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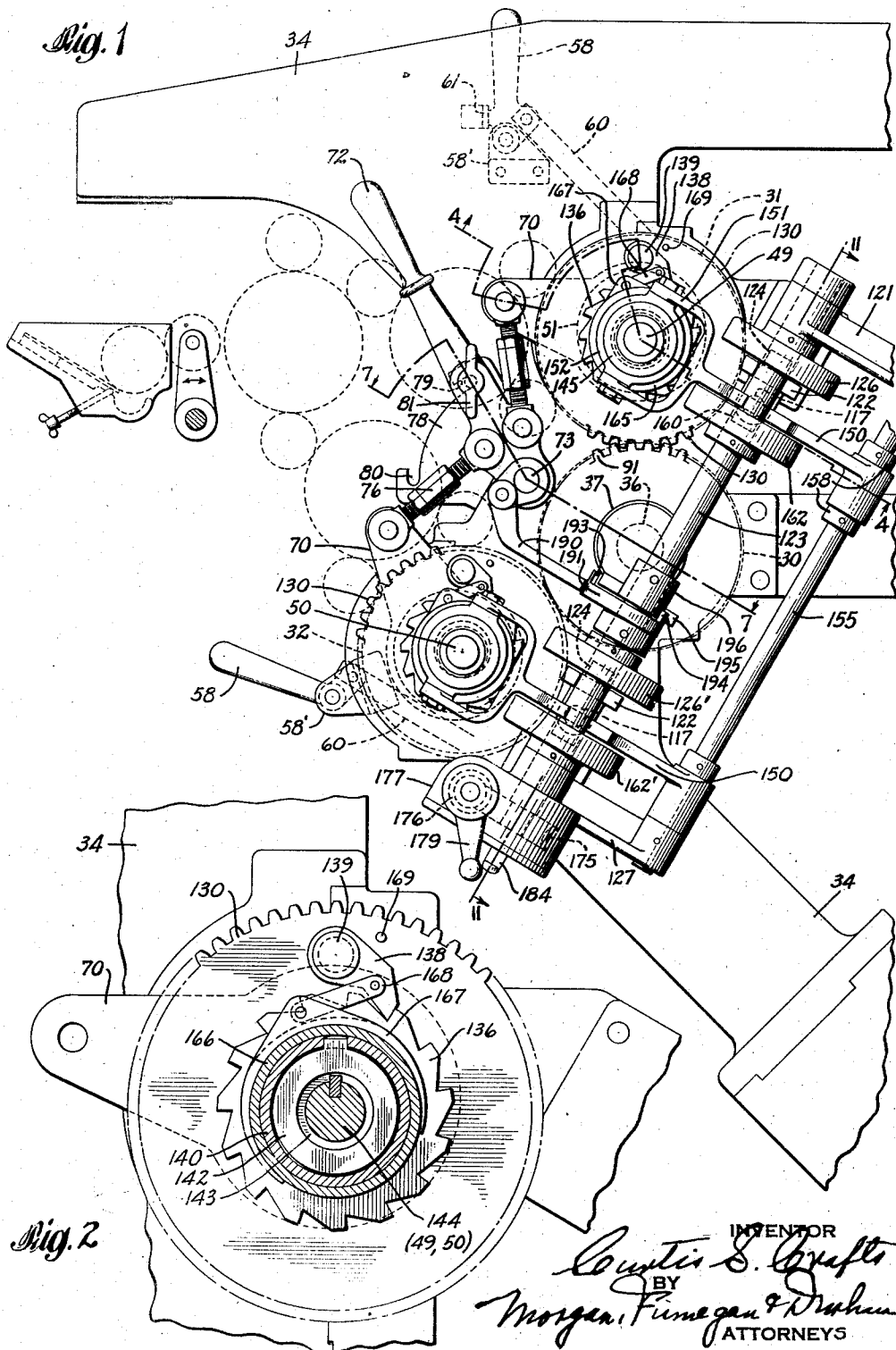
C. S. CRAFTS

2,268,191

ROTARY PRINTING PRESS

Filed July 24, 1940

10 Sheets-Sheet 1



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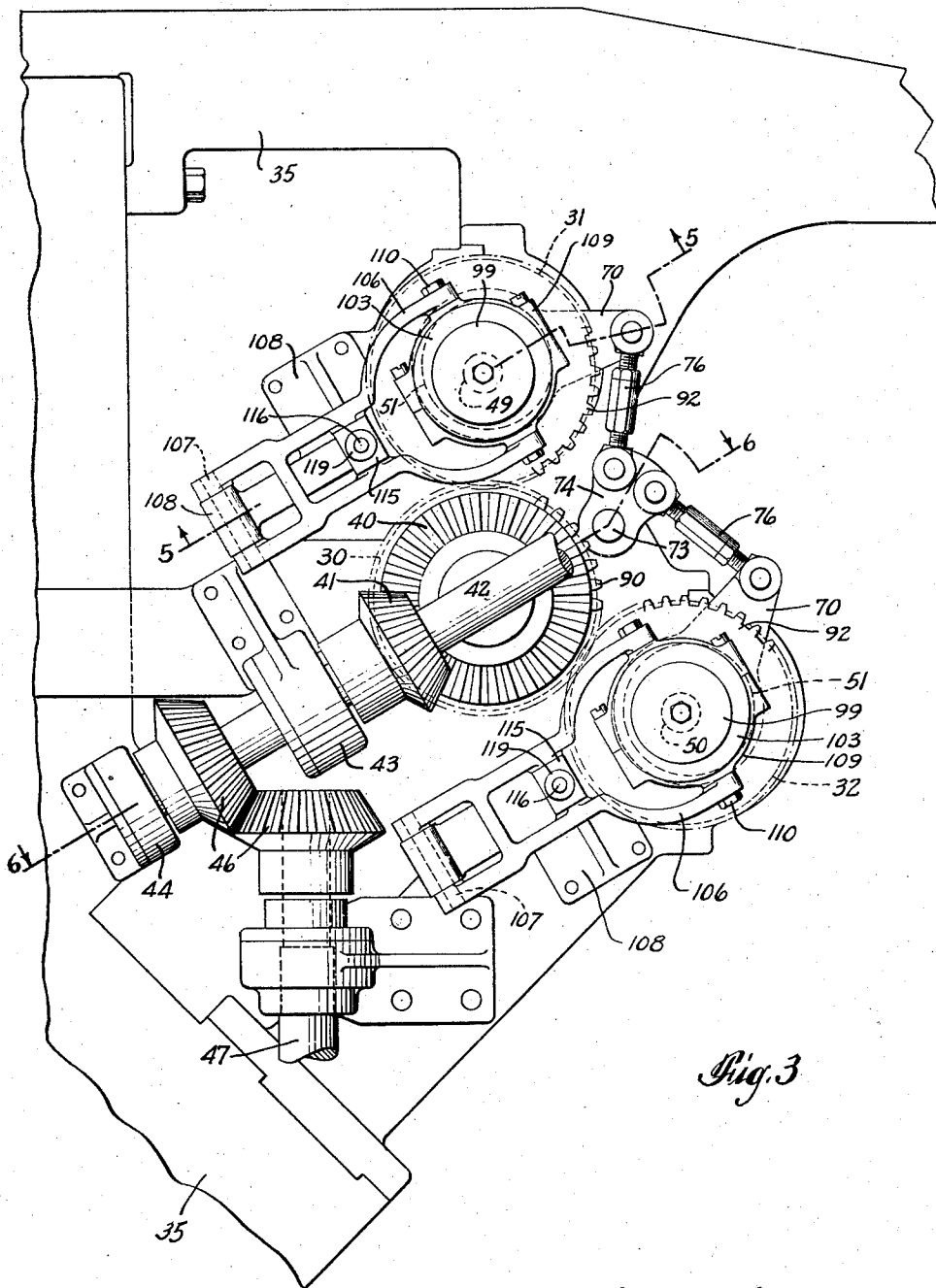


Fig. 3.

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Dec. 30, 1941.

