotation of the cylinders in their travel is caused by the gears 20 meshing with the planetary gears 14.

For suitably spacing the cylinders 18 and operatively associating the cylinders with each other a driving wheel or spider 22 is provided, rotatably mounted at substantially the center of one of the housings 12 and having slots 23 formed therein for receiving the slidable blocks 24. The trunnion of each cylinder, located adjacent the driving wheel 22, passes through the blocks 24 and thus rotation of the wheel causes the cylinder to travel in the planetary path provided for the same. Part of the cams 15 and 16 are provided with flat portions 25 forming a substantially straight travel for the cylinders over a printing bed, to be more fully described, and during this travel it will be seen that the blocks 24 slide inward towards the center of the driving wheel working outward again during the arcuate portion of the travel of the cylinders. It is to be understood that the driving wheel 22 is suitably driven through gearing from an electric motor or other form of power, the construction employed being common and well known in the art of printing presses and thus omitted for the sake of clearness.

The printing bed for supporting a printing form, best shown in Figures 2, 5 and 6, is indicated by numeral 28 and is provided with a flat surface 29 on its lower side forming a distributing surface and an opening 30 opposite thereto for receiving a printing form. Shafts 31 and 32 are rotatably journaled in the side frames of the bed with shaft 31 extending through and beyond one of the main frames 10 for receiving a suitable gear wheel 33, the gear being connected to the source of power through gears 34 and 35 for driving the inking mechanism, to be now described. Located at the respective sides of the printing bed 28 are endless chains 36 adapted to pass over sprockets 37 and 38 keyed to shafts 31 and 32, the chains being provided with means for journaling the shafts 39 carrying the inking rollers 40. Each side member 41 of the printing bed 28, the members serving to rigidly support the bed in the side frames 10, has its periphery formed to provide gear teeth 42, the teeth adapted to have meshing therewith pinions keyed to shafts 39 so that travel of the inking rollers around the printing bed will impart positive rotation to the rollers, as is well known in printing press construction. Gear 33 on shaft 32 meshes with an intermediate gear 43, in turn meshing with gear 44, keyed to shaft 45 for imparting rotation to the latter in timed relation to the rotation of shaft 32. Also keyed to shaft 45 is a crank arm 46 to which is rotatably mounted the ink ductor roller 47, adapted to have contacting engagement with the fountain roller 48 associated with the ink fountain or reservoir 49. Support 50 carries at a suitable height the reservoir, and adjusting screws 51 are provided for regulating the ink supply as is well known in the construction of printing presses.

The inking rollers 40 are caused to travel around the printing bed 28, one set of rollers passing over the printing form and thus supplying ink thereto in advance of each impression roller 18. The second set of rollers simultaneously engages the distributing surface 29 receiving ink therefrom, the same having been deposited by ductor roller 47 which alternately contacts with roller 48 and surface 29.

The printing bed is provided with a movable bed plate 52 for supporting the printing form, Figure 6, the plate having depending ribs 53 and transverse webs 54. Rotatably mounted in side members 41 are a plurality of shafts 55, 56 and 57, shaft 56 extending through side frames 10 and support 58 secured to the frame and having keyed thereto the bifurcated rock lever 60. Suitably secured to shafts 55, 56 and 57 are arms 61 pivotally connected at their upper end by the connecting member 62 so that rocking of shaft 56 will be imparted to shafts 55 and 57 respectively. Integral with shafts 55 and 57 are eccentrics 63 and 64, having mounted thereon the members 65, the latter being pivotally connected to the bed plate 52 by shafts 66 passing through the webs 54 of the bed.

The rocking of shaft 56 is controlled by the feeding of a sheet of paper to the impression cylinders 18 and, as indicated above, rocking motion of said shaft is imparted to shafts 55 and 57 to cause rotation of the eccentrics 63 and 64, imparting an upward or downward movement to the members 65, and thus to the bed plate 52, depending on the direction of rotation of said eccentrics. Upon the feeding of a sheet of paper to one of the impression cylinders the bed plate is maintained in raised position or on impression. In the event a sheet is not fed to the cylinder the mechanism to be next described causes rotation of the shaft 56 and eccentrics 63 and 64 to trip the bed off impression, i. e. to lower the bed plate 52.

