

Dec. 18, 1951

C. W. HARROLD ET AL

2,578,700

SHEET CONTROLLED INTERRUPTER FOR OFFSET PRINTING PRESSES

Filed July 12, 1946

6 Sheets-Sheet 1

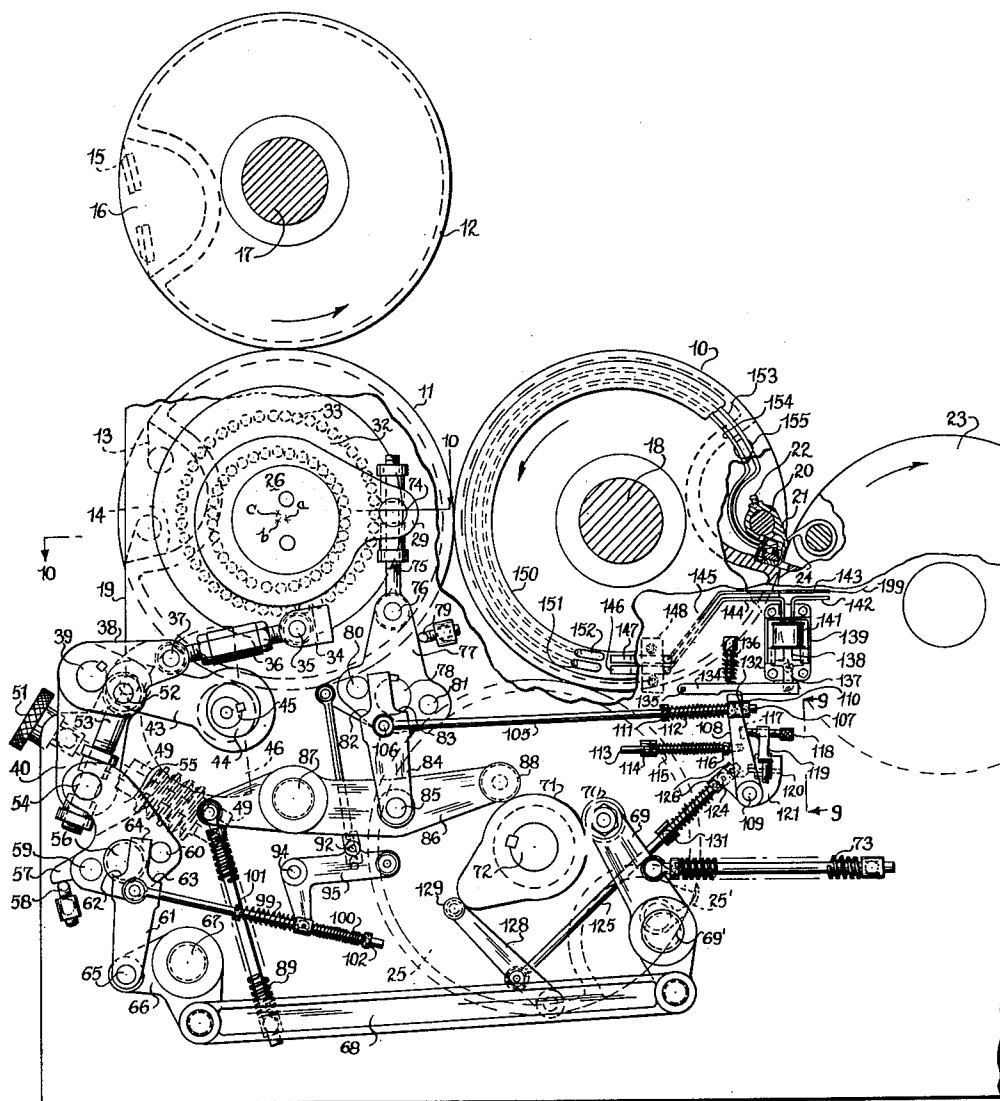


Fig. 1

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6 Sheets-Sheet 2

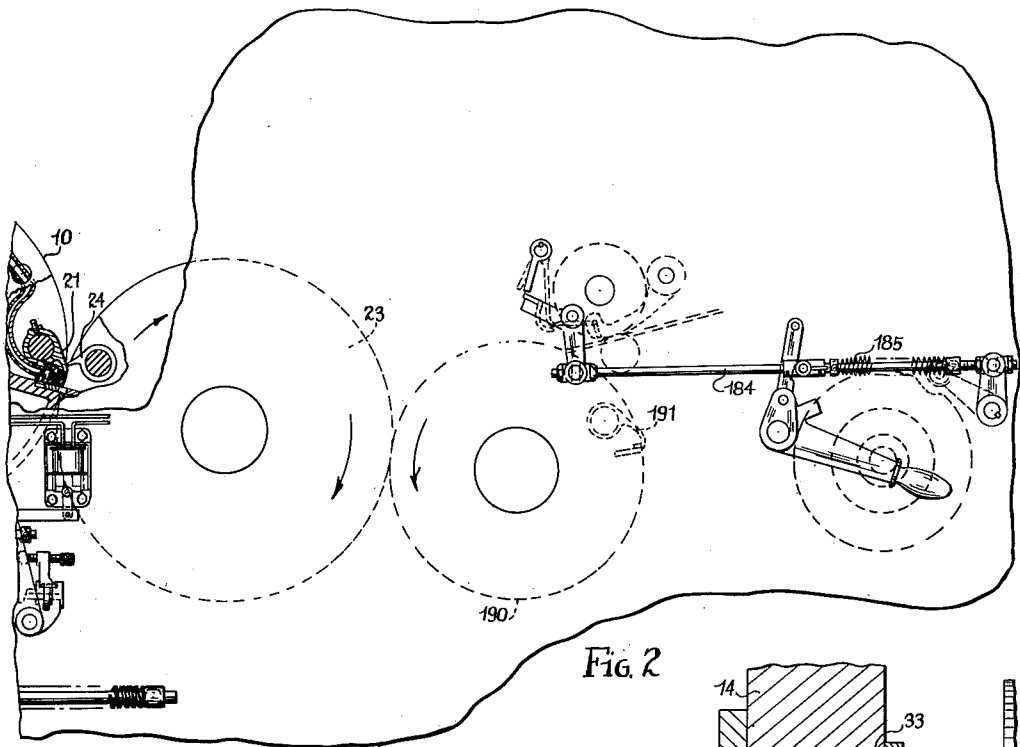


FIG. 2

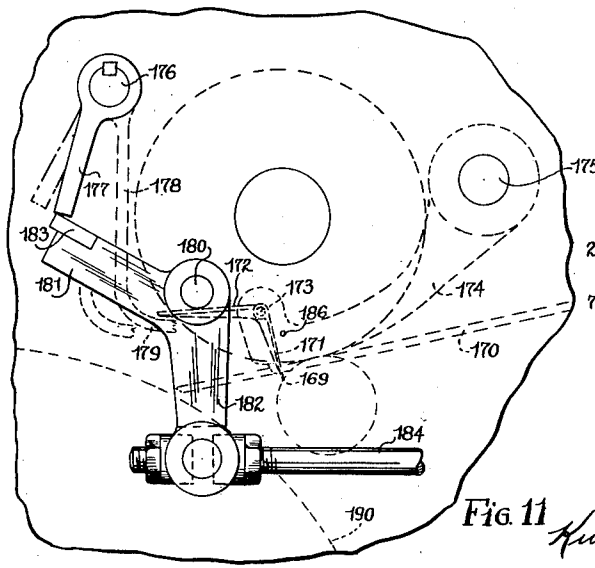


FIG. 11

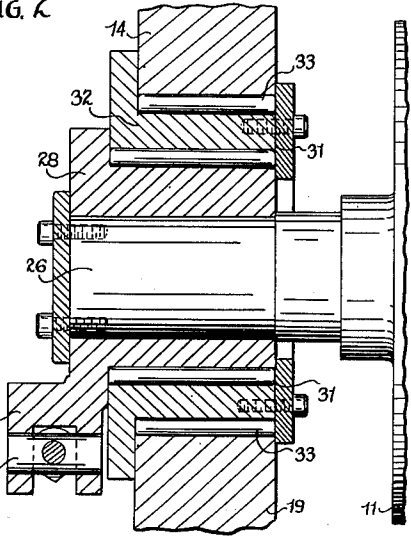


FIG. 10
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6 Sheets-Sheet 3

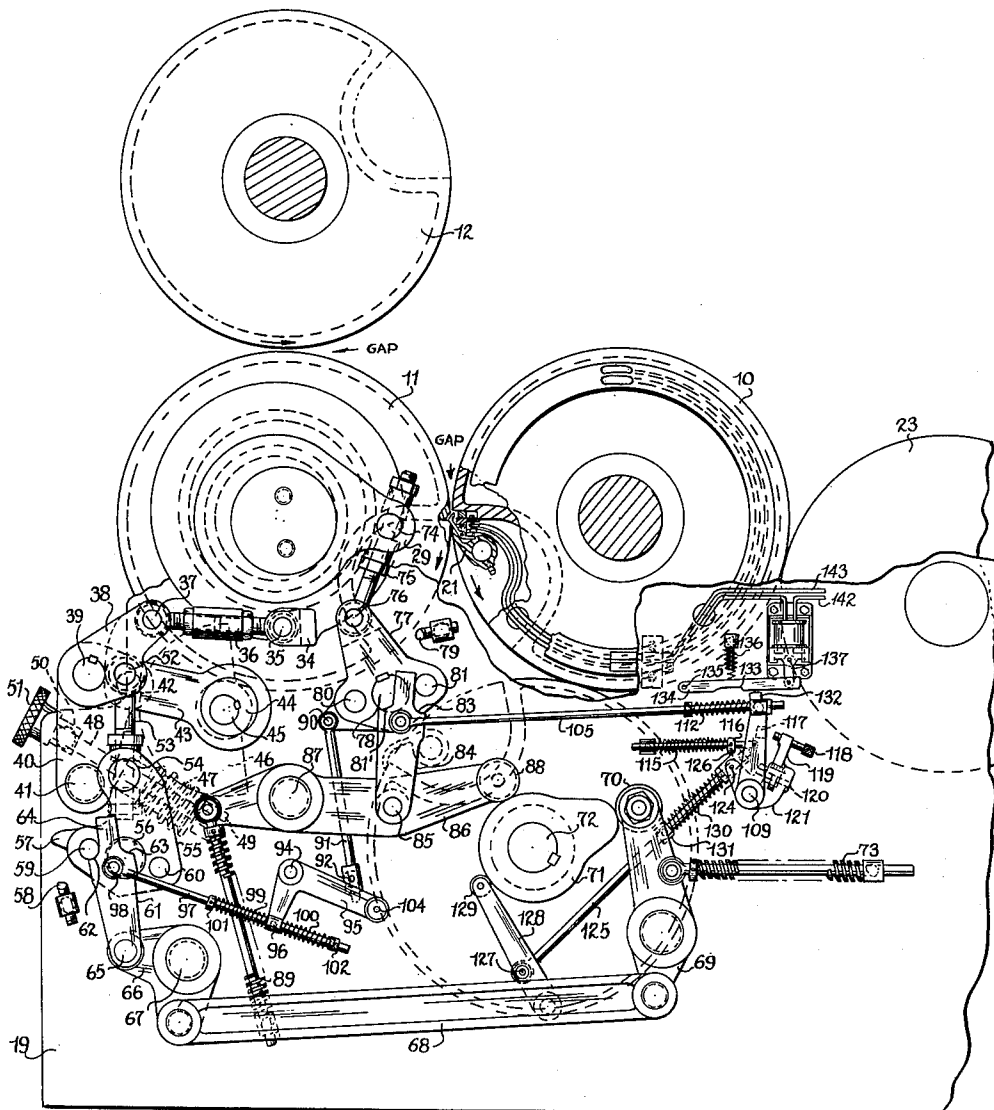


FIG. 3

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6 Sheets-Sheet 5

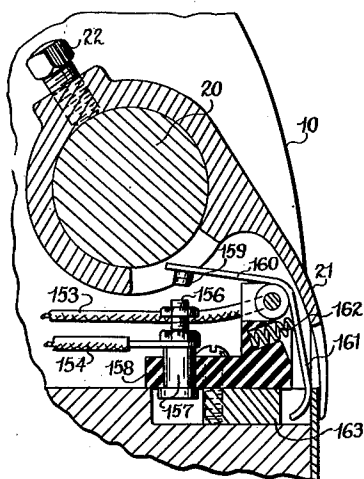


Fig. 5

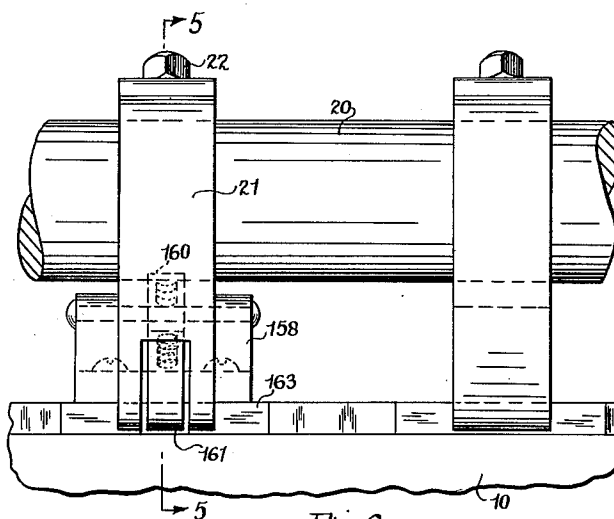


Fig. 6

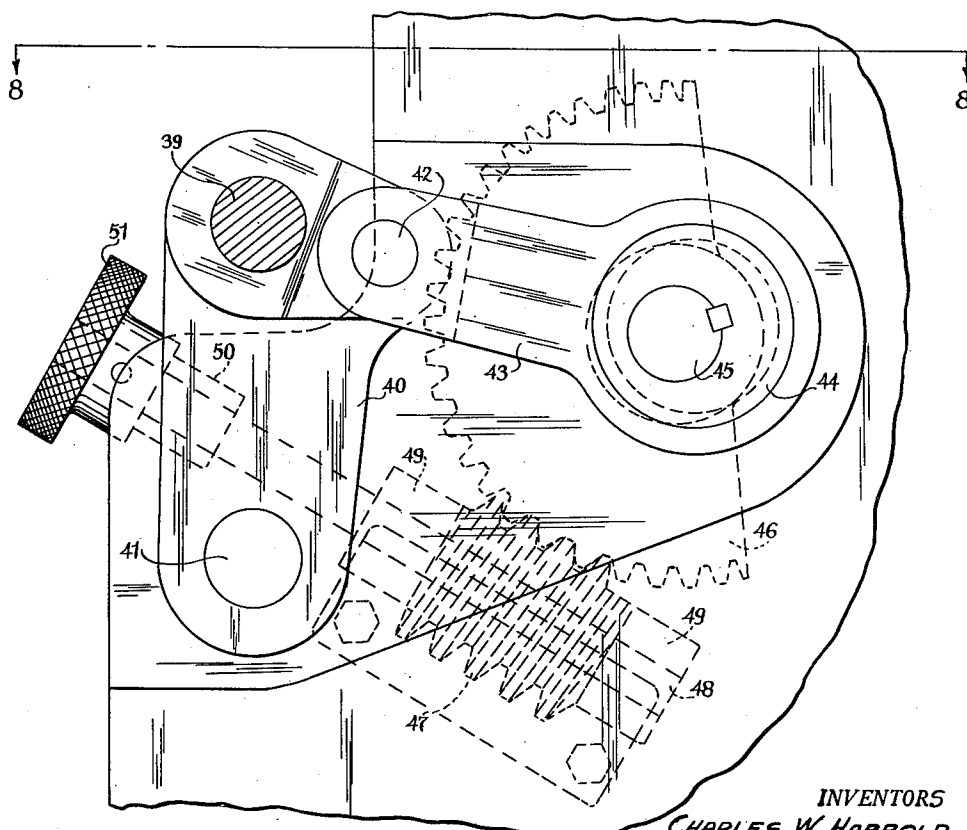