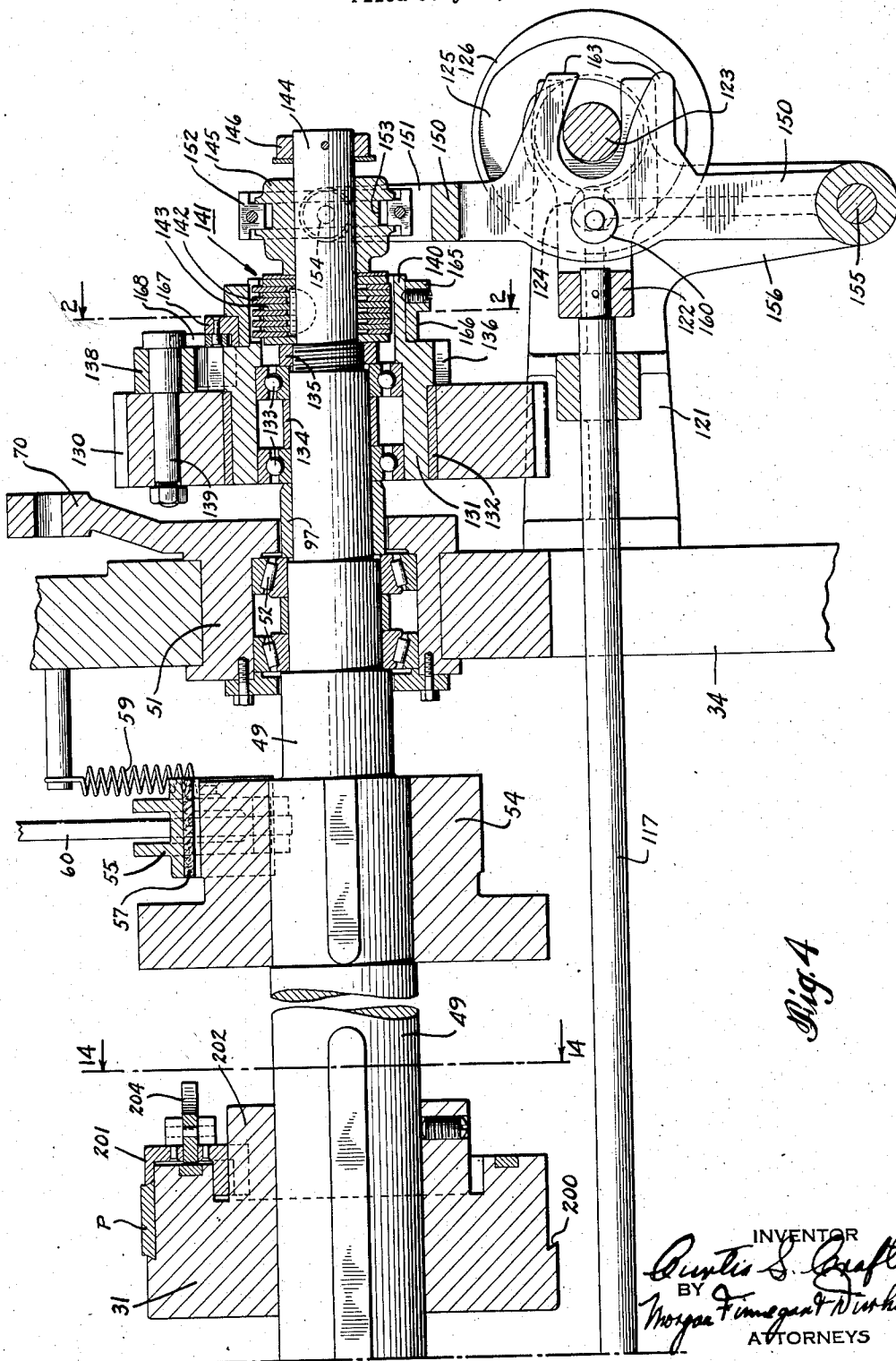
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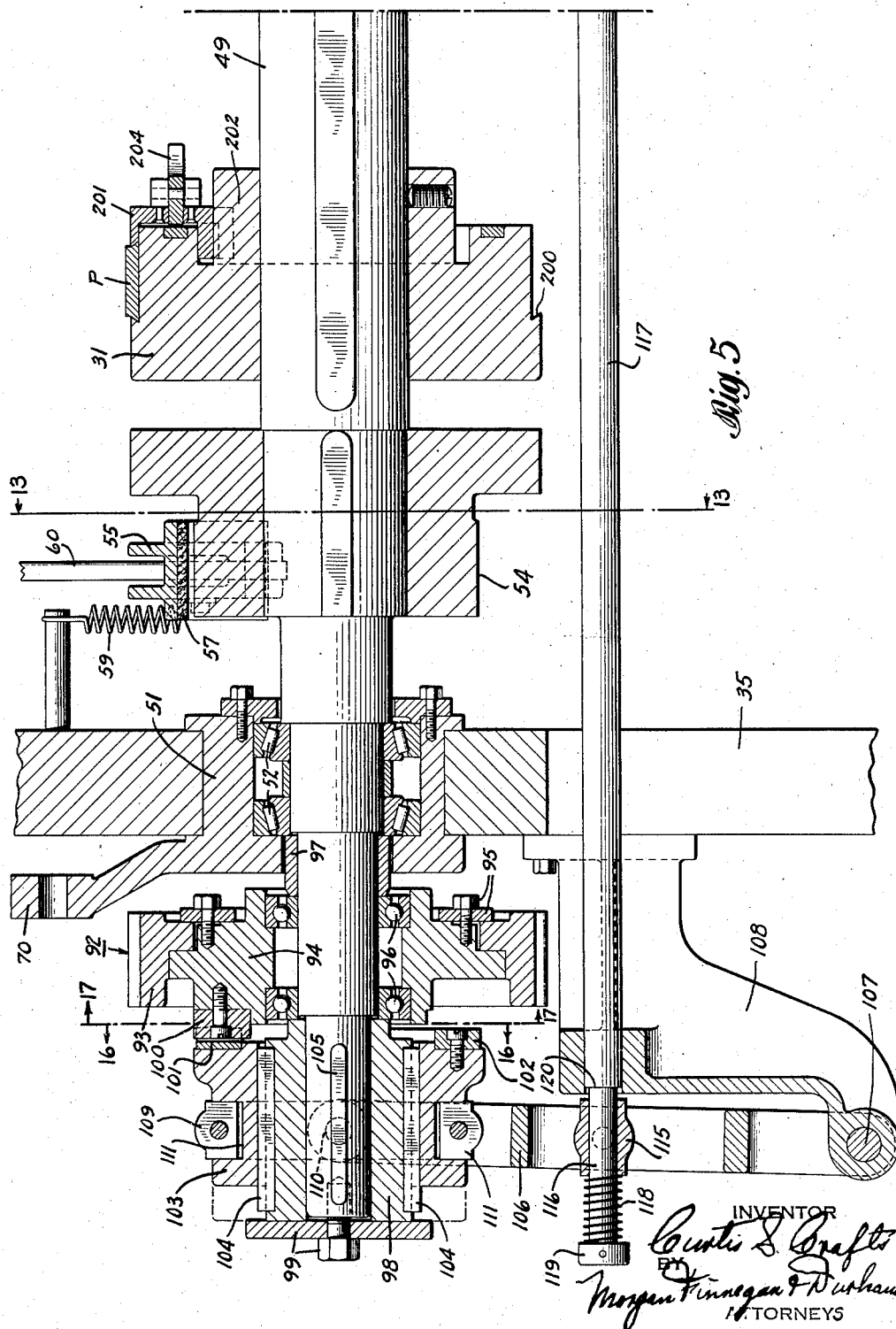
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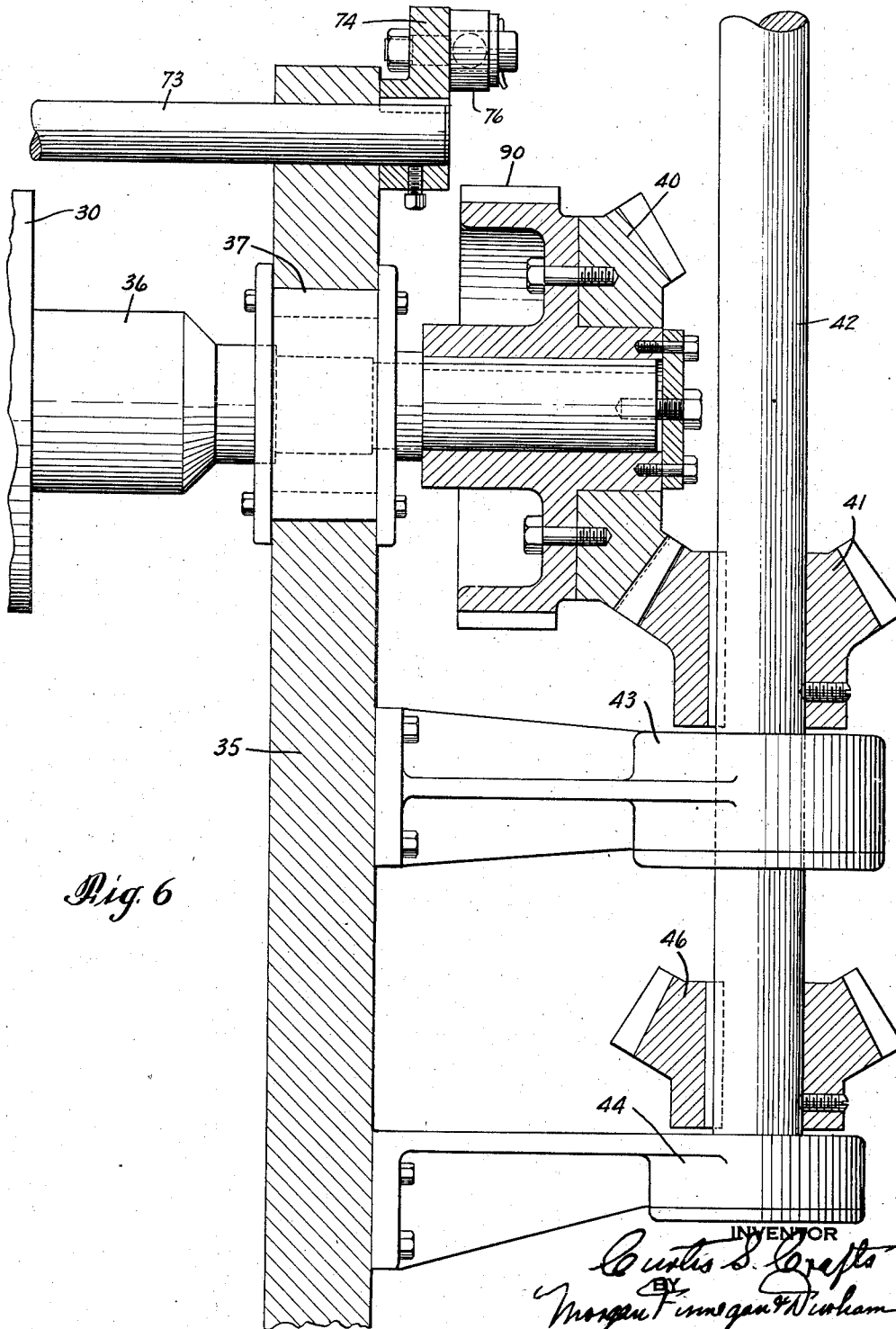
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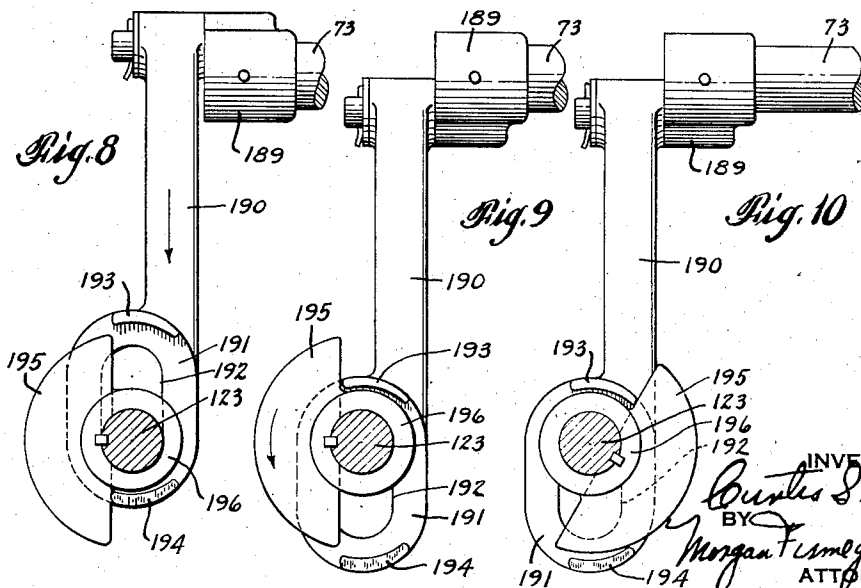
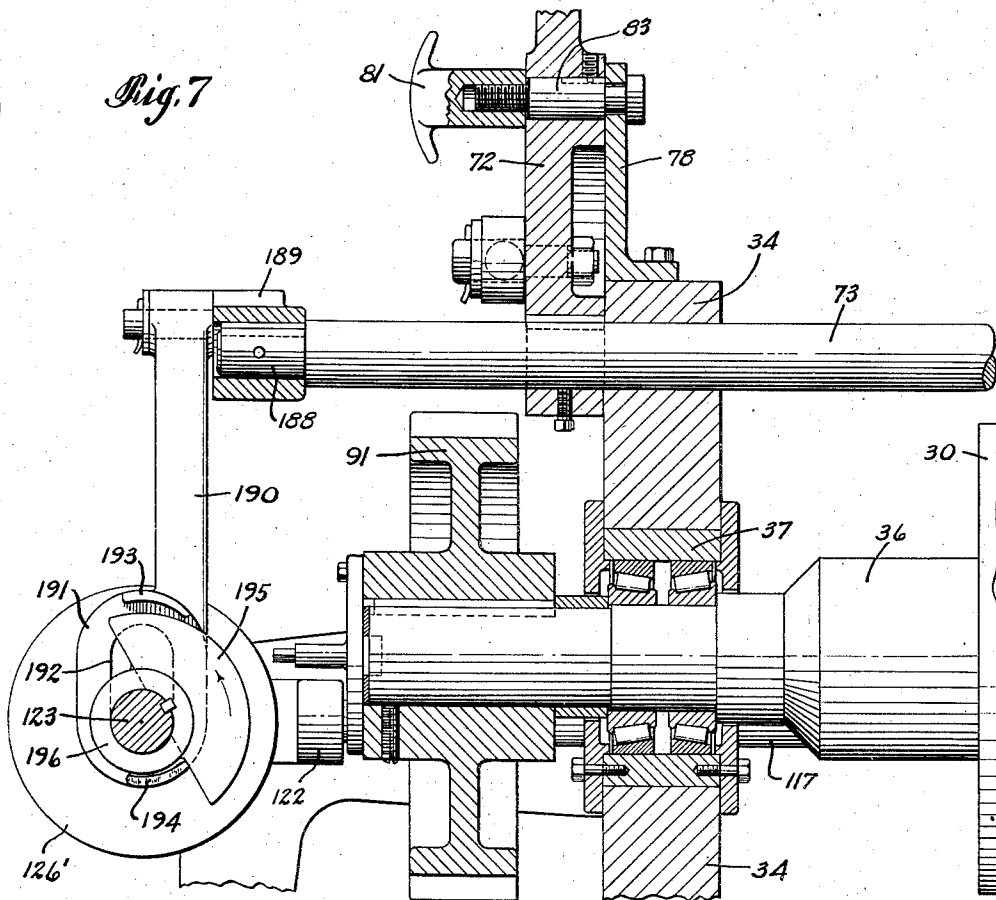
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10 Sheets-Sheet 6