As shown in Figure 2, a tube 68 is located within the spaced side frames 10 in position adjacent an impression cylinder after the same has passed the feeding mechanism in order to receive a sheet for printing. The tube is suitably connected to a suction pump, not shown, the air being drawn in through one or more openings 69 until a sheet of paper carried by an impression cylinder 18, in passing the tube closes the opening 69 preventing air from being drawn through the same and thereby establishing a vacuum in the system. Secured to and driven by shaft 70 is a cam wheel 71, Figure 7, having a cam race 72 formed therein, the contour of the race being substantially circular except for a dip 73. Pivoted to support 74, secured to side frame 10 is a bifurcated arm 75 having in turn pivoted thereto the connecting arm 76 by means of stud 77, the stud projecting into the cam race 72. The left end of connecting arm 76 is slotted at 78 for receiving the member 80 connecting the arm of the bifurcated rock lever 60. Secured to arm 76 over the slot 78 is a cylinder 81 having piston 82 operating therein and connected to the suction pumps and to tube 68 through the hose connection 83. The piston is normally maintained upon its seat by spring 84 so that the plunger 85, provided on said piston, will extend into the slot 78. Plate 86, slidably mounted between arm 76 and cylinder 81, is spring pressed by spring 87 into contact with plunger 85, but is withdrawn from engagement with the pin by dog 88 pivoted to support 89, in turn secured to the connecting

arm 76. The stationary pawl 90 is urged by spring 91 in the direction of the dog to engage the hooked end of the same.

In explaining the operation of the printing bed trip mechanism, it will be assumed that the arm 76 has reached its extreme left hand position, as viewed in Figure 7, so that upon continued rotation of the cam wheel 71 the dip 73 will cause reciprocation of the arm 76 to its extreme right hand position. It is further assumed that a sheet has not been fed to the respective cylinder, consequently the openings 69 remain open so that the spring 84 predominates over the air pressure in the system to maintain piston 82 upon its seat thus locating plunger 85 within the slot 78. Any further rotation of cam wheel 71 will again reciprocate the arm 76 to the left and as plunger 85 is in position to engage member 80, the reciprocation of the arm will accordingly rock the lever 60 to rotate shaft 56 and the eccentrics 63 and 64, as described, to lower the bed plate off impression. Thus the impression cylinder travels over the printing form but does not contact with the same, since no paper has been fed to the cylinder. The printing bed can be considered as tripped upon the failure of the feeding mechanism to feed to the cylinder a sheet of paper. Rotation of wheel 71 will in time cause dip 73 to retract arm 76 causing rocking of lever 60 to the right and rotation of the eccentrics in order to raise the printing bed on impression. Let it be assumed that the feeding mechanism has properly fed to an impression cylinder a sheet of paper and that the same has closed openings 69, whereupon the vacuum created in the system and communicated to cylinder 81 predominates to counteract pressure of spring 84, causing lifting of piston 82 and thus plunger 85. Reciprocation of arm 76 to the left as previously described will not in this instance rock the lever 60, since the member 80 will have free movement in slot 78. The bed thus remains up on impression causing a printing of the sheet as the cylinder rolls over the form.

When the suction in the system lifts piston 82 off its seat, withdrawing from the slot 78 plunger 85, it will be seen that plate 86, spring pressed towards the right, will locate its inner end under the shoulder formed on plunger 85, maintaining the latter in raised position irrespective of the intensity of the vacuum in the cylinder 81. As arm 76 is reciprocated to the right, dog 88 attached to the arm will be positioned to the right of pawl 90. Subsequent movement of the arm to the left causes the dog to contact the pawl rotating the former in clockwise direction to withdraw the plate 86 from its location under plunger 85, thus allowing the pin to drop should the air pressure in the cylinder permit the piston to do so. If at the instant when the plunger is liberated by the operation of the parts above described a sheet of paper carried by an impression cylinder has closed the openings 69, then the vacuum established in the cylinder 81 will hold the piston and plunger in raised position. However, should the openings not be closed then the plunger will drop into slot 78 and further movement of arm 76 to the left will function to rock lever 60 in order to lower the printing bed as described.

Extending axially of each impression cylinder 18, Figure 3, is a shaft 100, rotatably mounted in the cylinder and projecting through and beyond one of the trunnions of the same, as shown in Figure 1, to the projecting end of which is secured a rocker arm 101. Secured to the shaft