Fig. 7

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6 Sheets-Sheet 6

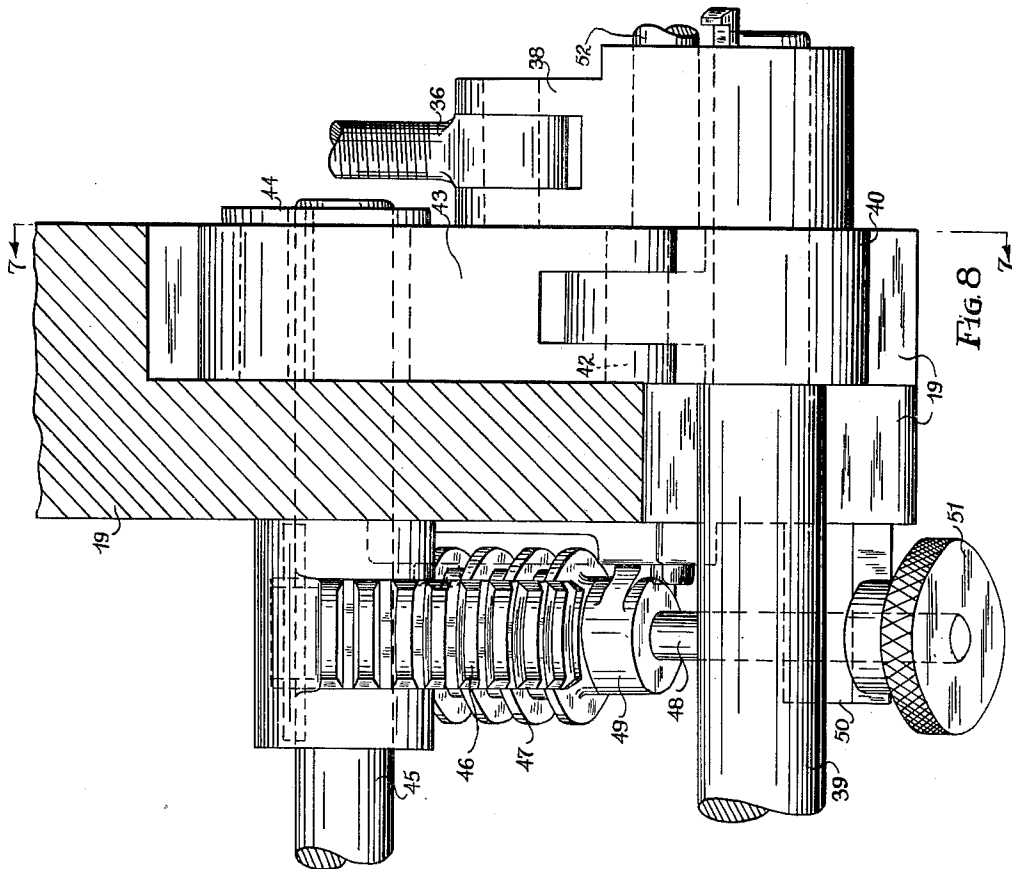


Fig. 8

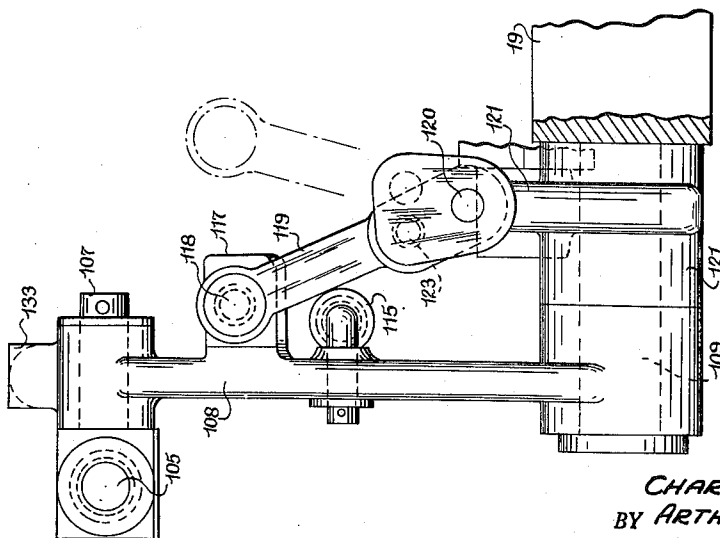


Fig. 9

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UNITED STATES PATENT OFFICE

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SHEET CONTROLLED INTERRUPTER FOR
OFFSET PRINTING PRESSES

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Application July 12, 1946, Serial No. 683,130

16 Claims. (Cl. 101—184)

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This invention relates to improvements in printing presses, and has to do particularly with impression throwoff mechanism for rotary offset presses, especially mechanism for throwing the blanket cylinder off from the plate cylinder and from the impression cylinder in two sequential steps, and to means responsive to failure of sheet feed for setting such mechanism into operation.

One of the objects of the invention is the provision of means dependent upon the presence or absence of a sheet in the printing unit itself for controlling the throwoff for that unit, so that if action of the feeder serving the press is interrupted the desired throwoff of the press unit takes place at the desired time regardless of the extent of sheet transfer means employed between the sheet feeder and the impression cylinder.

Another object is the provision of improved inner and outer eccentric mountings for the blanket cylinder.