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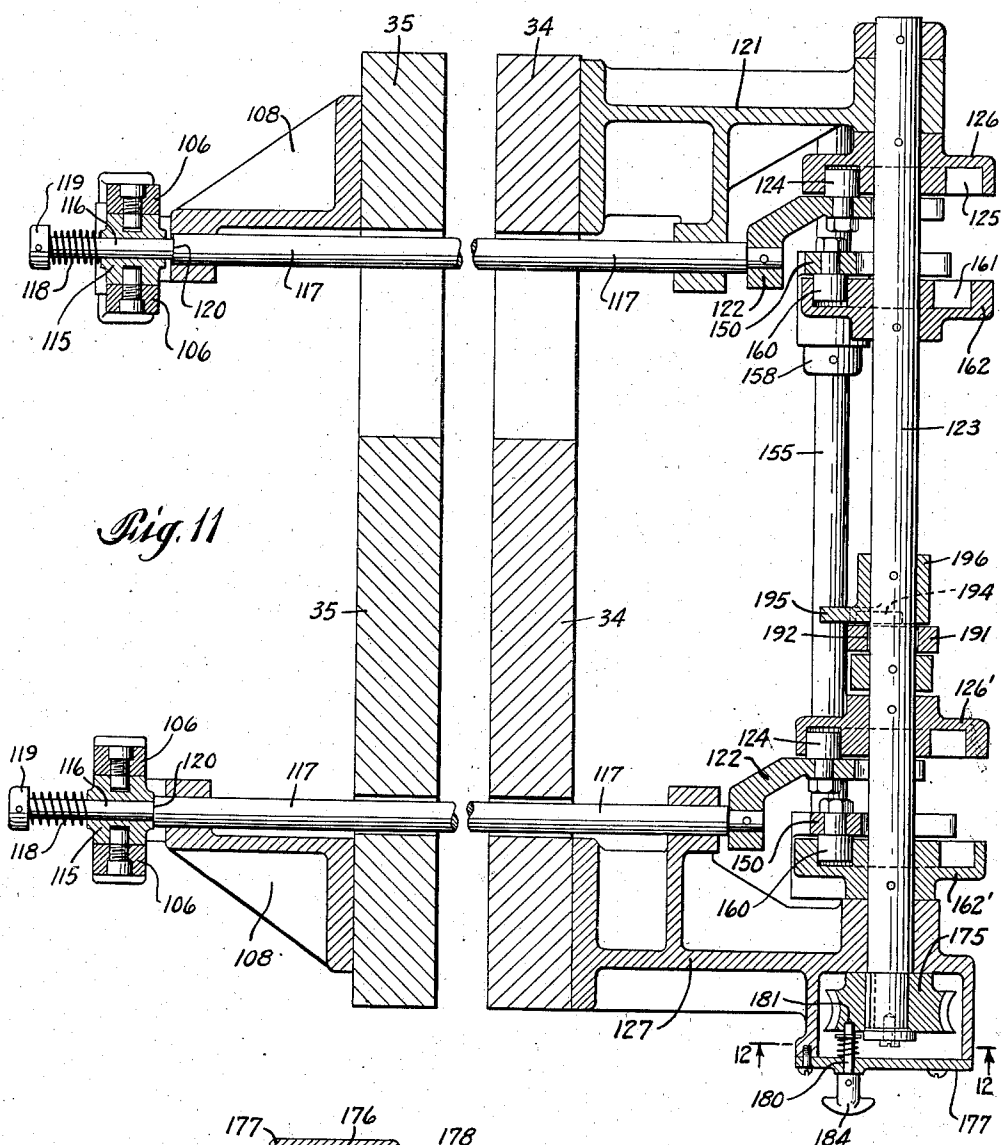