100 so as to rotate therewith and extending the length between the cylinder heads or bearers is the tubular gripper actuating shaft 102 provided with a groove 103 situated substantially central of the cylinder gap 104 formed to extend longitudinally of the cylinder shell 19. Fixedly secured to the respective bearers of each cylinder and situated in gap 104 is a gripper shaft 105 upon which is slidably mounted a plurality of cylinder grippers 106, each having a paper engaging shoulder 107 and a shank 108, the latter being located to project into the groove 103 in the gripper actuating shaft 102. At the side of the gap 104 adjacent the paper engaging shoulder 107 of the grippers is a gripper bar 110, the upper surface of which terminates substantially flush with the surface of the cylinder and which is provided with a surface 111 cooperating with the shoulder 107 on the grippers. A spring 112 is located between the bar 110 and gripper shank 108 to maintain the grippers in closed position and it will be seen that, to cause opening of the grippers, it is only necessary to rotate shaft 102 in the direction of the arrow, whereupon the grippers will be lifted from engagement with bar 110 to permit the insertion of a sheet of paper to be printed or to release a sheet after it has received an impression. The opening and closing of the grippers is accomplished during travel of the cylinders in their planetary path by the tripping members 113 and 114, Figure 1, secured to the cam plate 16. Tripping member 113 is engaged by the rocker arm 101 during downward travel of the cylinder to open the grippers for receiving a sheet from the feeding mechanism, the grippers automatically closing as arm 101 rides off the member. At the completion of the printing operation the cylinders begin their upward travel past the tripping member 114, and thus arm 101 in a similar manner strikes said member to cause opening of the grippers, at which instant the paper is removed by delivery mechanism, as will be hereinafter described.

The feeding mechanism is mounted within spaced frames 115, (see Figure 1), and disposed above a stock table 116, the table being raised automatically or manually by suitable mechanism, to be described, for maintaining the stock on the table at a predetermined height whereby the top sheet may be separated and gripped by suction feed grippers forming part of the feeding mechanism. A face board 117, Figures 3 and 4, secured between the frames 115, has secured thereto a facing plate 118 and a stock plate 119, against which the stock is held to align the front edges of the sheets. Rotatably mounted in the frames 115 and driven through connecting gearing by an electric motor or other suitable source of power, is a shaft 120 having keyed thereto a cam 121 and a second cam 122. Also mounted within the frames 115 is a shaft 123 upon which is rotatably mounted the crank lever 124 to the mid-portion of which is secured the roller 125 adapted to engage cam 121. Pivotally connected to the crank levers 124 by connecting rod 126 are a plurality of depending members 127 carrying at their lower ends the suction shoes 128, the same being connected through suitable hose connections to the suction pump previously referred to, so that through openings in the bottom of the shoes the suction will cause the top sheet of paper on the stack to adhere to the shoes, as is well known in the printing press art. Through the movements imparted to the crank lever 124 the shoes will be raised from their position in Figure 75

4 to an elevated position, Figure 3, where the sheet of paper lifted by the shoes will be presented to the forwarding rollers 131 and drop roller 132, the former being positively driven while the latter roller is mounted for vertical movement in slotted members 133, rotation of the same resulting from its contact with roller 131.

The weight of said drop roller or rollers is such that the roller will exert sufficient pressure onto a sheet so that it will be forwarded owing to its frictional engagement with the constantly rotating roller 131 and yet be sufficiently free to be shifted longitudinally of the latter for the purpose of side registering. Facing plate 118 is provided with a guideway 134 through which the sheet is advanced by the rotating rollers described. Secured to the rock shaft 135 are a plurality of gates 136 which have a rocking movement towards and away from the facing plate 118, the movement resulting from cam 122, which the roller 137 on arm 138 engages. Shaft 140 has the arm 138 and a second longer arm 141 suitably keyed thereto so that the rotation of the shaft is imparted to the latter arm, and through connecting link 142 to the shaft 135 and thus to the gates 136. In lowered position the lower end of the gates 136 are located over and in alignment with the guideway 134 so that the sheet of paper issuing from the guideway will engage the shoulder provided on the gates.

As the sheet of paper from the stack is lifted and advanced by means of the rollers 131 and 132 to engage said shoulder, the gates begin their outward movement away from the facing plate 118, the speed of the gates being accordingly accelerated as they approach the cylinder grippers. Simultaneously with this movement of the gates an impression cylinder is traveling towards the feeding mechanism and grippers 106 are being opened for receiving the sheet of paper. Rollers 131 and 132 cause feeding of the sheet through the guideway 134 whereupon the leading edge of the sheet engages the shoulder provided on the gates and the sheet and gates move outward in unison. This operation functions to guide and accurately align the leading edge of the sheet prior to presenting the same to the grippers 106. The gates have their limit of outward movement slightly beyond the shoulder 107 of the grippers so that feeding of the sheet is under positive control until the same engages the shoulders of the grippers when the grippers are actuated to close, holding the sheet upon the impression cylinder. It will be seen that the above construction aligns the leading edge of the sheet in advance of presenting the same to the registering guides or shoulders 107 on the cylinder grippers 106, and thus the alignment of each sheet is the same when the cylinder is in position to receive it. In order to secure the alignment of a sheet upon a cylinder to coincide with the registered position of a sheet upon the other cylinders, it is only necessary to cause alignment of the paper engaging edge 107 on the grippers of each cylinder to coincide with each other. The structure of the present invention thus readily permits accurate registry of a sheet upon a certain cylinder in relation to the registered position of a sheet upon any other cylinder to be secured. This results from the following operation: An impression cylinder is located with its gripper exactly opposite the feeding mechanism which is the position the same assumes in actual operation at the instant a sheet of paper is adapted to be fed to the grip-

