July 19, 1938. C. R. KADDELAND 2,124,420

PRINTING PRESS

Original Filed May 20, 1933 3 Sheets-Sheet 1

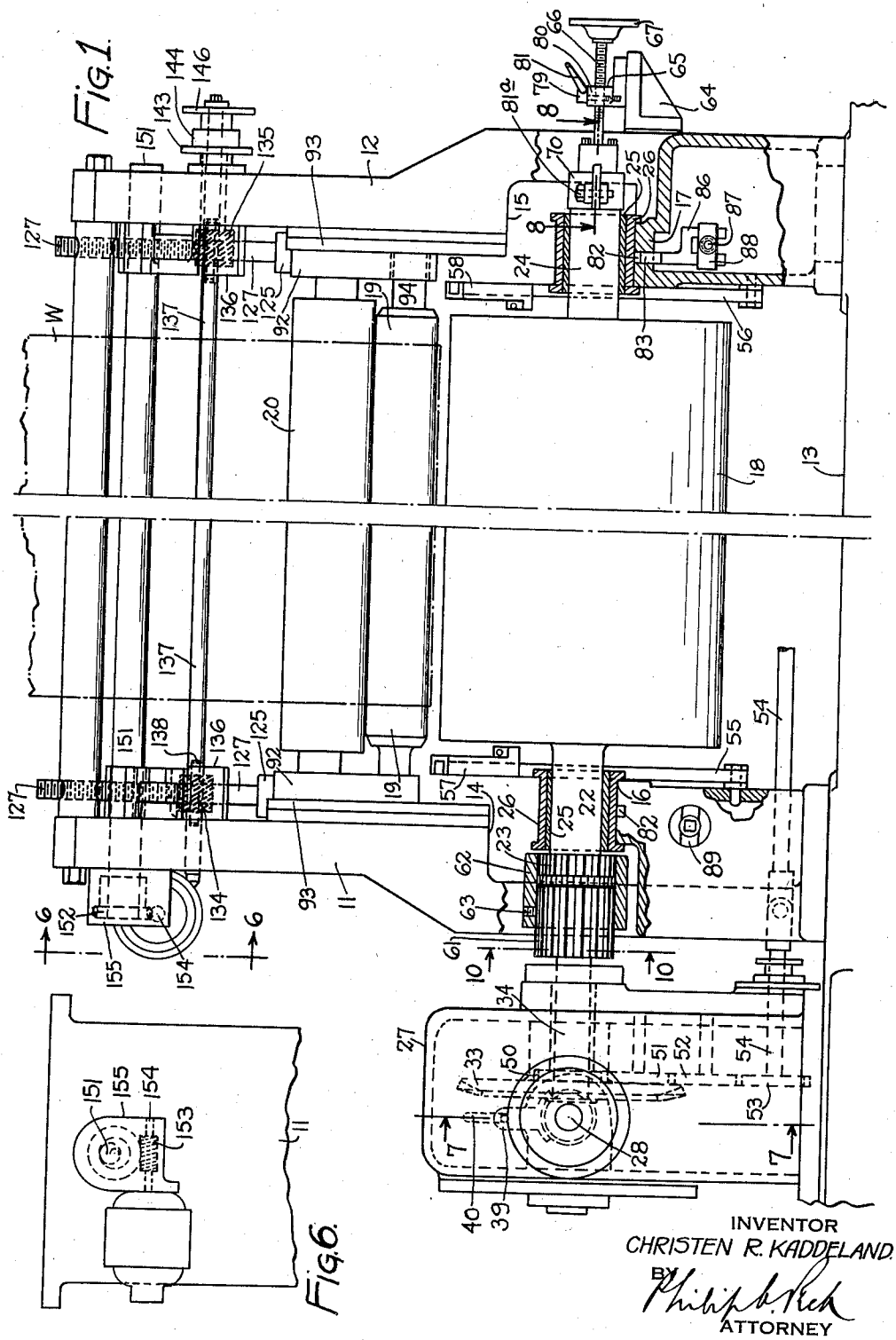


FIG. 1.