Fig. 11

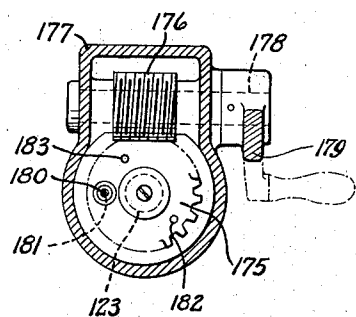


Fig. 12

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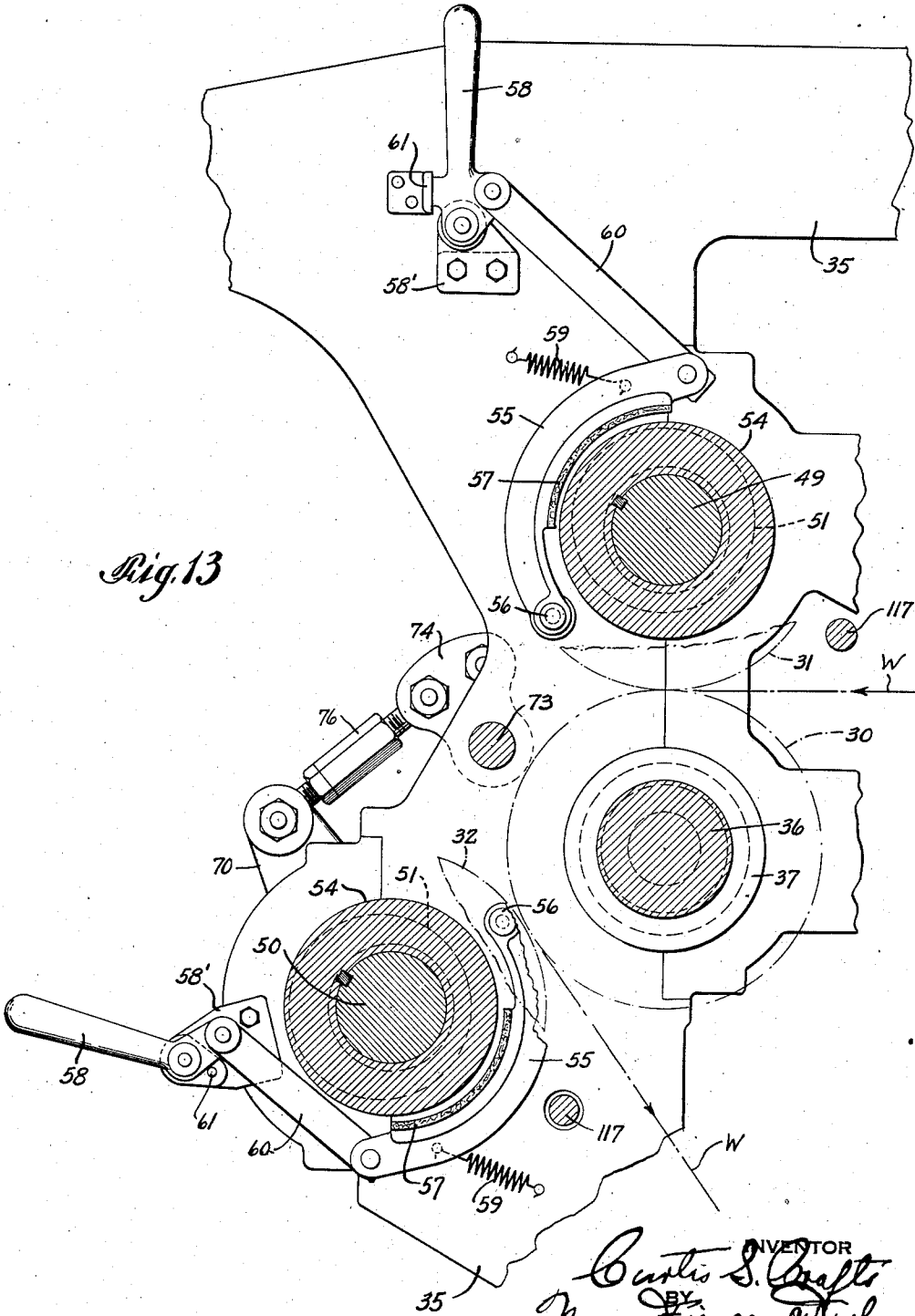
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10 Sheets-Sheet 8



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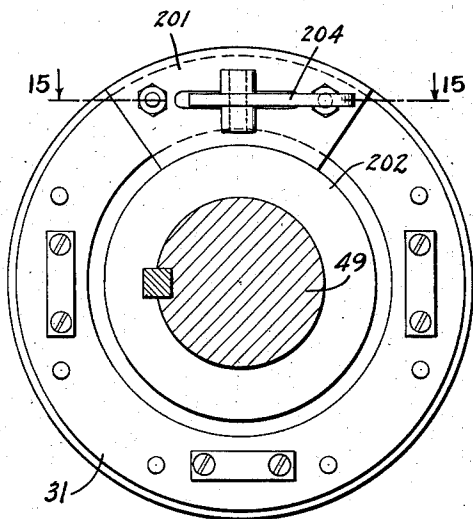


Fig. 14

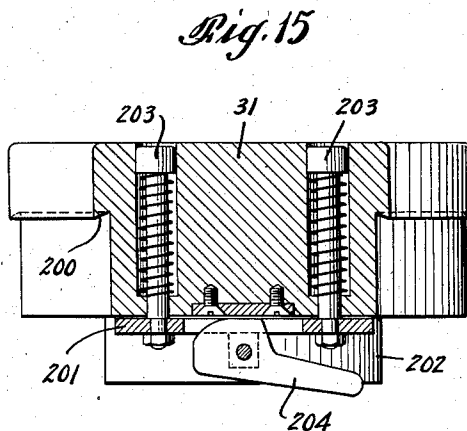


Fig. 15

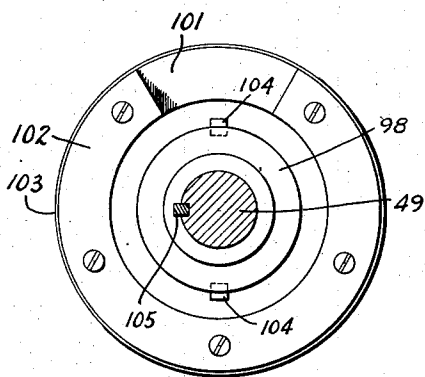


Fig. 16

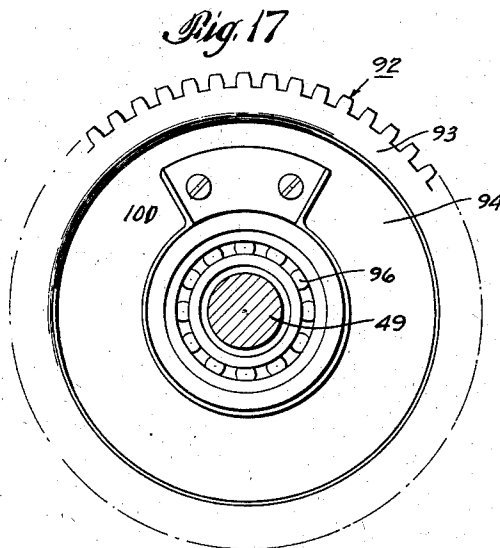


Fig. 17

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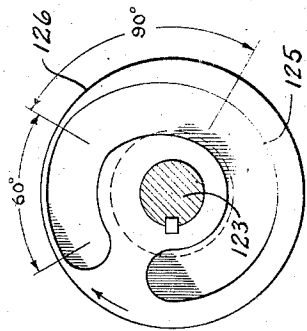