pers. The surface 111 of the gripper bar 110 is then aligned with the leading edge of a particular gear tooth in the planetary gear 14, (Figure 2) to accurately fix the rotative position of the cylinder with respect to the feeding mechanism, particularly the gates 136. As the surface 111 determines the alignment of the paper engaging edge formed by the shoulder 107 on the grippers it will be seen that this edge is also aligned with the gear tooth. The same procedure is repeated with the grippers on the remaining impression cylinders so that the cylinders not only operate in definite cooperative relationship with the feeding mechanism, but also the parts operate to coordinate the alignment and thus the registered position of the sheets upon the cylinders. Each sheet is delivered to the cylinders and accurately registered thereon before being held to the cylinder so that the sheet may be run through the press a plurality of times and exact registry secured.

The stock table 116 is arranged for vertical adjustment and may be moved either automatically or by manually operated mechanism. As shown in Figure 1, the shaft 120, which is mounted for rotation in the feeder frame and driven by the feeding mechanism, has an eccentric connection with the arm 145 so as to constitute a crank for the purpose of reciprocating the bar 146 to which the arm 145 is pivotally connected. The bar 146 carries a pawl 147 which reciprocates with the latter and is arranged to engage and rotate a ratchet wheel 148 in order to advance the stock table, as is well known in the art.

It will be understood that since the ratchet wheel 148 is secured to the upper end of the vertical rod 149 the latter will rotate in the same direction. A pinion 150 is suitably keyed to the rod 149 to mesh with a bevel gear 151 for the purpose of imparting rotation to rack pinions not shown, associated with the stock table and meshing with the vertically arranged rack bars 152.

Thus rotation automatically through the above mechanism or by means of handle 153 can be given to the vertical rod 149 to lower or raise the stock table as desired.

Suitable mechanism, controlled by the height of the pile of stock on the table 116 may be provided in order to automatically render the pawl 145 inoperative when required. Mechanism of that class, however, are well known in sheet handling machinery and need not be described here since that pawl does not concern the present invention.

The worm gear 154 keyed to the vertical rod 153 meshes with worm gear 155 to drive the endless chain 156 passing over sprockets secured to shafts 157 and 158 respectively. As shown in Figure 16 shaft 158 is rotatably mounted in the vertical support 159 and has secured to its end opposite its sprocket a gear 160. Passing vertically through the support is a threaded rod 161 upon which is threaded a miter gear 162, the gear meshing with a similar miter gear 163, having the lug 164 integrally formed on its hub.

The gear 163 is rigidly secured to the inner end of the shaft 165 which latter is journaled in the arcuate arm 166 and in the support 159. A gear 167, the hub of which is cut away to form a lug 168, is loosely mounted on the shaft 165 to rotate thereon and to slide axially of said shaft so that it may be moved in and out of meshing relation with the gear 160. Therefore rotation of the shaft 158, which it receives by means of the chain 156 driven by the worm wheel 154, will be

imparted through the meshing gears 160 and 167 and miter gear 163 to the miter gear 162, which has threaded engagement with the threaded rod 161 to cause raising and lowering of the rod, depending on the direction of rotation of the gear. The threaded rod 161 in turn supports a delivery table 170 and thus lowering of the table results from the raising of the stock table 116. The table 170 is provided with three receptacles, as will be more fully described, for receiving the printed sheets from the three impression cylinders and therefore the table is lowered one third as fast as the stock table is raised. The ratio of course depends upon the number of receptacles employed and can be varied, should for any reason, the number of receptacles be changed.

Since it is desirable to allow the printed sheets to build up to a thickness of substantially one-fourth of an inch upon the delivery table 170, the gear 167 is so positioned at the beginning of the printing operation that the lugs 164 and 168 will be spaced apart to provide for lost motion between gears 163 and 167. Consequently the gear wheel 167 must rotate a considerable part of a revolution before the lugs 164 and 168 engage in order to drive gear 163, i. e., before the delivery table 170 begins to move down. The delivery table is also adapted to be raised or lowered manually by means of the squared end 171 provided on shaft 165. For this purpose the wheel 167 will be slid out of mesh with the gear 160 into a position indicated by broken lines in Figure 16.