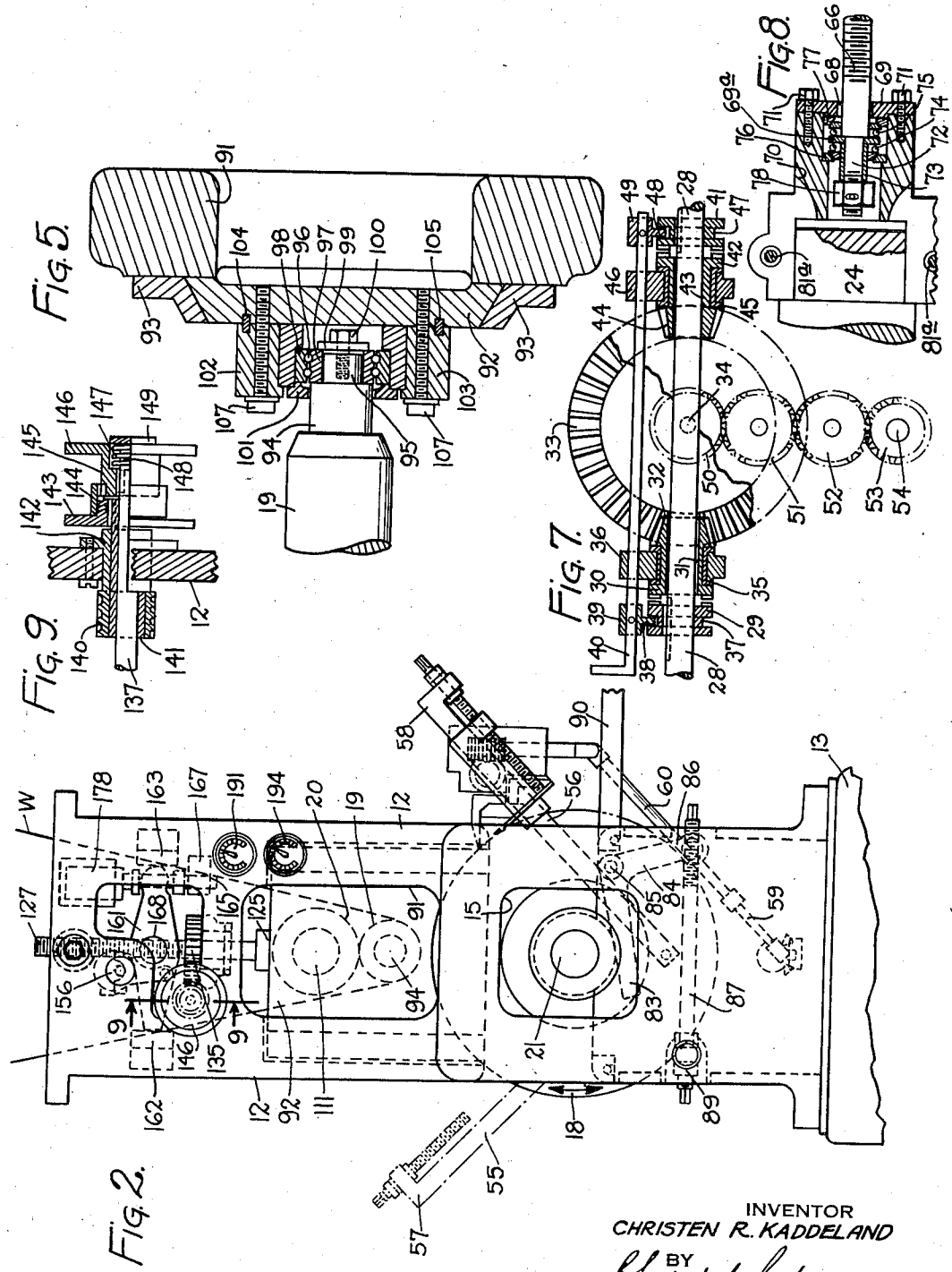
FIG. 6.