Fig. 18

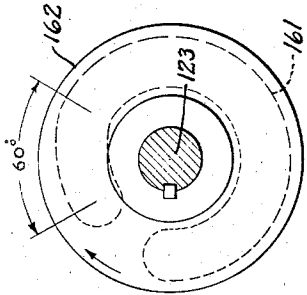


Fig. 19

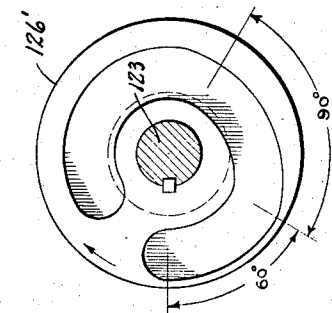


Fig. 20

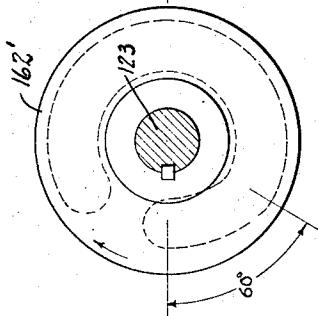
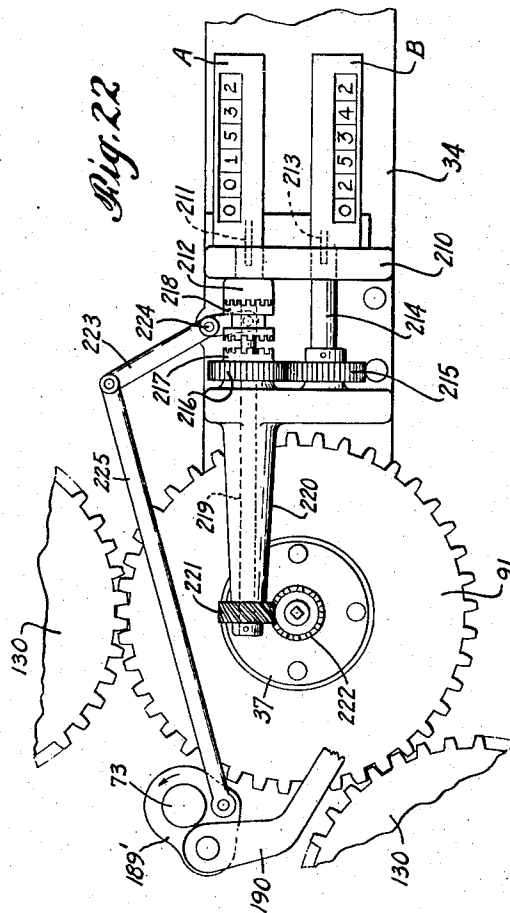


Fig. 21



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UNITED STATES PATENT OFFICE

2,268,191

ROTARY PRINTING PRESS

Curtis S. Crafts, Oak Park, Ill., assignor to The
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corporation of Illinois

Application July 24, 1940, Serial No. 347,152

9 Claims. (Cl. 101—221)

The present invention relates to new and useful improvements in rotary printing presses and more particularly to a novel and improved non-stop rotary fudge press or printing attachment.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

The accompanying drawings, referred to herein and constituting a part hereof, illustrate one embodiment of the invention, and together with the description, serve to explain the principles of the invention.

Of the drawings:

Figure 1 is a fragmentary side elevation, with certain parts omitted, of a typical and illustrative embodiment of the present invention;

Figure 2 is a detail side elevation, with certain parts in section, of the driving means for one of the two fudge cylinders;

Figure 3 is a side elevation of the other end of the attachment shown in Figure 1;

Figures 4 and 5 are sectional views taken on the line 4—4 of Figure 1 and 5—5 of Figure 3;

Figure 6 is a detail fragmentary sectional view taken on the line 6—6 of Figure 3;

Figure 7 is a fragmentary detail sectional view taken on the line 7—7 of Figure 1;

Figures 8, 9 and 10 are fragmentary sectional views of the parts shown at the left of Figure 7 with these parts in their various operative positions;

Figure 11 is a sectional view taken on the line 11—11 of Figure 1, the parts between the press frames being omitted;

Figure 12 is a detail sectional view taken on the line 12—12 of Figure 11;

Figure 13 is a vertical sectional view showing the relation of the printing cylinders to each other taken on the line 13—13 of Figure 5;

Figure 14 is a detailed sectional view taken on the line 14—14 of Figure 4 and showing one end of a plate cylinder;

Figure 15 is a sectional view taken on the line 15—15 of Figure 14;

Figure 16 is a detail sectional view taken on line 16—16 of Figure 5 and showing one of two cooperating clutch members;

Figure 17 is a similar view taken on the line 17—17 of Figure 5 and showing the other of the clutch members;

Figures 18 and 21 are detail views of the rotary cam members for controlling the various parts of the fudge press; and

Figure 22 is a fragmentary diagrammatic view showing a modification of the present invention.

The present invention has for its object the provision of an improved non-stop rotary fudge press in which means are provided for alternatively driving two plate-carrying cylinders and for moving them alternately into printing relation with a cooperating printing cylinder. A further object of the invention is the provision of a novel and improved non-stop rotary fudge press in which interlocking means are provided for preventing careless or improper operation of the press such as might cause damage to its operative parts. Still another object of the invention is the provision of an improved rotary fudge press in which the impressions can be changed from one fudge to another while the press is operating at full speed, and with a minimum of wasted copies.

In accordance with the present and illustrative embodiment of the invention, the web of paper to be printed is passed over an impression cylinder before or after it has received the principal impressions from the usual rotary printing couple, and a pair of cylinder shafts are provided upon which one or more rotary printing cylinders may be adjustably positioned and adapted for alternative cooperation with the impression cylinder, means being provided for alternatively driving these printing cylinders in proper registering relation, and for moving one set of the printing cylinders out of printing relation with the impression cylinder as the other set of printing cylinders is moved into printing relation, thereby enabling the late news or other supplementary printing matter to be plated on the inoperative set of printing cylinders while the press is being operated and other late news or supplementary printing matter is being printed by the other set of printing cylinders.

A single control means is preferably provided for gradually applying the driving force to the set of newly plated cylinders and for finally affecting a positive and correctly registered driving connection thereto before the said cylinders are brought into impression position, and to then disengage from the driving force the other set of plate cylinders after the impression has been shifted from the old to the newly plated cylinders. Other means are provided interlocked

with the single control means whereby the impression may be shifted and printing contact established with one or the other of the two sets of plate cylinders only when the single control means is in its middle position wherein both sets of plate cylinders are revolving at press speed and correctly registered with the running web.

Means are also provided for individually locking or holding either of the printing cylinders against rotation so that the supplementary or late news printing plates may be changed on the cylinders which are not in operative relationship to the impression cylinder.

As illustratively embodied, the single control means comprises a crank, which, when rotated, causes certain cams associated therewith to establish the driving connection for the idle set of plate cylinders, first by engaging a yieldable or friction clutch so that the cylinders are gradually brought up to approximate printing speed, for example 98% of printing speed, and finally engaging a single tooth positive clutch to complete the driving connection at full printing speed and accurate register. Further turning of the crank, after the impression has been shifted from the one set of plate cylinders to the other, causes certain other cams to declutch the drive to the plate cylinders which were shifted away from impression position. However, the plate cylinders which were disconnected from their drive may continue to rotate by momentum or other causes and this may continue for some time and prove inconvenient from an operative standpoint. To overcome this effect and facilitate more rapid and efficient operation of the mechanism, braking means are provided whereby the plate cylinders just shifted from impression position may rapidly be brought to rest so that plate changes may be made thereon immediately.

When it is desired to shift from one printing cylinder to the other this is accomplished by moving a lever which shifts the impression but can be moved only when the crank controlling the drive has been moved to its mid-position.

Counting means are provided for individually totalizing the number of impressions by each set of printing cylinders, and means are preferably provided for automatically connecting and disconnecting the totalizers with their respective printing cylinders as the impression is shifted from one set of printing cylinders to the other, so that it is possible to obtain an accurate account of the copies produced and wastage of copies through uncontrolled excess production is avoided.

It will be understood that the foregoing general description, and the following detailed description as well, are exemplary and explanatory of the invention but are not restrictive thereof.

Referring now in detail to the illustrative embodiment of the invention as shown in the accompanying drawings, the non-stop rotary fudge printing mechanism is shown as particularly adapted for use as an attachment to a high speed rotary printing press of conventional construction. The web of paper W which has been previously printed over the larger part of its surface and is to receive the supplementary or late news impression is passed around an impression cylinder 30 and is printed with the late news or supplementary impression on either set of printing cylinders 31 or 32. Impression cylinder 30 is mounted for rotation between the side frames 34, 35 by means of its shaft 36 and suitable jour-

nals or other bearings 37. Means are provided for driving the impression cylinder 30 in timed relation with the rest of the press and comprise a beveled gear 40 meshing with a bevel pinion 41 on shaft 42, and shaft 42 is rotatably mounted in the bearing brackets 43 and 44 and is driven through bevel gears 46 from the main drive shaft 47.

Printing cylinders 31 and 32 are mounted respectively on shafts 49 and 50 and adjustably secured thereon so as to permit lateral adjustment for lateral registration with the space to be printed on the web W. It is to be noted that, although the drawings illustrate a pair of printing cylinders mounted on each shaft 49 and 50, various other arrangements of cylinders may be mounted thereon, such as a single cylinder of press width or more than two cylinders of the form shown in the drawings.

The mounting of shafts 49 and 50 in the side frames 34, 35 is such as to permit their movement, while rotating, toward or away from the impression cylinder 30. Since the shafts 49 and 50 are substantially identical a description of one is deemed sufficient, the corresponding parts of the other shaft being indicated by the same reference characters. Shaft 49 (and 50) is rotatably supported in the side frames 34, 35 by means of rotatable eccentric journals 51 wherein roller bearings 52, in which the shaft 49 is journaled, are mounted in the eccentric journals 51 on a different axis from the axis of rotation of the said eccentrics. Thus a simultaneous partial rotation of the eccentrics 51 will move the axis of the plate cylinder shaft 49 (or 50) toward or away from the impression cylinder 30.