The transfer mechanism, whereby the printed sheets are transferred from the impression cylinders to the delivery means, includes delivery arms 174 fixedly secured to shaft 175 and adapted to have oscillating movement through suitable driving means operatively associated with said shaft, (see Figures 9 to 11). A plurality of arms 174 are provided, the same being connected at their lower end by rod 176 to which are secured the suction shoes 178. Pivoted at 180 to one of the arms 174 is a gear segment 181 provided with pin 182, the pin riding in the cam slot 183 so that during oscillations of arms 174 the gear segment is rocked about its pivot 180. The gear segment meshes with a pinion keyed to shaft 176, whereupon a compound movement is imparted to the suction shoes by reason of the swinging of arms 174 and rotation of segment 181, the latter causing rotation of the suction shoes as the arms oscillate. In Figure 9 the suction shoes are in position to remove from the impression cylinders 13 the printed sheet of paper and as arm 174 swings towards the right the suction shoes have rotation on the arm to assume the position shown in Figure 11, where the printed sheet is presented to gripper members in open position for receiving the same.

As mentioned hereinabove the transfer mechanism is adapted to deliver the printed sheets to delivery mechanism constructed and arranged to deposit the sheets in separate receptacles corresponding to the cylinders from which the same were received. The frame members 184 and 185 provide supporting means for the delivery mechanism, the member 185 being adjustable transversely of the delivery table 170 through rotation of shaft 186, which preferably may have secured thereto pinions meshing with racks extending transversely of the delivery table. The inner end of the frame member 185 is slidably mounted upon the transverse shafts 175 and 187. Shaft 187, as well as studs 188, which latter are mounted in the outer ends of the frame members 184

and 185, have suitably keyed thereto sprockets 189 over which pass the endless chains 190. Secured to the chains at intervals are a plurality of gripper members 191, the same taking the place of the usual links in the chains and having pivotally secured to the lower end, Figure 12, a gripping finger 192, the arm 193 being formed integrally therewith and located on that side of the gripper members facing adjacent the frame members. Spring 194 is suitably located within opening 195 formed in the base of said members and functions to maintain the gripping finger closed against said base so that a sheet of paper can be resiliently held between the parts. Also secured to the side of the gripper members opposite arm 193 is a stripping cam 196, the cam proper projecting a definite distance from the side of the members 191 for the purpose described later.

The uprights or jogger boards 197 mounted on the delivery table 170 form the end of receptacles for receiving the printed sheets of paper and suitably secured to the frame members 184 and 185 at points above and slightly in advance of the uprights 197 are housings 198 to which are pivoted counterweights 200, the counterweights having pivotal connection to stripping fingers 201, the fingers being provided at their lowermost end with notch 202. Also secured to the frame members at points adjacent the stripping fingers are gripper cams 203, the cam surface of which being spaced, as shown in Figure 13, a predetermined distance from the frame to have contacting engagement with arm 193 during the travel of the gripper members past the stripping fingers 201. Formed integrally upon the stripping fingers 201 is a lug 204 adapted to be engaged by the stripping cam 196 simultaneously with the engagement of arm 193 with gripper cam 203, as shown in Figure 14. The stripping finger 201 is normally held in elevated position by counterweight 200, but as cam 196 engages lug 204 the finger is lowered, while at the same time arm 193 is depressed releasing the printed sheet held by the gripping finger 192. As clearly shown in Figure 14 the leading edge of the sheet engages notch 202 of the stripping finger and the sheet is thus deposited in its proper receptacle.

The spacing of stripping cam 196 from the side of the gripper member 191 and the spacing of gripper cam 203 from the side of the frame members is varied for each receptacle provided on the delivery table 170, as is also the position of arm 193 and the spacing of lug 204 outwardly from the inner surface of the stripping fingers. For each cam 203 there is provided an arm 193 having a position to engage the cam and thus to be actuated thereby, and in a similar manner, for each cam 196 there is provided upon the stripping fingers a lug 204 adapted to cooperate therewith so that upon engagement of the parts the particular stripping finger will be lowered.

As more particularly shown in Figure 9 an opening cam 205 is also secured to the frame members in position immediately below the forward sprockets 189, the cam having a formation so that the same will engage and actuate arm 193 on all of the gripper members. Immediately upon actuation of the arms to open the gripping fingers 192 the suction shoes 178, carrying a printed sheet, will move in position to present the same to the gripper members, the sheet being located between the base of the same and the gripping fingers 192. Shaft 187 is suitably driven

to provide constant rotation to sprockets 189 and thus constant travel of the endless chains and the gripper members secured thereto, so that as said members leave their position adjacent the cam 205, the arm 193 will be released causing the printed sheet to be held by the grippers. As stated before, the spacing of the arm 193 and of the stripping cam 196 on the particular gripper member determines the particular gripper cam and stripping finger, which will be actuated thereby so that the sheets from each individual cylinder are thus deposited in separate receptacles, and by suitable timing of the rotation of the sprockets 189 and thus the travel of the gripper members in relation to the travel of the various impression cylinders 18 in their planetary path, coordination between the delivery mechanism and cylinders can be secured to cause the mechanism to deposit the sheets in receptacles, according to the cylinder from which the same was received.