Another object is the provision of improved means for adjusting the impression pressure or compensating for different stock thicknesses as a part of the throwoff mechanism.

A further object is the provision of throwoff means comprising two toggle mechanisms in series for enabling the throwoff to function properly in spite of adjustments of the anchor pivot of the toggle mechanism directly connected with the eccentric mounting of a cylinder.

Still another object is the provision of sheet detector means acting to latch the throwoff mechanism in printing position except when a sheet fails to be presented properly to the sheet grippers, and serving electrically in such case to withdraw the latch at a given point in the cycle of the unit.

Another object is the provision of means for disabling partially or completely the throwoff mechanism when desired.

Other objects and features of novelty will appear as we proceed with the description of that embodiment of the invention which, for the purposes of the present application, we have illustrated in the accompanying drawings, in which

Fig. 1 is a diagrammatic side elevational view of one printing unit of a rotary offset press embodying the invention, and showing the impression on.

Fig. 2 is a continuation of Fig. 1 showing a portion of a sheet feeder, and sheet transfer mechanism interposed between the feeder and the first unit of the press.

Fig. 3 is a view similar to Fig. 1 but showing both parts of the throwoff mechanism operated

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to provide a narrow gap between the blanket cylinder and each of the other cylinders of the unit.

Fig. 4 is a view similar to Fig. 3 but with the second part of the throwoff mechanism disabled, operating contact between the plate and blanket cylinders being accordingly maintained.

Fig. 5 is a detail sectional view on a larger scale showing a sheet gripper and accompanying sheet feeler with electrical contacts controlled thereby, the view being taken substantially on the line 5—5 of Fig. 6.

Fig. 6 is a fragmental view at right angles to Fig. 5.

Fig. 7 is a detail view on a larger scale of the eccentric means for adjusting the position of the anchor pivot for the toggle mechanism which operates the throwoff of the blanket cylinder from the impression cylinder, the view being taken substantially on the line 7—7 of Fig. 8.

Fig. 8 is a plan view, partly in section along the line 8—8 of Fig. 7.

Fig. 9 is a detail elevational view on a larger scale looking in the direction of arrows 9—9 of Fig. 1.

Fig. 10 is a sectional view through one end of the blanket cylinder mounting, the view being taken substantially on the line 10—10 of Fig. 1, and

Fig. 11 is an enlarged view of a portion of a feeder throwoff shown in Fig. 2.

In the drawings 10 is the impression cylinder of a rotary offset printing unit, which also comprises a blanket cylinder 11 and a plate cylinder 12. A blanket 13 is wrapped around cylinder 11 and secured within the gap 14 thereof in the usual manner, and the usual plate 15 surrounds cylinder 12 and is clamped within gap 16 of that cylinder.

Plate cylinder shaft 17 and impression cylinder shaft 18 are carried in the main frame 19 of the press, these shafts being preferably mounted in fixed journals in the frame. The cylinders are rotated in the directions shown continuously during the operation of the press by gearing of conventional character, not shown.

The impression cylinder 10 is equipped with the usual gripper shaft 20 carrying a series of sheet grippers, a particular one of which is shown at 21. These grippers may be secured directly to the gripper shaft as by setscrews 22, or they may be loosely mounted upon the gripper shaft and actuated in a well-known manner by dogs keyed to the shaft. In either event they are opened and closed at the proper times by any suitable mechanism, not shown.

Sheets may be conveyed to grippers 21 by any

suitable means. In the illustrated case this means comprises a conveying cylinder 23 provided with grippers 24 which function to release a sheet as it is taken by grippers 21. The sheets are carried by the latter grippers and by the impression cylinder 10 into contact with blanket cylinder 11, by which they are printed, and thence to the grippers 25 of a delivery cylinder or any other suitable device for conveying sheets to a delivery or to another unit of the press.

The blanket cylinder 11 is provided with a shaft 26 rigid with the cylinder, each end of the shaft being supported in a bearing carried by an inner eccentric block 28 having a projecting ear 29 connected to mechanism for movement of the block through a small angle, as will be presently described. Block 28 in turn is carried in an antifriction bearing 31 within an outer eccentric block 32. Finally block 32 is mounted within an antifriction bearing 33 carried in the main frame 19. Eccentric block 32 is provided with an ear 34 to which there is connected mechanism, presently to be described, for turning block 32 through a small angle.

Both ends of shaft 26 are mounted as above described, there being a pair of eccentric blocks 28 and a pair of eccentric blocks 32, each mounted in antifriction bearings. In conformity with common practice these blocks will be referred to hereinafter simply as eccentrics.

A limited rotation of the two eccentrics 28 causes movement of the cylinder 11 toward or away from plate cylinder 12 without substantially altering its position in relation to impression cylinder 10, and a limited rotation of the two eccentrics 32 causes movement of the blanket cylinder 11 toward or away from impression cylinder 10 without substantially altering its relation to plate cylinder 12. The center of shaft 26 is indicated at *a*, the center of eccentric 28 at *b*, and the center of eccentric 32 at *c*.

At each side of the press ear 34 of eccentric 32 carries a pin 35 which is connected by a link 36 of adjustable length to a pin 37 of a lever 38 keyed to a shaft 39 which extends across the press, shaft 39 being sometimes referred to hereinafter as an anchor pivot. Shaft 39 is rotatably mounted near each end in a link 40 which is pivotally supported on a stud 41 in frame 19, see particularly Fig. 3. Each link 40 carries a pin 42 which takes into a hole in one end of a further link 43. The other end of the latter link is mounted on an eccentric bearing 44, keyed to a shaft 45, the latter shaft being rotatably journaled in frame 19 and extending across the press.

At one side of the press, just inside the main frame 19, a worm wheel sector 46 is keyed to shaft 45. This sector meshes with a worm 47 keyed or pinned to a short shaft 48 between bearings 49 fixed to the inner surface of frame 19. Shaft 48 is rotatable in bearings 49 and in a hole in a stud 50 fixed in frame 19, and has secured to its upper end a knob 51 which may be turned by hand.

Through the connections just described it is possible, by turning knob 51, to adjust the angular position of shaft 45 and thereby move the shaft 39 bodily toward or away from the center of shaft 45, the shaft 39 moving at all times parallel to itself in an arc about the studs 41. This adjustment of shaft 39 enables the operator to limit the extent of movement of blanket cylinder 11 toward impression cylinder 10 when the lever 38 and link 36 are in posi-

tion to bring shaft 39, pin 37 and pin 35 substantially into alignment as shown in Fig. 1, in other words when the toggle composed of lever 38 and link 36 is "on toggle." In practice the position of the blanket cylinder with respect to the impression cylinder for different impression pressures or for different stock thicknesses is indicated by graduations upon a suitable scale carried by the frame, the pointer for such scale being carried by the shaft 45 or the sector 46.

Each of the levers 38 is provided with a second pin 52 which rotatably receives one end of a link 53, the other end of which surrounds a pin 54 in a lever 55 which is carried on a shaft 56 journaled in frame 19. There are levers 55 on both ends of shaft 56. These levers are rotatable through a limited angle from a position where abutment 57 of each lever engages a stop screw 58 carried by frame 19 as shown in Fig. 1 to a position where shaft 56, pin 54 and pin 52 are in substantial alignment, as in Fig. 3. In practice pin 54 is moved slightly past the position of alignment, whereby the parts tend to remain "on toggle."