Means are provided for alternatively moving the cylinders 31 and 32 into and out of printing contact with impression cylinder 30 so that either of the printing cylinders is moved into printing contact as the other printing cylinder is moved away from the impression cylinder. As embodied, each of the eccentrics 51 at each end of the printing cylinders 31 and 32 is provided with an arm 70 extending therefrom. A handle 72 is pivotally mounted on side frame 34 by means of a rotatable rod 73 which extends the width of the press and has secured to its other end a short lever 74. On the one side of the press the eccentric arm 70 for the printing cylinders 31 and 32 are pivotally connected with an intermediate portion of the handle 72 by means of the turn buckles 76 each of which has one of its ends connected to the end of an eccentric arm 70 and its other end connected to the adjacent side of the handle 72. At the other side of the press the eccentric arms 70 are similarly connected to a short lever 74 by means of the turn buckles 76. Handle 72 and the lever 74 are interconnected for simultaneous movement by means of the rod 73 to which both of them are keyed, and as the handle is moved from one position to another the lever 74 is moved to a similar extent, thereby rendering uniform the movement of the eccentrics 51 at each side of the press. A bracket 78, carried on frame 34, is provided with a pair of slots 79 and 80 interconnected by an arcuate surface, and a wing nut 81 is threaded on a bolt 83 carried by handle 72 and adapted to engage one or the other of the slots 79, 80 so that the handle 72 may be held in either of its extreme positions. With the handle in either of its extreme positions, the printing pressure between the printing cylinder 31 or 32 and the impression cylinder 30 may be adjusted to the desired value by turning

the proper ones of the turn buckle 76, and as the handle is moved from one position to the other, one set of printing cylinders is moved away from the impression cylinder and form rollers as the other set of cylinders is moved towards the impression cylinder and form rollers.

Means for arresting the free rotation of the plate cylinders 31 or 32 after they have been shifted off impression position, and for holding them at rest during plate changing operations, are provided near each side frame at a point convenient for operation. As embodied, each end of shafts 49 and 50 is provided, adjacent the inside face of the side frames 34, 35, with a brake drum 54. Brake shoes 55, pivoted at 56 on the side frame 34, 35, are in cooperative relation with brake drums 54 and provided with an arcuate surface upon which is secured a brake lining 57 adapted to be pressed against the periphery of the brake drum.

Brake shoes 55 are normally held in released position by means of tension springs 59, while the brake may be applied by operation of a brake handle 58, one of which is associated with each brake shoe. Each brake handle 58 may be pivoted on a bracket 58', secured to the side frames 34, 35, and operatively connected to the free end of its brake shoe 54 by a link 60. Stop devices 61 cooperate with the brake handles 58 which serve shaft 49, and stop pins 62 cooperate with the brake handles 58 which serve shaft 50, to limit the outward movement of the brake shoes 55. Thus it will be seen that, by a clockwise rotation of either brake handle 58 associated with the shaft 49, braking action is applied to bring to rest the plate cylinders 31, while a counter-clockwise rotation of either brake handle 58 associated with shaft 50 performs the same function for the plate cylinders 32.

Means are provided whereby the plate cylinders 31, 32 may be driven by the impression cylinder 30 in timed and registered relation thereto, and as embodied, consist of a drive gear 90, keyed on the driven end of impression cylinder shaft 36, and a second drive gear 91, keyed on the other end of shaft 35. The two drive gears 90 and 91 are adapted to drive the plate cylinders 31, 32 in a particular manner to be presently described and since the gearing and clutches provided to accomplish this are substantially identical on each of the shafts 49 and 50 a description of these members associated with shaft 49 will suffice for both shafts.

Rotatably mounted on the end of shaft 49 (and 50), externally of the side frame 35, is a spur gear 92 which meshes with the drive gear 90 and has the same pitch diameter as that gear so that a one to one speed ratio exists therebetween. Gear 92 may be formed in two parts, whereby certain adjustments may be made for purposes of printing registration, and consists of a ring portion 93, upon which the gear teeth are formed, and a hub portion 94, upon which the toothed portion 93 may be clamped by plate and screws 95. The hub 94 is rotatably supported and held in lateral alignment on the end of shaft 49 by ball bearings 96, spacer ring 97, clutch hub 98 and retaining plate and screw 99. Thus hub portion 94 may be rotated in relation to the gear portion 93 upon loosening of clamp plate 95 and when the desired relationship has been established the gear portion 93 and hub portion 94 may be clamped together again to act as a unit.

Positive clutch means are provided for trans-

mitting the motion of gear 92 to the plate cylinders 31 (or 32) and for engaging the clutch so that the plate cylinders are in correct rotative register with the impression cylinder 30 and web W whereby printing will occur in the provided space on the web. As embodied, the positive clutch comprises a segmental tooth 100, secured on the outer face of gear hub 94, and adapted to engage a single recess 101 formed in a ring 102 which is mounted on the inner face of a sliding clutch member 103. Clutch member 103 is slidably keyed, as by splines 104, on the clutch hub 98 which, in turn, is keyed by spline 105 on the end of shaft 49. The retaining plate 99 serves to limit the disengaging movement of clutch member 103. Thus, since there is provided only the one clutch drive tooth 100 in a fixed rotative relationship to the impression cylinder 30, and a corresponding single recess 101 on the driven member 103 of the clutch, it is obvious that when the clutch is engaged the plate cylinders 31 (or 32) will always be in correct rotative relationship to the impression cylinder.

Means for actuating the sliding clutch member 103 are provided and comprise a forked lever 106, pivoted at 107 on frame bracket 108, a split ring 109, pivotally carried by trunnions 110 mounted in lever 106, and a groove 111, in the periphery of clutch member 103, wherein the split ring 109 rides. Midway of the lever 106 there is pivotally mounted a trunnion block 115 through which projects a reduced end 116 of a cam rod 117. A compression spring 118 encircles the reduced end 116 between the outer face of trunnion block 115 and a collar 119 which is secured on the end of the reduced portion 116. A shoulder 120, formed by the junction of the reduced end 116 with cam rod 117, serves as the operating element whereby when the cam rod is moved to the left, trunnion block 115 and lever 106 are moved to the left (Fig. 5) to disengage the clutch, while the spring 118, as the cam rod 117 is moved to the right, serves to resiliently urge the clutch into engagement.

Cam rod 117 is slidably supported at one end in the frame bracket 108 and extends to the other side of the press where it is slidably supported in frame bracket 121. A cam follower block 122 is secured upon the end of cam rod 117 and is forked so as to span and be guided by a cam shaft 123. Cam roller 124, pivotally mounted on follower block 122, is adapted to travel in a cam groove 125 formed in the adjacent face of cam 126, and the cam 126 is fixed on the cam shaft 123, which is journaled at one end in the bracket 121, and at the other end in frame bracket 127 (see Figure 1). A second cam 126' is fixed on cam shaft 123 in operative relationship to the cam rod 117 which is associated with the plate cylinder shaft 50, but the cam groove in this cam is so formed as to actuate its cam rod at a different angular position of the cam shaft 123 from that of the groove in cam 126. In the illustrative embodiment this angular displacement is shown as 90 degrees (see Figs. 19 and 21).

Thus, a clockwise rotation of cam shaft 123 from the position shown in the drawings, will first cause the cam 126' to engage the clutch member 103 associated with shaft 50 and then, after certain other actions to be described later, cause cam 126 to disengage the clutch member 103 associated with shaft 49.

Means are provided whereby the plate cylinders 31 or 32 may be driven from the impression

cylinder 30 from a position of rest to a speed a little less than that of the impression cylinder so that when the positive clutch 103 is engaged there will be little if any load shock produced as the speed is increased to full printing speed. Further means are provided so that, after positive clutch 103 has been engaged and the shaft 49 (or 50) brought to printing speed, the partial speed means above referred to are rendered inoperative until the positive clutch is again disengaged.

As embodied, the spur gear 91, which is mounted on the end of the impression shaft 36 externally of the side frame 35, is adapted to mesh with a spur gear 92 carried upon the end of plate cylinder shaft 49 (and 50), and the ratio of the pitch diameters of the spur gear 91 and the gear 92 is such that the latter is driven at a slightly slower speed, for example, 98% of printing speed, than impression cylinder gear 91. Gear 92 is rotatably mounted upon a hub member 131 by means of a bushing 132 and the hub 131 in turn is rotatably mounted in fixed lateral position upon the shaft 49 (and 50) by ball bearings 133, spacer ring 134 and clamp nut 135. Hub member 131 is provided, adjacent the outside face of gear 130, with a series of ratchet teeth 136 adapted to be driven only in the same direction in which gear 130 is driven. A pawl 138 is pivotally mounted upon a stud 139 secured in gear 130 and adapted to drive the hub 131 as the gear 130 rotates. The extreme outer portion 140 of the hub 131 comprises one member of a friction clutch 141 and has slidably keyed therein a series of friction plates 142 adapted to engage under certain conditions a corresponding series of friction plates 143 which are slidably keyed on the reduced end 144 of shaft 49 (and 50) and interspaced alternately with the plates 142. A clutch collar 145 is freely mounted on the reduced shaft end 144 and adapted to be so moved as to gradually press into engagement the two series of plates 142, 143 so that the rotation of the gear 130 is gradually transmitted to the shaft 49. A collar 146, pinned on the shaft end 144 limits the outward or disengaging motion of the clutch collar 146.