It is to be understood that I do not wish to be limited by the exact embodiment of the device shown, which is merely by way of illustration and not limitation, as various and other forms of the device will of course be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

I claim:

1. In a printing press, the combination of a plurality of printing cylinders traveling through a planetary path and being cooperatively associated with a printing member, means to feed sheet material to said cylinders, and means on said cylinders adapted to register the sheet in relation thereto during the feeding operation.
2. In a printing press, the combination of a plurality of printing cylinders traveling through a planetary path and being cooperatively associated with a printing member, means to feed sheets to said cylinders, sheet holding means on said cylinders, said sheet holding means being provided with a registering edge with which the leading edge of the sheet engages prior to the sheet being held upon said cylinders.
3. In a printing press, the combination of a plurality of printing cylinders traveling through a planetary path and being cooperatively associated with a printing member, means to feed sheets to said cylinders, sheet holding means on said cylinders, said sheet holding means having a registering edge which is aligned at the registering moment with a particular point in the planetary path.
4. In a printing press, a plurality of printing cylinders traveling through a planetary path, each of said cylinders being cooperatively associated with a printing member, means to feed sheet material to said cylinders, and registering means for said sheets operative to adjust the registering position of a sheet on one cylinder with relation to the registering position of a sheet on another cylinder.
5. In a printing press, the combination of a plurality of printing cylinders traveling through a planetary path and being cooperatively associated with a printing member, means to feed sheet material to said cylinders, gripper members mounted on said cylinders for receiving the sheet material, said gripper members having a registering edge and a gripping edge, said registering edge adapted to coordinate the sheet registering position on said cylinder with the registering position on any other cylinder prior to the sheet being held by said gripping edge.
6. In a printing press, the combination of a plu-

ality of printing cylinders traveling through a planetary path and being cooperatively associated with a printing member, means to feed sheets to said cylinders, and preliminary sheet registering means common to all of said cylinders to coordinate the registering position of the sheets on said cylinders.

7. In a printing press, the combination of a plurality of printing cylinders traveling through a planetary path and being cooperatively associated with a printing member, means to feed sheets to said cylinders, sheet registering means on each cylinder, and swinging gates with which the leading edge of the sheet engages prior to the presentation of said sheet to the registering means on said cylinders.

8. In a printing press, the combination of a plurality of printing cylinders traveling through a planetary path, sheet holding means on said cylinders, said holding means having a registering edge for positioning the sheet upon the cylinder, means to feed sheet material thereto including gates to which the sheets are advanced in succession, said gates moving at an accelerating speed and guiding the leading edge of the sheets for presentation to said registering edge.

9. In a printing press, the combination of a plurality of printing cylinders traveling through a planetary path, sheet holding means on said cylinders, said holding means having a registering edge for positioning the sheet upon the cylinder, means to feed sheet material thereto including gates to which the sheets are advanced in succession, means to move said gates towards the cylinders, said gates moving at an accelerating speed and guiding the leading edge of the sheets for presentation to said registering edge, said gates having a limit of movement slightly beyond the registering edge, whereby the sheets are positioned upon the cylinders only by said edge.

10. In a printing press, a plurality of printing cylinders traveling through a planetary path, a relatively movable printing member adapted for cooperative association with said cylinders, pneumatic means for feeding a sheet of paper to said cylinders, and means pneumatically controlled by the sheet of paper fed to said cylinder for operating the movements of said printing member.

11. In a printing press, a plurality of printing cylinders traveling through a planetary path, a relatively movable printing member adapted for cooperative association with said cylinders, pneumatic means for feeding a sheet of paper to said cylinders, a shaft associated with said printing member and adapted to raise and lower said member upon actuation thereof, and means pneumatically controlled by the sheet of paper fed to said cylinder for operating said shaft.

12. In a printing press, a plurality of printing cylinders traveling through a planetary path, a relatively movable printing member adapted for cooperative association with said cylinders, pneumatic means for feeding a sheet of paper to said cylinders, a reciprocating arm, means operatively connecting said arm with said movable printing member, and means pneumatically controlled by the sheet of paper fed to said cylinder for operating said connecting means.