The lever 55 on one side of the press is provided with two outwardly projecting studs, 59, 60, on opposite sides of shaft 56. These studs are adapted to be engaged selectively by a thrust block 61 having shoulders 62, 63 for engaging the studs 59, 60, and an upward projection 64 for limiting the sidewise movement of block 61. Block 61 is pivotally mounted on pin 65 in bell crank 66 rotatably supported on stud 67 in frame 19. The other arm of bell crank 66 is connected by link 68 to one end of a cam lever 69 pivoted on stud 69' the other end of which lever carries a follower 70 which follows a cam 71 keyed to shaft 72 of delivery cylinder 25. Lever 69 is urged toward cam 71 by spring 73.

By means of the mechanism described, cam 71 causes thrust block 61 to be periodically raised and lowered to engage one or the other of the studs 59, 60 depending upon whether block 61 is moved to the left or right on its pivot 65. The means employed to control the position of block 61 will be described hereinafter. If this block engages pin 60, lever 55 is turned counterclockwise to the position shown in Fig. 1, thereby pulling lever 38 down until shaft 39, pin 37 and pin 35 are substantially in line, that is "on toggle." This causes rotation of eccentrics 32 and moves blanket cylinder 11 toward impression cylinder 10. If block 61 engages pin 59, lever 55 is swung clockwise until shaft 56, pin 54 and pin 52 are substantially in line, that is "on toggle" as in Fig. 2, and pin 37 is moved "off toggle." This causes eccentrics 32 to rotate clockwise and move the blanket cylinder away from the impression cylinder.

The eccentrics 28 are moved by the following means. On each side of the press a pin 74 is mounted in ear 29 and connected by rod 75 to a pin 76 in a lever 77 similar in function and operation to lever 55. Levers 77 are keyed to a shaft 78 extending across the press and have movement from a position against stop screws 79 such that shaft 78, pin 76 and pin 74 are substantially "on toggle" as in Fig. 1 to the position shown in Fig. 3.

A lever 77 on one side of the press only has two outwardly projecting studs 80, 81 which are adapted to be engaged by the shoulders 82, 83 of a thrust block 84 pivotally carried on stud 85 mounted in a cam lever 86 which is pivoted on

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a stud 87 in frame 19. Lever 86 at one end has a follower 88 which is pressed against cam 71 by spring 89 acting on the other end of the lever. As cam 71 rotates it rocks lever 86 and raises thrust block 84 into engagement with one or the other of the studs 80, 81. When it engages stud 80, lever 77 is turned clockwise to the position of Fig. 1 where pin 76 is "on toggle" and eccentric 28 has been turned counterclockwise to move the blanket cylinder toward the plate cylinder 12. When block 84 engages stud 81 lever 77 is turned counterclockwise to the position shown in Fig. 3 where pin 76 is "off toggle" and the blanket cylinder has been moved away from the plate cylinder 12.

The two levers 77 and 55 are interconnected by the following means. Lever 77 carries a stud 90 which is connected by rod 91 to a noddle pin 92 in lever 93, see Fig. 4, which is loosely mounted on a pivot stud 94 in frame 19. On this same stud 94 there is also pivotally mounted a bell crank lever 95, the lower arm of which carries a noddle pin 96 in which slides a rod 97 having a head surrounding stud 98 fixed in thrust block 61. Surrounding rod 97 there are two compression springs 99, 100, on opposite sides of noddle pin 96 abutting against collars 101 and 102.

Lever 93 and bell crank 95 are arranged so that movement of the former is transmitted to the latter or is not so transmitted, according to the desire of the press operator. Lever 93 is provided with a hole 103, Fig. 4, and bell crank 95 is provided with a slidable pin 104 which may be inserted into hole 103 when it is desired to lock the two levers together for movement in unison, which pin may be retracted from engagement with hole 103 when it is desired not to transmit movement of lever 93 to bell crank 95.

By the connections just described it will be seen that when pin 104 is in position in hole 103 a movement of lever 77 to the right to the position shown in Fig. 1 will cause thrust block 61 to be resiliently pulled over against stud 60 of lever 55, and movement of lever 77 to the left to the position shown in Fig. 3 will cause block 61 to be resiliently pushed over against stud 59. If pin 104 is withdrawn from hole 103 as in Fig. 4, movement of lever 77 in either direction will have no effect on block 61, but due to the action of gravity upon bell crank 95 projection 64 on block 61 will tend to rest against stud 59.

Thrust block 84 is swung to the right or left about its pivot 85 in accordance with the presence or absence of a sheet on impression cylinder 10 by the following mechanism. A control rod 105 extends from a stud 106 in block 84 through a noddle pin 107 in an arm 108 which is pivoted on a stud 109 in frame 19. Rod 105 is provided with two collars 110 and 111 and a spring 112 to form a resilient connection in one direction between rod 105 and noddle pin 107. A spring rod 113 connected to arm 108 and passing through a hole in stud 114 in frame 19 carries a spring 115 which acts against collar 116 to urge arm 108 toward the right.

Arm 108 is provided with a lug 117 which abuts against an adjustable screw 118 that is received in a threaded hole in a lever 119 pivotally mounted on pin 120 in a bell crank 121. Lever 119 has limited movement about pin 120, as indicated in Fig. 9. The lever is held in normal operative position, that is with screw 118 in line with abutment 117, by means of a detent device 123 which engages an indentation in bell crank 121. Lever 119 is also movable to an inoperative position in

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which screw 118 is out of line with abutment 117, in which position it is held by the detent device 123 engaging another indentation in bell crank 121.

The other arm of bell crank 121 carries a noddle pin 124 through which extends one end of a rod 125 which is secured against movement in the noddle pin by collars 126. The other end of rod 125 has a head which surrounds a stud 127 in a cam lever 128 having a follower 129 which follows cam 71. Spring 130 surrounding rod 125 abuts against one of the collars 126 and against a slotted stud 131 for urging follower 129 against the cam.

The action of cam 71, lever 128, and rod 125 is to move bell crank 121 back and forth about its pivot 109 with each rotation of the cylinders, that is once during each cycle of the press. Owing to the pressure of spring 115, arm 108 tends to follow the movements of bell crank 121 and maintain abutment 117 in contact with screw 118.

Arm 108, however, is arranged to be latched at times in its left hand position, so as not to follow the movement of bell crank 121 and for this purpose is provided with a hardened plate 132 which is adapted to engage a notch 133 in a latch bar 134 pivoted to the frame at 135 and pressed downwardly by a spring 136. The free end of latch bar 134 is connected by a link 137 to the armature 138 of a solenoid 139 secured to the frame 19 by bolts 140. The coil 141 of the solenoid is adapted to be energized by electrical power, preferably of low voltage, supplied by lead wires 142, 143, from a suitable source, not shown. One of the leads, 142 as shown, is connected directly to the coil 141, while the other lead 143 is connected through switching mechanism now to be described to the incoming lead 144 of coil 141.