INVENTOR
CHRISTEN R. KADDELAND
BY Philip B. Reed
ATTORNEY

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INVENTOR
CHRISTEN R. KADDELAND
BY
ATTORNEY

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PRINTING PRESS

Original Filed May 20, 1933 3 Sheets-Sheet 3

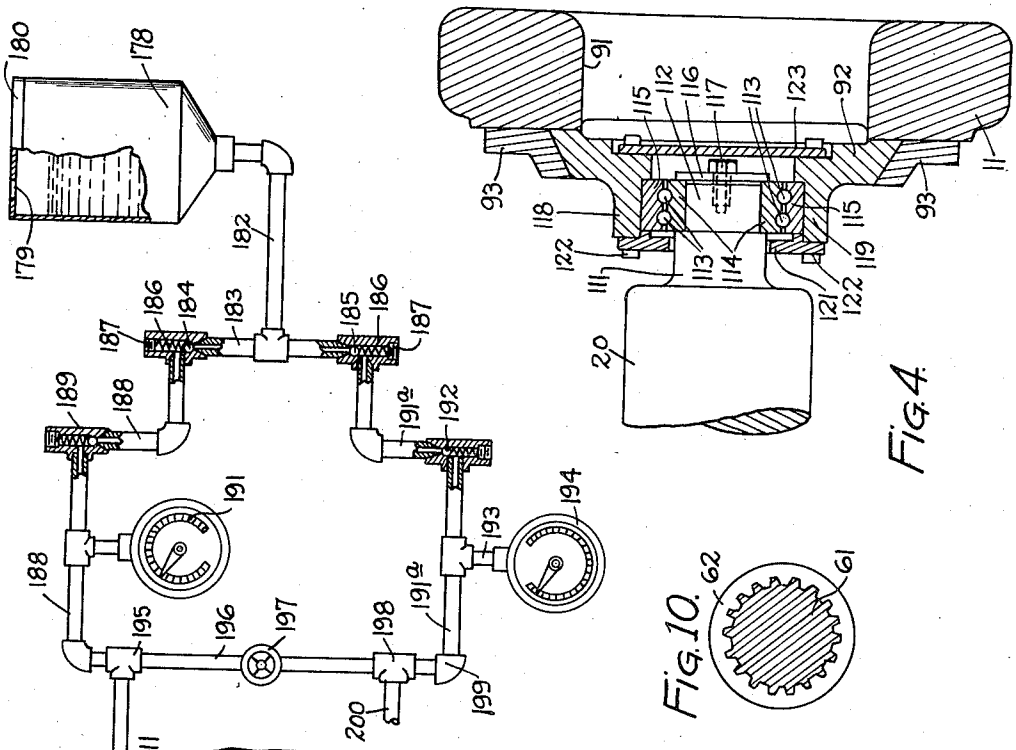


FIG. 4

FIG. 10.