13. In a printing press, a plurality of printing cylinders traveling through a planetary path, a relatively movable printing member adapted for cooperative association with said cylinders, pneumatic means for feeding a sheet of paper to said cylinders, a reciprocating arm, a rocking lever associated therewith, means operatively connect-

ing said lever with said movable printing member, and means pneumatically actuated upon the failure of feeding means to feed a sheet of paper to said cylinder to impart the reciprocations of said arm to the lever to cause lowering of said movable printing member.

14. In a printing press, a plurality of printing cylinders traveling through a planetary path, a printing bed, a movable bed plate supported thereby, means for imparting raising and lowering movements to said bed plate, said means being pneumatically controlled by the presence of a sheet of paper fed to said cylinders and by the failure of a sheet to be presented to said cylinders.

15. In a printing press, a plurality of printing cylinders traveling through a planetary path, a printing bed, a movable bed plate supported thereby, means for imparting raising and lowering movements to said bed plate, including a transverse shaft journaled in said printing bed, a reciprocating arm for rocking said shaft, a plunger for operatively connecting said arm to said shaft, and pneumatically controlled means for withdrawing said plunger.

16. In a printing press, a plurality of printing cylinders traveling through a planetary path, a printing bed, a movable bed plate supported thereby, means for imparting raising and lowering movements to said bed plate, including a shaft journaled in said printing bed, a reciprocating arm for rocking said shaft, a plunger for operatively connecting said arm to said shaft, pneumatically controlled means for withdrawing said plunger, and a spring pressed plate for maintaining said plunger in withdrawn position.

17. In a printing press, a plurality of printing cylinders, sheet holding means on said cylinders, means to feed sheet material thereto including suction shoes, rollers to which the sheet is presented by said shoes, and swinging gates for controlling the feeding of said sheet.

18. In a printing press, a plurality of printing cylinders, sheet holding means on said cylinders, means to feed sheet material thereto including gates to which the sheets are advanced in succession, a transverse shaft for mounting said gates, and a cam for imparting rotation to said shaft to swing said gates.

19. In a printing press, a plurality of printing cylinders, sheet holding means on said cylinders, means to feed sheet material thereto including gates to which the sheets are advanced in succession, a transverse shaft for mounting said gates, and a cam for imparting rotation to said shaft to swing said gates, said cam having a contour to cause accelerated movement of said gates as they swing towards the holding means on said cylinders.

20. In a printing press, a plurality of printing cylinders traveling through a planetary path, each of said cylinders being cooperatively associated with a printing member, means for feeding sheet material to said cylinders, and delivery mechanism for removing said sheets from the cylinders, constructed and arranged to deposit said sheets in separate receptacles corresponding to the cylinders from which the sheets were received.

21. In a printing press, a plurality of printing cylinders traveling through a planetary path, each of said cylinders being cooperatively associated with a printing member, means for feeding sheet material to said cylinders, and delivery mechanism for removing said sheets from the cylinders, a plurality of receptacles, and means on said delivery mechanism adapted to deposit the sheets

in said receptacles corresponding to the cylinders from which the sheets were received.

22. In a printing press, a plurality of printing cylinders traveling through a planetary path, each of said cylinders being cooperatively associated with a printing member, means for feeding sheet material to said cylinders, delivery mechanism, transfer means for removing said sheets from the cylinders and presenting same to the delivery mechanism, said mechanism comprising an endless conveyor having members thereon adapted to grip the sheet presented thereto and deposit same in a receptacle corresponding to the cylinders from which the sheet was received.

23. In a printing press, a plurality of printing cylinders traveling through a planetary path, each of said cylinders being cooperatively associated with a printing member, means for feeding sheet material to said cylinders, delivery mechanism, transfer means for removing said sheets from the cylinders and presenting same to the delivery mechanism, said mechanism comprising an endless conveyor, gripping members thereon adapted to grip the sheet presented thereto, and stop in the path of said members to cause them to open to deposit their sheet.

24. In a printing press, a plurality of printing cylinders adapted to travel in a planetary path and being operatively associated with a printing member, means to feed sheet material to said cylinders, delivery mechanism, transfer means adapted to remove sheets from said cylinders and present same to the delivery mechanism, said mechanism including spaced endless chains, gripping members thereon adapted to grip the sheet presented thereto, and operating cams located in the path of said members to cause them to open and release a sheet.

25. In a printing press, a plurality of printing cylinders traveling through a planetary path, each of said cylinders being cooperatively associated with a printing member, means for feeding sheet material to said cylinders, delivery mechanism, transfer means for removing said sheet from the cylinders and presenting same to the delivery mechanism, said mechanism including endless chains having members thereon adapted to grip the sheet presented thereto, a plurality of receptacles, stripping fingers adapted to be lowered into the path of said members, and releasing cams located over said receptacles for actuating the members, whereby the sheet is released and caused to drop into said receptacles by said fingers.