The two wires 143, 144, pass through an opening 145 in frame 19 and are connected to two metal brushes 146, 147 which are held in a bracket 148 secured by screws or the like to the inside surface of frame 19. These brushes bear against the surface of a flat annular ring 150 which is fastened to the end of cylinder 10 by means not shown. Ring 150 is formed of electrically non-conducting material. Inserted in the ring are two metal contact plates 151, 152 which are adjacent each other but radially spaced so as to pass beneath and into contact with brushes 146, 147, respectively. These plates 151, 152, are connected to wires 153, 154 which lie in grooves formed in the inner face of ring 150, and, at a point adjacent the gap in the periphery of the cylinder 10 pass through an opening 155 in the end wall of the cylinder into the gap. As shown, particularly in Fig. 5, wire 154 is connected to contact point 156 carried on a stud 157 which is secured on a block 158 of insulating material. The other wire 153 is connected to a contact point 159 carried on one arm of a detector finger 160 which is pivotally mounted in block 158. The other arm 151 of the detector finger 160 lies under and between the two parts of the bifurcated gripper finger 21 and is normally urged outwardly of the cylinder and the space between the bifurcations by a small spring 162. The gripper pad 163 is cut out as shown to receive the end of the arm 151 of the detector finger. The arrangement is such that when there is no sheet in the gripper 21, spring 162 will urge arm 161 of the detector finger outwardly between the bifurcations of the gripper 21 until the contact point 159 engages contact point 156. But when a sheet is presented by grippers 24 and gripped by grippers 21 against

pad 163 the sheet will depress arm 161 into the recess in pad 163 and cause contact points 156, 159 to separate.

The position of the metal plates 151, 152 is preferably so chosen in relation to the position of the gripper 21 and the location of brushes 146, 147, that the plates 151, 152 will make contact with the brushes 146, 147 very shortly after the gripper 21 has closed upon the sheet, thereby giving ample time for the mechanism controlled thereby to function properly.

170 represents the feed board of a pile feeder. Sheets are conveyed down this board by tapes in the well-known manner of such feeders. Suitable means for throwing off the feeder action are employed to take effect in case a sheet fails to strike the front registering means on the feed board at the proper time, or in case a sheet approaching the said registering means is crumpled, folded or askew. Figs. 2 and 11 illustrate one means for this purpose.

Front registering means are illustrated at 169, and 171 represents a detector finger approximately in transverse alignment with the said registering means. Preferably there are two such fingers spaced transversely of the feed board. The fingers 171 are integral with forwardly projecting fingers 172, these two parts thus constituting a bell crank lever which is pivoted at 173 upon an arm 174 that is pinned to an oscillating shaft 175 and carries the said registering means 169. Gravity tends to move the bell crank counter-clockwise on its pivot 173. A second oscillating shaft 176 carries a depending latch bar 177 and a depending leg 178 which is provided with a rearwardly projecting foot 179 having a V-shaped extremity.

A fixed stud 180 supports a bell crank lever having arms 181 and 182. Arm 181 carries a pad 183 which is adapted to engage the end of latch bar 177, while arm 182 has an articulated connection with a longitudinally movable rod 184 which is subjected to pressure by a spring 185 tending to move the rod forward but prevented by cam action from doing so during the major part of each cycle of the feeder.

When a properly fed sheet strikes a finger 171 the corresponding finger 172 is lifted to the position of Fig. 11, so that when the leg 178 swings rearwardly its foot 179 moves beneath finger 172 and latch bar 177 moves into position above pad 183, thereby preventing spring 185 from forcing the rod 184 forwardly. Arm 174 will then rise because of the oscillation of shaft 175, and the sheet will be fed forward by suitable pull-out rollers or the like.

If on the other hand a sheet should fail to approach the front stops at the proper time in the cycle of the feeder, finger 172 through the action of gravity will take a position lower than that illustrated, that is until finger 171 bears against a stop 186. In this lower position the forward extremity of finger 172 will engage the V-notch in foot 179 as the leg 178 swings rearwardly, and thus will hold latch bar 177 in the broken line position, or clear of the pad 183. Accordingly, when the previously mentioned cam means permits, spring 185 will drive the rod 184 forwardly, which will function in any known manner to stop feeder action.

190 represents a sheet transfer device having sheet grippers 191, this device being preferably a rotary device of irregular motion adapted to take a sheet from the feed board while the sheet is moving at less than press speed and accelerate

it to press speed at the time of its transfer to a second constant speed transfer cylinder 23, previously mentioned, which rotates at press speed and is provided with the grippers 24 which are adapted to deliver the sheet to the grippers 21 of the impression cylinder 10.

In the normal operation of the press, a sheet is presented at each revolution of cylinder 10 to the grippers of that cylinder and the closing of gripper 21 on the sheet causes the sheet to move arm 161 inwardly, thereby separating contact 159 from contact 156 and keeping open the circuit to solenoid 139 at the time when plates 151, 152 pass under brushes 146, 147. Under such conditions the armature 138 is free to remain in its downward position allowing latch bar 134 to be pressed down by spring 136 into position for its notch 133 to engage plate 132 of arm 108. Under these conditions, bell crank 121 continues to oscillate back and forth at each revolution of the press under the influence of cam 71 acting upon lever 128 and rod 125 but it has no influence upon arm 108 other than to relieve the pressure of plate 132 against notch 133 each time the screw 118 is brought into contact with lug 117 of arm 108 at the leftward end of its stroke.

If, however, there is an interruption in the presentation of sheets to impression cylinder 10, with the result that no sheet is present when gripper 21 closes on pad 163, arm 161 of the detector finger remains in its outward position and contact points 156, 159 remain closed. Shortly thereafter, the rotation of cylinder 10 brings plates 151, 152 into contact with brushes 146, 147 thereby completing the electrical circuit to solenoid 139 and causing armature 137 to be quickly lifted to the position shown in Fig. 3. This occurs at the time when the pressure of plate 132 on notch 133 has been relieved by cam 71, as previously described, and causes the unlatching of arm 108 by latch bar 134. Arm 108 is thus free to be pressed by its spring 115 toward the right and to follow the movement of bell crank 121 under the control of cam 71.

Arm 108 in moving toward the right acts through rod 105 to pull thrust block 84 to the right over against stud 81. Thereafter on the next upward movement of block 84 stud 81 is raised by shoulder 83 and lever 77 is thereby swung to the left into the position shown in Fig. 3. The corresponding lever 77 on the opposite side of the press experiences a similar movement since both levers 77 are keyed to shaft 78. This movement breaks the toggle between shaft 78 and eccentrics 28 and causes these eccentrics to be rotated somewhat clockwise thereby moving blanket cylinder 11 away from plate cylinder 12.

The movement of lever 77 toward the left imparts a downward thrust to rod 91 which acts through lever 93 and bell crank 95 (assuming pin 104 is in its normal position in hole 103) and rod 97 to resiliently push thrust block 61 to the left against pin 59 so that, on the next upward movement of block 61, pin 59 will be lifted by shoulder 62 and lever 55 will be swung toward the right as in Fig. 3. This movement of lever 55 imparts an upward thrust through rod 53 to pin 52 until pin 54 reaches the "on toggle" position. The upward thrust on pin 52 turns lever 38, and consequently also shaft 39 thereby breaking the toggles on both sides of the press between shaft 39 and eccentrics 32 and giving these eccentrics a slight clockwise rotation to move

blanket cylinder 11 away from impression cylinder 10.