Means for shifting the clutch collar 145 to engage and disengage the clutch 141 are provided and comprise a lever 150, the forked end 151 of which carries a split shift ring 152 having an internally extending flange adapted to engage a groove 153 in the clutch collar 145. Trunnions 154, mounted in the fork arms 151 of the lever 150, serve as the pivotal support for split ring 152. Lever 150 is pivoted at its lower end on a cross rod 155, which is supported by bracket arms 156, 157 extending respectively from frame brackets 121 and 127, and held in lateral alignment by a pair of collars 158 pinned on cross rod 155 each side of the lever. A cam roller 160 is pivotally mounted midway on the lever 150 and adapted to engage a cam groove 161 formed in the adjacent face of a cam 162 mounted and keyed on cam shaft 123. A pair of spaced arms 163 project laterally from the lever 150 which are adapted to span the cam shaft 123 to act as additional guiding and aligning means. A cam 162', analogous to cam 162, is fixed on cam shaft 123 in operative relationship to the lever 150 which is associated with the plate cylinder shaft 50, but the cam groove in cam 162' is so formed as to actuate its lever at a different angular position of the cam shaft from that of the groove 161 in cam 162. As illustrated in the

drawings this angular displacement is shown as 240 degrees, see Figs. 18 and 20.

Thus, a clockwise rotation of cam shaft 123 from the position shown in the drawings, will first cause the cam 162' to engage the friction clutch 141 associated with cylinder shaft 50 and then cause cam 162 to disengage the friction clutch 141 associated with cylinder shaft 49.

During the time that plate cylinders 31 (or 32) are in printing relation with the impression cylinder 30, both the friction clutch 141 and positive clutch 103 are engaged, and the plate shaft 49 (or 50) is therefore revolving at full press speed due to the gearing 90, 92, associated with the positive clutch 103, having a one to one ratio. The hub 131, on the friction clutch end of shaft 49, is therefore also revolving at full press speed by reason of the friction clutch 141, but due to the slower speed of the gear 130 the ratchet teeth 136 on hub 131 creep ahead of the driving pawl 138 which is pivoted on gear 130. This condition is undesirable, although not functionally impractical if a spring pressed pawl were used, and means have therefore been incorporated in the mechanism whereby the pawl 138 may be thrown out of engagement with the ratchet teeth 136 as soon as shaft 49 has reached full press speed and thrown into engagement again as soon as the speed of shaft 49 drops below the speed of gear 130. As embodied, the outer portion 140 of hub 131 has affixed thereto a collar 165, the reduced portion 166 of which carries a friction member 167 in the form of an interrupted ring, and this friction ring 167 is operatively connected to the pawl 138 by a link 168. Thus, if the hub 131 and its attached collar 165 rotate faster than gear 130 and pawl 138, the friction ring 167, which tends to move at the speed of collar 165, will push the pawl 138 out of engagement with ratchet teeth 136 to a distance limited by a stop pin 169 affixed in gear 130. From then on the friction ring 167 revolves at the speed of gear 130 while the collar 165 continues to revolve at the faster speed of the hub 131. Conversely, when the positive clutch 103 is disengaged and the speed of shaft 49 falls below the speed of gear 130, the friction ring 167 will tend to rotate in the opposite direction to that just described and will therefore pull the pawl 138 into engagement with the ratchet teeth 136.

The single control means whereby the various clutches on the plate cylinder shafts 49 and 50 are engaged and disengaged in proper sequence is constituted by the cam shaft 123 and cams 126, 126', 162 and 162', and means are provided for rotating the cam shaft 123 in a specific manner to accomplish the desired function. As embodied, the lower end of cam shaft 123 has secured thereon a worm gear 175 which is adapted to be driven by a worm 176 journaled in a housing 177 which is formed as part of the frame bracket 127. The shaft 178 of the worm 176 extends outside of the housing 177 and has secured thereon a crank handle 179 (see Figs. 11 and 12). Detent means are provided for arresting the rotation of cam shaft 123 at three predetermined points and releasing it for further rotation when desired. As embodied, a spring pressed finger 180 is slidably mounted in the worm gear housing 177 and adapted to seat itself in one of three recesses 181, 182, 183, which are formed in the side face of the worm gear 175 and, when so seated, prevent the rotation of the gear. A handle 184, fixed on the external end of finger 180 permits the

finger to be retracted from whichever recess it may be in and thereby free the worm gear 175 for rotation by crank 179. When the worm gear has been rotated a small amount the finger handle 184 is released and the finger 180, being urged inwardly by its spring, rides along the face of the worm gear until it registers with another of the recesses 181, 182, or 183 when it then drops in and arrests further rotation of the cam shaft 123 until it is again manually released by retraction of finger 180.

Interlock means are provided between the mechanism which shifts the plate cylinders 31, 32 into and out of printing position and the mechanism consisting of the cams 126, 126', 162, 162' which connect and disconnect the drive for the plate cylinders, whereby the steps of operation necessary in shifting the impression from one set of cylinders to the other may only be performed in the correct sequence and the proper direction. As embodied, the end 188 of the cross rod 73, which operates the eccentrics 51, is extended outwardly from the side frame 34 to a point almost over the cam shaft 123 and has secured thereon a lever arm 189. Pivotaly attached to the end of the arm 189 is an interlock bar 190 which is enlarged at its lower end 191 and provided with a slot 192 by means of which the bar is guided and supported on the cam shaft 123 which projects through the slot 192. Projecting from one face of the enlarged portion 191 of interlock bar 190 at either end thereof is a pair of arcuate stop lugs 193, 194 which are so spaced and proportioned as to cooperate in a specific manner, to be described, with a substantially semi-circular stop plate 195 which is keyed and fixed upon the cam shaft 123 by means of its hub 196.

The operation of the interlock mechanism may be apprehended from a study of Figures 7, 8, 9 and 10. In Figure 7 it will be observed that impression shifting rod 73 cannot be rotated due to the position of stop plate 195 which is in the path of movement of lugs 193, 194, and the stop plate 195, in turn, can only be rotated counter-clockwise, the correct direction in this case, due to the lug 194 being in a position to prevent its clockwise movement. Thus the first step in the sequence of necessary movements is the rotation of cam shaft 123 in a counter-clockwise direction until the leading edge of stop plate 195 strikes the stop lug 194 (see Fig. 8). The interlock bar 190 is now free to be moved, thereby permitting the rotation of rod 73 by impression shifting handle 72, which movement shifts also the position of the interlock bar 190 so that lug 194 no longer blocks the rotation of stop plate 195 (see Figure 9). Stop plate 195 and cam shaft 123 are now free for rotation, again only in the correct direction, until they are brought to a stop in their final position by the leading edge of stop plate 195 striking the lug 193 (see Figure 10). It is obvious that a reversal of these movements will permit a shift of impression contacts in the reverse direction.

The plate cylinders 31 and 32 may be of any desired construction and for purposes of illustration one of the many possible forms has been shown in Figs. 4, 14 and 15, in which a plate cylinder 31 is provided with a dove tail edge 200 around its periphery for receiving one edge of a printing plate P. The other edge of the plate P is adapted to be held in position on the cylinder by a spring pressed plate 201 which is guided and supported on the cylinder 31 by a grooved

hub 202 and pressed against the plate by a pair of spring plungers 203 mounted within the cylinder. A cam finger 204, pivoted on the plate 201 is adapted, when swung outwardly, to retract clamp plate 201 and so release the printing plate P for replacement by a new plate. In the form of cylinder shown provision has been made for clamping only one plate on a cylinder but, as will be seen, the cylinder has been prepared to mount four clamp plates 201 and thus carry four printing plates if desired.

Referring now to Fig. 22 there is shown somewhat diagrammatically a mechanism which may be added to the press whereby a record may be made of the number of impressions printed by each set of printing cylinders 31 or 32. As embodied, a pair of counting devices A and B may be provided and mounted on a bracket 210 secured to side frame 34 adjacent the impression cylinder shaft 36. The shaft 211 which operates counter A is adapted to be driven by a clutch member 212, and the operating shaft 213 of counter B is adapted to be driven by a stub shaft 214 which carries a gear 215 meshing with a spur gear 216 having a clutch member 217 formed on one side thereof. A central clutch member 218 is slidably keyed upon a drive shaft 219, which is journaled in an extension 220 of the bracket 210, and has a helical gear 221 fixed upon the end thereof. A second helical gear 222, having the same pitch diameter as gear 221 is fixed upon the extended end of the impression cylinder shaft 36 and meshes with gear 221. A lever 223, pivoted at 224 on bracket 210, is operably connected at one end to the sliding clutch member 218 and the other end is connected by a link 225 to the interlock bar lever 189', which is carried on the end of impression shifting rod 73.