26. In a printing press, a plurality of impression cylinders traveling through a planetary path and cooperatively associated with a printing member, pneumatic means for feeding sheet material to said cylinders, sheet engaging means on said cylinders, sheet delivery mechanism, means to transfer printed sheets from said cylinders to said mechanism, and means located in said planetary path and common to all of said cylinders for operating said sheet engaging means.

27. In a printing press having a plurality of printing cylinders traveling in a planetary path and cooperatively associated with a printing member, sheet engaging elements on said cylinders, means controlled by the presence of a sheet to move said member into and out of printing position, said means becoming operative after a sheet has been engaged by said elements and before printing starts.

28. In a printing press, a plurality of printing cylinders traveling in a planetary path, a type

bed adapted to move into and out of its operative position, tripping means for retaining said bed in its inoperative position when a sheet is missed, and means controlled by the feeding of a sheet for setting up said tripping means.

29. In a printing press, a plurality of printing cylinders travelling through a planetary path, a stock table, means to feed sheets of paper from the stock table to the cylinders, a delivery table, means depositing the printed sheets upon the delivery table in receptacles corresponding to the various cylinders, and connecting means between the stock table and delivery table for lowering said delivery table as the stock table is raised.

30. In a printing press, a plurality of printing cylinders travelling through a planetary path, a stock table, means to feed sheets of paper from the stock table to the cylinders, a delivery table, means depositing the printed sheets upon the delivery table in piles corresponding to the cylinders from which the sheets were received, means raising the stock table as the sheets are removed therefrom, and connections between the stock table and the delivery table for lowering the delivery table as the stock table is raised.

31. In a printing press, a plurality of printing cylinders travelling through a planetary path, a stock table, means to feed sheets of paper from the stock table to the cylinders, a delivery table, means depositing the printed sheets upon the delivery table in piles corresponding to the cylinders from which the sheets were received, means raising the stock table as the sheets are removed therefrom and connections operatively connecting the stock table with the delivery table, whereby the delivery table is lowered as the stock table is raised, the lowering movement having a definite ratio to the raising movement of the stock table.

32. In a printing press, a plurality of printing cylinders travelling through a planetary path, a stock table, means to feed sheets of paper from the stock table to the cylinders, a delivery table, means depositing the printed sheets upon the delivery table in piles corresponding to the cylinders from which the sheets were received, means raising the stock table as the sheets are removed therefrom, means controlled by the movement of the stock table for automatically lowering said delivery table at a predetermined ratio to the movement of the stock table, and means to permit of manually moving said delivery table any desired amount independently of the movement of said stock table.

33. In a printing press, a plurality of printing

cylinders, sheet holding means on said cylinders, means to feed sheet material to the sheet holding means, and swinging gates for controlling the feeding of the sheets and for initially registering the sheet.

34. In a printing press, a plurality of printing cylinders, sheet holding means on said cylinders, means to feed sheet material to the holding means including sheet separating means and swinging gates, said gates controlling the feeding of the sheets and also initially registering the sheets.

35. In a printing press, a printing cylinder travelling in a planetary path, sheet holding means on the cylinder, means for removing the printed sheet therefrom, oscillating arms to which the sheet removing means are pivotally secured, said means having rotative movements with respect to the arms during oscillation thereof, for the purpose of giving said means a movement in synchronism with the bodily movement of the cylinder immediately prior to the delivery of a sheet thereto.

36. In a printing press, a printing cylinder travelling in a planetary path, sheet holding means on the cylinder, transfer means for removing the printed sheet therefrom, oscillating arms to which the transfer means are pivotally secured, connections between the arms and the transfer means for rotating the transfer means during oscillation of the arms, said transfer means immediately prior to receiving a sheet from the printing cylinder travelling in a direction toward the cylinder and having movement in synchronism therewith for the purpose of following the bodily movement of the cylinder until said sheet holding means releases the sheet on the cylinder.

37. In a printing press, a printing cylinder travelling in a planetary path, sheet holding means on the cylinder, transfer means for removing the printed sheet therefrom, oscillating arms to which the transfer means are pivotally secured, cam actuated means pivoted to said arms and operatively connecting with the transfer means for rotating the transfer means during oscillation of the arms, the oscillation of the arms and resulting actuation of the transfer means causing the transfer means to travel in synchronism with the cylinder immediately prior to and during the delivery of the sheet thereto, whereby the transfer means has movement with the bodily movement of the cylinder to insure proper removal of the printed sheet therefrom.

EDWARD CHESHIRE.