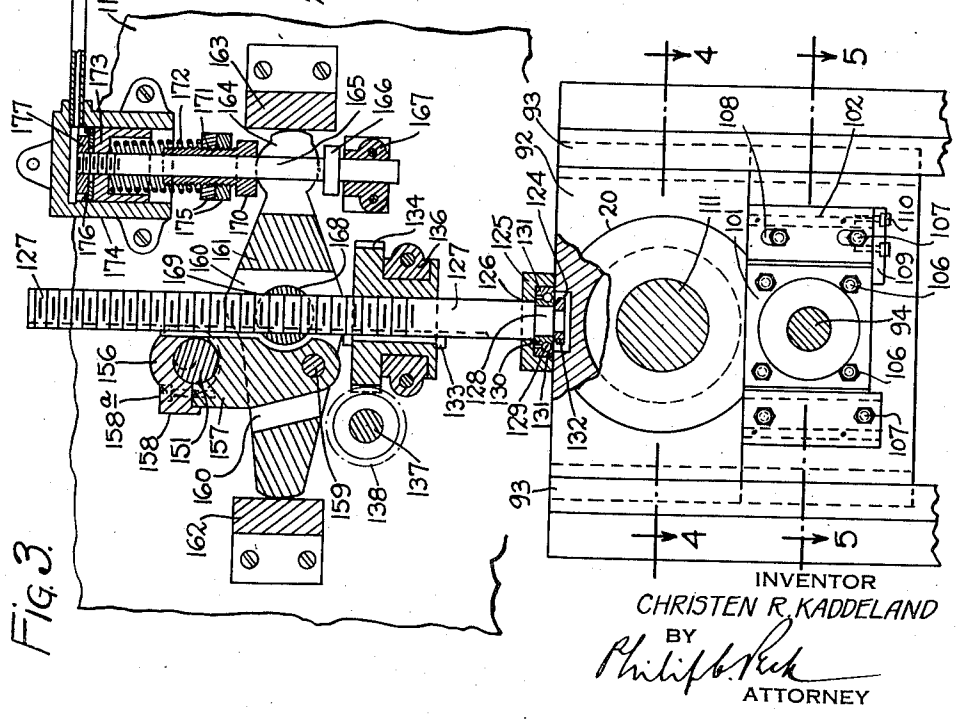


FIG. 3

INVENTOR
CHRISTEN R. KADDELAND
BY
Philip B. Kirk
ATTORNEY

Patented July 19, 1938 2,124,420

UNITED STATES PATENT OFFICE

2,124,420

PRINTING PRESS

Christen R. Kaddeland, Shelton, Conn., assignor to Harris-Seybold-Potter Company, Cleveland, Ohio, a corporation of Delaware

Original application May 20, 1933, Serial No. 671,992. Divided and this application January 24, 1935, Serial No. 3,238

35 Claims. (Cl. 101—247)

My invention relates to certain improved devices used in conjunction with rotary printing-presses, and more particularly relates to web printing-presses and especially to web gravure presses printing from intaglio cylinders.

This application is a division of my pending application for patent filed May 20, 1933 Serial No. 671,992, which has now matured into Patent No. 2,064,168.

The objects of my invention are, among other things, to provide a novel and simplified type of rotary printing-press of the type that is particularly adapted for gravure printing, though my improvements may be embodied in rotary printing-presses of various types.

A further feature of my invention is to provide a rotary printing-press with novel means for adjusting pressure on the cylinders constituting the printing unit at each side of the press independently of the other or simultaneously as desired, whereby a separate or unitary adjustment of the coacting cylinders may be reached, which mechanism is preferably coupled with separate fluid pressure indicators arranged on one side of the press so that the pressman may readily adjust the pressures applied at either end or at both ends of the cylinder to secure a uniform pressure throughout the width of the printing unit without changing his position relatively to the press.

A further feature of my invention is the provision of novel and improved mechanisms used in conjunction with the pressure adjusting devices hereinbefore described, whereby the impression cylinder or cylinders embodied in the printing unit may be manually raised out of printing relation, such mechanisms being also used to reestablish the required pressure from both ends of the press either separately or simultaneously to secure the range of pressure adjustments especially needed for gravure printing where various sizes of cylinders are used.

Further objects and advantages will appear hereinafter and be particularly pointed out in the claims, and the drawings show a preferred embodiment of my invention as applied to a web gravure rotary printing-press, but my improvements are not necessarily restricted to any particular form or type of rotary printing-press constructions.