Thus, it will be seen, that either counter A or counter B will be driven in timed relation to impression cylinder 30 as each is connected in turn thereto by its clutch, and the position of sliding clutch member 218, determined by whichever plate cylinder is in impression position, automatically selects the proper counter for recording its impressions.

The operation of the mechanism is as follows: As shown in the drawings the printing cylinders 31 are in printing contact with impression cylinder 30 and the web W and being driven thereby at full printing speed, while the plate cylinders 32 are stationary and assumed to be newly plated and ready for being shifted into impression position. When the operator is ready to shift impression he first retracts the stop finger 180 by handle 184 to unlock the cam shaft 123. He then turns crank 179 to rotate the cam shaft 123 and this can be turned only in one direction due to the position of the interlock bar 190. The first part of the rotation of cam shaft 123, for example 60 degrees, causes the cam 162' to actuate the lever 150 associated with cylinder shaft 50 and thereby engage the friction clutch 141 on that shaft. The "slow" gear 130 is thereby caused, through its pawl and ratchet 138 and 136, to gradually transmit its motion to the cylinder shaft 50 and cylinders 32 which gradually but rapidly attain a speed almost that of the printing speed. The continuing rotation of cam shaft 123 next causes cam 126' to actuate the cam rod 117 which is associated with cylinder shaft 50. The spring 118 on the end of rod 117 rocks the forked lever 106 to the right (Fig. 5) and moves the clutch member 103 into engaging position. If the clutch recess 101 is not yet in

register with clutch tooth 100 the spring 118 is compressed by the full movement of rod 117, and the slightly faster rotating tooth 100 will, within a few revolutions, finally register with the recess 101 and the clutch will engage and increase the speed of cylinder shaft 50 to full printing speed. The rotation of the cam shaft is arrested just previous to, or at the instant of, the engagement of clutch 103 by the stop finger 180 dropping into the recess 182 formed in the worm gear 175 mounted on cam shaft 123, and this action prevents the further turning of the crank 179, which indicates to the operator that the next step in the cycle of operations may be instituted.

At this point in the cycle of operations both sets of plate cylinders 31 and 32 are running at full printing speed, cylinders 31 are still printing while cylinders 32 are still off impression and the friction ring 167 associated with the friction clutch 141 on shaft 50 has disconnected the pawl 138 on gear 130 from the ratchet teeth 136 on clutch hub 131 whereby the driving connection of the "slow" gear 130 to shaft 50 is broken leaving the "slow" gear 130 to freely rotate. The stop plate 195 on the cam shaft has now assumed the position indicated in Fig. 8 and the parts are in the positions and running conditions whereby the shift of impression between cylinders 31 and cylinders 32 may be made.

The operator now unlocks wing nut 81 on the shift handle 72 and swings the latter downwardly through an arc of approximately 90 degrees to its lowermost position where it is again locked by the wing nut 81. This action rotates, through the turn-buckles 76, all of the eccentrics 51, in two of which shaft 50 is journaled, the remaining two serving as journals for the shaft 49. Due to the particular positioning of the eccentricity of the two pairs of eccentrics 51 and their angular relationship with the arcuate movement of the shift handle 72, their simultaneous movement first causes the plate cylinders 31 to be shifted off impression and finally brings cylinders 32 into printing position on impression cylinder 30. The printing has now been shifted from the one set of cylinders 31 to the other set 32.

At the completion of the shifting operation the interlock bar 190 assumes the position indicated in Fig. 9 and the cam shaft 123 is thereby released for further rotation whereby the drive to the cylinders 31, which are no longer printing, may be disconnected, and this is accomplished as follows:

The operator retracts the stop finger 180 from the recess 182 in worm gear 175 and rotates the crank 179 in the same direction it was previously turned (the only direction possible due to the position of the interlock bar 190) and this action causes, first, the disengagement of positive clutch 103 on cylinder shaft 49 by the cam 126, and finally, the disengagement of the friction clutch 141 on the same shaft by the cam 162, thereby leaving both of the drive gears 92 and 130 on shaft 49 freely rotating. It may be noted here that, although the shifting of plate cylinder shafts 49 and 50 away from impression tends to unmesh the gears 92 and 130 from the drive gears 90 and 91 on the impression cylinder shaft 30, the distance which the shafts 49 and 50 are moved away from the impression cylinder 30 is so small that the gears are never actually unmeshed.

The plate cylinders 31 are now freely rotating under their own momentum and may be brought

to rest by the operation of either or both brake handles 58 associated with these cylinders. When the cylinders have been brought to rest the plates P may be removed and others substituted, whereupon the entire mechanism is ready to be re-shifted as soon as the desired number of impressions have been printed from the operating cylinders 32, and this shift may be made by a reversal of the operations just described.

The invention in its broader aspects is not limited to the specific mechanisms shown and described but departures may be made therefrom within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its chief advantages.

What I claim is:

1. In a non-stop rotary fudge press, the combination of a pair of rotary plate cylinders, an impression cylinder, means for driving the impression cylinder and alternatively driving the plate cylinder, the driving means for each plate cylinder including an overrunning clutch and a positive clutch having a definite engaging position to drive the plate cylinder in register with the impression cylinder, means for engaging and disengaging each of said clutches, a common means for sequentially operating all of the clutch operating means, means for alternately moving the plate cylinders into and out of printing engagement with the impression cylinder, and interlock means interconnecting the common means and the clutch operating means preventing movement of the plate cylinders except when one of the positive clutches is engaged.

2. In a non-stop rotary fudge press, the combination of a pair of rotary plate cylinders, an impression cylinder, means for driving the impression cylinder and alternatively driving the plate cylinders, the driving means for each plate cylinder including an overrunning clutch and a positive clutch, means for engaging and disengaging each of said clutches, a common means for sequentially operating all of the clutch operating means, means for alternately moving the plate cylinders into and out of printing engagement with the impression cylinder, and interlock means interconnecting the common means and the clutch operating means preventing movement of the plate cylinders except when one of the positive clutches is engaged.

3. In a non-stop rotary fudge press, the combination of a pair of rotary plate cylinders, impression means cooperating with said cylinders, means for driving said plate cylinders including a freewheeling clutch for each cylinder, a positive clutch for each cylinder, said positive clutch driving its cylinder slightly faster than the freewheeling clutch, means for sequentially engaging and disengaging the clutches in a definite order, means for alternately moving the plate cylinders into and out of impression relation with respect to the impression means, and means interconnecting the sequentially operating means and plate cylinder moving means for preventing movement of the plate cylinder except when one of the plate cylinders is positively driven.

4. In a non-stop rotary fudge press, the combination of a pair of rotary plate cylinders, an impression cylinder to cooperate with the plate cylinders alternately, driving means for the cylinders including an overrunning clutch and a positive clutch for each plate cylinder, an operating means for each clutch, and a rotary shaft having cams thereon for shifting said operating

means, the cams being arranged for sequential operation of the clutches by rotation of the shaft.

5. In a non-stop rotary fudge press, the combination of a pair of rotary plate cylinders, an impression cylinder to cooperate with the plate cylinders alternately, driving means for the cylinders including an overrunning clutch and a positive clutch for each plate cylinder, an operating means for each clutch, and a rotary shaft having cams thereon for shifting said operating means, the cams being arranged for sequential operation of the clutches by rotation of the shaft, means for moving the printing cylinders into and out of printing relation to the impression cylinder, and blocking means actuated by the cam shaft and controlling movement of the printing cylinders for preventing movement of the printing cylinders in certain positions of the cam shaft.

6. In a non-stop rotary fudge press, the combination of a pair of rotary plate cylinders, impression means cooperating with said cylinders alternately, driving means, positive clutches for coupling each cylinder to the driving means, means for driving each cylinder from the driving means at a slower speed, means for sequentially engaging and disengaging the several driving means in a predetermined order, means for moving the plate cylinders into alternate engagement with the impression means and means interconnecting the plate cylinder moving means and the sequential engaging means for prevent-

ing movement of the plate cylinder except when one of the plate cylinders is positively driven.

7. In a non-stop rotary fudge press, the combination of a pair of rotary plate cylinders, an impression cylinder, means for driving the impression cylinder and alternatively driving the plate cylinders, the driving means for each plate cylinder including an overrunning clutch and a positive clutch, and a common means for operating all of the clutches in a predetermined sequence.

8. In a non-stop rotary fudge press, the combination of a pair of rotary plate cylinders, an impression cylinder, means for driving the impression cylinder and alternatively driving the plate cylinders, the driving means for each plate cylinder including an overrunning clutch and a positive clutch, a common means for operating all of the clutches, means for alternately moving the plate cylinders into printing relation to the impression cylinder and means preventing movement of the plate cylinder moving means except when one of the plate cylinders is in printing relation to the impression cylinder.

9. In a rotary printing press, the combination of a pair of plate cylinders, impression means, means for alternately moving the plate cylinders into cooperation with the impression means, a clutch for each plate cylinder through which it is driven, common means for operating the clutches and means preventing movement of the plate cylinder moving means except when the clutch operating means is in certain positions.

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