The action just described is so timed that the blanket cylinder moves away from the plate cylinder first and then in the same cycle away from the impression cylinder, both movements taking place as the gaps of the respective cylinders are passing the line joining the corresponding cylinder centers.

If the impression mechanism is in the "off" position, as at the end of the sequence of movements just described, and a sheet is then presented to grippers 21 the mechanism functions to throw the impression "on" in the same sequence, that is, the blanket cylinder 11 moves toward plate cylinder 12 first and toward impression cylinder 10 second in the same cycle, these movements occurring during passage of the gaps past the lines of centers of their respective cylinders.

When the inner eccentric is operated to throw the blanket cylinder toward the plate cylinder it exerts a wedging action upon the outer eccentric which tends to resist movement of the latter eccentric. Hence the operation of the outer eccentric to shift the blanket cylinder toward the impression cylinder is opposed by this wedging action. However, because of the antifriction bearings on both sides of the outer eccentric, it is possible to effect the required movement of the latter in spite of the additional load imposed upon it by this wedging action.

Thus, starting with the parts in off position and with impression cylinder 10 approaching the sheet receiving position, the high spot of cam 71 travels under follower 129, as in Fig. 1, causing bell crank 121 to move arm 108 to the left into latching position. Gripping of the sheet by gripper 21 opens contact points 156, 159 thereby keeping the circuit to solenoid 139 open during the time plates 151, 152 contact brushes 146, 147. Latch bar 134 thus is permitted to remain in its lower position to latch up the arm 108 so that as follower 129 rides down cam 71 arm 108 will not be permitted to follow bell crank 121 toward the right.

The leftward movement of arm 108 puts block 84 over against pin 80 so that as the high point of cam 71 comes under follower 88 block 84 pushes pin 80 up and rocks lever 77 into the "on toggle" position thereby moving eccentrics 28 counterclockwise and moving cylinder 11 toward plate cylinder 12.

The rocking of lever 77 to the right raises rod 91 and thereby moves block 61 to the right against pin 60 so that when the high point of cam 71 passes under follower 70 block 61 pushes pin 60 upward and moves lever 55 to the left thereby pulling levers 38 down into the "on toggle" position and moving eccentrics 32 counterclockwise to move cylinder 11 toward impression cylinder 10.

When it is the desire of the operator to run the press without sheets and with the blanket and plate cylinders in contact, as for "rolling up" the blanket in preparation for printing, he first cuts off the electric power to the solenoid 139, as by opening the line switch 199 (Fig. 1), so that the latch bar will not be raised and lever 108 will remain in the latched up position, then he removes pin 104 from hole 103 in lever 93 and moves, or permits gravity to move, bell crank 95 down so that link 61 bears against stud 59. Under these conditions, as shown in Fig. 4, the pressure between plate and blanket cylinders re-

mains on while the pressure between blanket and impression cylinders remains off.

In case it is the desire of the operator to run sheets through the press without pressure of the blanket cylinder against either of the other two cylinders, as when testing sheet feeding and handling, he merely swings lever 119 about pin 120 to the position in which screw 118 is out of alignment with lug 117 so that movement of lever 119 will have no influence on lever 108, then he lifts latch bar 134 to allow lever 108 to move to the right under the pressure of spring 115 thus shifting link 84 over against pin 81. This puts eccentrics 28 in the off position on the next revolution of cam 71. If pin 104 is in its normal position in hole 103 the movement of lever 77 will set link 61 to throw off the eccentrics 32. If pin 104 is not in hole 103, link 61 will be set in the latter position automatically by action of gravity as previously mentioned. Under the conditions just described, pressure between all cylinders will remain off regardless of the presence or absence of a sheet in gripper 21.

When the operator desires to adjust the blanket cylinder toward or away from the impression cylinder 10 in order to accommodate sheets of different thickness or for changing the amount of printing pressure, he turns knob 51 in the proper direction to move shaft 39 toward the right about its pivot 41 for setting the blanket cylinder closer to the impression cylinder and toward the left for the reverse effect.

The mechanism illustrated in Figs. 2 and 11 serves to stop the operation of the feeder in the event that a sheet fails to strike the detector finger 171 at the proper time in the feeder cycle. This action conventionally serves to set in motion means for throwing off the impression of the printing press when the sheet last fed has been printed. This of course calls for delayed action mechanism, and where the sheets before being presented to the first impression cylinder must pass over intermediate transferring elements such as the cylinders 190 and 23 of the illustrated case, such mechanism must be somewhat complex. In accordance with the present invention, however, the impression throwoff is not directly affected by the feeder throwoff, but is set in operation at the proper time by the failure of the feeder to present a sheet to the first printing unit.

Having thus described our invention, we claim:

1. In a machine of the character described, a feed table for supporting sheets fed automatically in timed sequence, front registering means associated with said table, a printing press having an impression cylinder, sheet grippers thereon adapted to take sheets advancing from said feed table, impression throw-off mechanism, sheet detecting means associated with said front registering means, means set in motion by said detecting means for stopping the feed of sheets in the absence of a sheet at said front registering means at the beginning of a press cycle, sheet advancing means forward of said feed table timed to present to said impression cylinder grippers a sheet which has passed said detecting means and is in transit between said feed table and said impression cylinder, and means associated with the grippers on said impression cylinder, functioning in the absence of a sheet fed to said cylinder, for setting said throw-off mechanism in impression off position and holding it in that position until the next sheet is fed.

2. In a machine of the character described, a feed table for supporting sheets fed automatically

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in time sequence, front registering means associated with said table, a printing press having an impression cylinder, sheet grippers thereon, sheet advancing means forward of said feed table comprising a transfer cylinder in operative relation with said impression cylinder, said advancing means being timed to present to said impression cylinder grippers a sheet the rear edge of which has passed said front registering means and is in transit between said feed table and said impression cylinder, impression throw-off mechanism, sheet detecting means associated with said front registering means operable to stop the feed of sheets, and means associated with the grippers on said impression cylinder, functioning in the absence of a sheet fed to said cylinder, for setting said throw-off mechanism into operation.

3. In a machine of the character described, a feed table for supporting sheets fed automatically in timed sequence, front registering means associated with said table, a printing press having an impression cylinder, sheet grippers thereon, sheet advancing means forward of said table comprising a plurality of sheet transfer devices timed to present to said impression cylinder grippers a sheet the rear edge of which has passed said front registering means and is in transit between said feed table and said impression cylinder, impression throwoff mechanism, sheet detecting means associated with said front registering means operable to stop the feed of sheets, and means associated with the grippers on said impression cylinder, functioning in the absence of a sheet fed to said cylinder, for setting said throw-off mechanism into operation.

4. In mechanism of the character described, a frame, plate, blanket and impression cylinders, a pair of outer eccentrics, roller bearings for said outer eccentrics mounted in said frame, a pair of inner eccentrics carried by said outer eccentrics, the shaft for said blanket cylinder being mounted in said inner eccentrics, impression throwoff means functioning to turn one pair of said eccentrics to separate the blanket cylinder from the plate cylinder, and impression throwoff means set in operation by the actuation of said first named throwoff means for separating the blanket cylinder from the impression cylinder in the same cycle of the press.

5. In mechanism of the character described, a frame, plate, blanket and impression cylinders, a pair of outer eccentrics, roller bearings for said outer eccentrics mounted in said frame, a pair of inner eccentrics, roller bearings for said inner eccentrics carried by said outer eccentrics, the shaft of said blanket cylinder being mounted in said inner eccentrics, and impression throwoff means functioning to turn said pairs of eccentrics in sequence, said means comprising means for turning the second pair of eccentrics set in motion by the means for turning the first pair.

6. In mechanism of the character described, a frame, plate, blanket and impression cylinders, a pair of outer eccentrics, roller bearings for said outer eccentrics mounted in said frame, a pair of inner eccentrics carried by said outer eccentrics, the shaft for said blanket cylinder being mounted in said inner eccentrics, cam actuated means for turning said inner eccentrics first and said outer eccentrics thereafter in sequence during a press cycle to throw off the blanket cylinder from the plate cylinder first and from the impression cylinder second, and means settable in advance to disable said means for turning said inner eccentrics, whereby the blanket cylinder will remain in con-

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tact with the plate cylinder but will be thrown off from the impression cylinder.

7. In mechanism of the character described, a frame, plate, blanket and impression cylinders, a pair of outer eccentrics, roller bearings for said outer eccentrics mounted in said frame, a pair of inner eccentrics carried by said outer eccentrics, the shaft for said blanket cylinder being mounted in said inner eccentrics, impression throwoff means functioning to turn said inner eccentrics to throw said blanket cylinder toward said plate cylinder, and impression throwoff means set in operation during the same cycle by said first named throwoff means for turning said outer eccentrics in their roller bearings to throw said blanket cylinder toward said impression cylinder.

8. In mechanism of the character described, a frame, plate, blanket and impression cylinders, a pair of outer eccentrics mounted in said frame, a pair of inner eccentrics carried by said outer eccentrics, the shaft for said blanket cylinder being mounted in said inner eccentrics, impression throwoff means functioning to turn first said inner and then said outer eccentrics for moving said blanket cylinder relative to said plate and impression cylinders in sequence in the same press cycle, said second throwoff means functioning in response to the action of said first throwoff means, and means interconnecting the eccentrics of one of said pairs and operable at a single operating station to adjust the angular position of the latter eccentrics.

9. In throw-off mechanism for a printing press, an adjustable mounting for the shaft of a cylinder, a toggle lever one end of which is connected with said adjustable mounting, an anchor pivot for the opposite end of said lever, an arm pivoted at one end, a movable mounting for said anchor pivot at the opposite end of said arm, means for shifting the intermediate pivot of said toggle lever to "on toggle" or "off toggle" position, a link to one end of which said movable mounting is connected, an eccentric bearing for the opposite end of said link, and means for turning said eccentric bearing to adjust the position of said movable mounting.

10. In throw-off mechanism for a printing press, an adjustable mounting for the shaft of a cylinder, a toggle lever one end of which is connected with said adjustable mounting, an anchor pivot for the opposite end of said lever, an arm pivoted at one end, a movable mounting for said anchor pivot at the opposite end of said arm, means for shifting the intermediate pivot of said lever to "on toggle," or "off toggle" position, a link to one end of which said movable mounting is connected, an eccentric bearing for the opposite end of said link, and non-reversible means for turning said eccentric bearing to adjust the position of said movable mounting.

11. In throw-off mechanism for an offset printing press, a pair of outer eccentrics, a pair of inner eccentrics carried by said outer eccentrics, a blanket cylinder journaled in said inner eccentrics mechanism for throwing off the blanket cylinder from the plate cylinder, separate mechanism for throwing off the blanket cylinder from the impression cylinder, means adapted to be actuated by the throw-off from said plate cylinder for setting in operation the throw-off from said impression cylinder, said means comprising twin elements one of which is adapted to be driven and the other of which is adapted to drive, and detachable means for connecting said twin elements together, whereby the removal of said

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detachable means disables said throwoff mechanism.

12. In throw-off mechanism for printing presses, a toggle lever arranged when thrown to "toggle on" position to move a cylinder to on position and maintain it there, an adjustable anchor pivot for said toggle, a second toggle operatively connected to said first toggle for moving said first toggle from one position to the other, a fixed anchor pivot for said second toggle, and a swingable thrust block for operating said second toggle in either direction.

13. In throw-off mechanism for printing presses, a toggle lever arranged when thrown to "toggle on" position to move a cylinder to on position and maintain it there, and adjustable anchor pivot for said toggle, a second toggle operatively connected with said first toggle for shifting the first toggle to "toggle on" position when the second toggle is moved to "toggle off" position and vice versa, a fixed anchor pivot for said second toggle, and a swingable thrust block for operating said second toggle in either direction.

14. In throw-off mechanism for printing presses, a printing couple comprising a rotating cylinder, sheet grippers thereon, a feeler on said cylinder adapted to be shifted by a sheet when gripped by said grippers, an electric circuit opened by said feeler when shifted, a second cylinder, means for moving said second cylinder to on or off position comprising a toggle lever, a swingable thrust block for causing said toggle to assume either "toggle on" or "toggle off" position, a throw-off control for swinging said thrust block from one position to the other, a latch adapted to hold said control and said thrust block in position to maintain said toggle in impression on position, magnetic means responsive to current in said circuit for disabling said latch, and means for moving said unlatched control to swing said thrust block to position for causing said toggle lever to assume impression off position, and cam means operable to return said throwoff to impression on position during the next cycle following the taking of a correctly fed sheet by said grippers and the consequent opening of said electric circuit.

15. In mechanism of the character described, a frame, plate, blanket and impression cylinders, a pair of outer eccentrics carried by the frame, a pair of inner eccentrics carried by said outer eccentrics, a shaft for said blanket cylinder journaled in said inner eccentrics, the inner and outer surfaces of said outer eccentric being engaged by roller bearings, and means for turning one of said pairs of eccentrics to press said blanket cylinder against said plate cylinder and for thereafter while pressure is maintained

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against said plate cylinder turning the other pair of eccentrics to press said blanket cylinder against said impression cylinder.

16. A printing unit adapted for use in a multi-unit press, said unit embodying a plate cylinder, a blanket cylinder and an impression cylinder, said blanket cylinder being disposed between said plate and impression cylinders with its axis to one side of the plane through the axes of the plate and impression cylinders, impression throw-off mechanism effective to move said blanket cylinder out of contact with said plate and impression cylinders in sequence, means comprising a feeler on said impression cylinder functioning in the absence of a sheet fed to said cylinder for setting said throwoff mechanism to move said blanket cylinder out of contact with said plate cylinder and thereafter out of contact with said impression cylinder, said means functioning also to return said blanket cylinder to impression on position relative to said plate and impression cylinders in sequence during the cycle following the taking of a correctly fed sheet by said grippers, cam and cam follower means timed to cause said sequential action to be completed in a fraction of one revolution of said impression cylinder, and means for placing each sheet on the impression cylinder more than said fraction of revolution ahead of the printing line, and transfer means for taking sheets from said impression cylinder and advancing them to the next unit of the press.

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