In the drawings, Fig. 1 is a front elevation of a web gravure printing-press embodying my improvements, certain parts being shown in vertical section;

Fig. 2 is a side elevation looking from the right of Fig. 1;

Fig. 3 is an enlarged side elevation of the upper part of the press, partly in section, and also showing a diagrammatic lay-out of the fluid pressure indicating mechanism;

Fig. 4 is a detail sectional view on the line 4—4 of Fig. 3;

Fig. 5 is a detail sectional view on the line 5—5 of Fig. 3;

Fig. 6 is a side view on the line 6—6 of Fig. 1;

Fig. 7 is a side view partly in section on the line 7—7 of Fig. 1;

Fig. 8 is an enlarged sectional view on the line 8—8 of Fig. 1;

Fig. 9 is a detail sectional view on the line 9—9 of Fig. 2; and

Fig. 10 is a sectional view on the line 10—10 of Fig. 1.

Similar numerals refer to similar parts throughout the several figures.

Referring to the figures and more particularly to Figs. 1 and 2, the press frames 11 and 12 are mounted on the base 13 in spaced-apart relation with the lower part of the frames 11 and 12 having the reentrant spaces 14 and 15 formed respectively therein to allow space for the projecting ends of the cylinder shaft when the cylinder is removed or installed. The standards 16 and 17 preferably integral with the frames 11 and 12, afford fixed bearing supports for this cylinder shaft as shown in Fig. 1.

The press proper, preferably a web gravure press, comprises the printing cylinder 18, the therewith coacting resiliently covered impression cylinder 19 and the pressure cylinder 20 which is adapted to exert pressure on the cylinder 19. The web W is shown in Figs. 1 and 2 in tripped relation with the cylinders 18 and 19, and the cylinders 19 and 20 are illustrated in their raised position with the web W out of contact with the printing cylinder 18.

The printing cylinder shaft 21 is driven from its left end 22 (Fig. 1) by the clutch gear 23 fastened to the shaft end 22. The right end 24 carries the mechanism for laterally shifting the printing cylinder 18 relatively to the press frames 11 and 12 to secure proper side registration of the cylinder. The shaft ends 22 and 24 each carry similar bushings 25 that are carried in the sleeves 26 which are supported in the socketed portions of the standards 16 and 17 on which fixed bearings the cylinder shaft 21 is rotatably mounted within the bushings 25.

The means for driving the printing cylinder 18 through its shaft 21 in either direction will now be described: On the left side of Fig. 1 is the housing

27 in which is journalled the main drive shaft 28 actuated from any suitable source of power (not shown). Slidably keyed at left end (Fig. 7) of the shaft 28 is the clutch gear 29 adapted to removably engage with the clutch gear 30 mounted on the sleeve 31 which encircles the shaft 28 and is freely rotatable thereon. The inner end of the sleeve 31 carries the bevel pinion 32 that engages the large bevel gear 33 fast to the cross-shaft 34 journalled in the housing 27. Surrounding the sleeve 31 is the bearing collar 35 carried by the bracket plate 36 secured within the housing 27. The clutch gear 29 is exteriorly grooved at 37 in which groove 37 rides the nose 38 of the bracket 39 pinned to the slidable control rod 40 that is laterally shiftable in the bracket plate 36.

On the right side of Fig. 7 a similar construction is shown comprising the clutch gear 41 slidably keyed to the shaft 28 which gear 41 is adapted to removably engage with the clutch gear 42 mounted on the sleeve 43 which also encircles the shaft 28 and is freely rotatable thereon. The inner end of the sleeve 43 carries the bevel pinion 44 that engages the bevel gear 33 opposite to the bevel pinion 32. Surrounding the sleeve 43 is the bearing collar 45 carried by the bracket plate 46 secured within the housing 27. The clutch gear 41 is exteriorly grooved at 47 in which grove 47 rides the nose 48 of the bracket 49 that is pinned to the end of the control rod 40 that also slides in the bracket plate 46 as well as the plate 36.

By this mechanism the constantly rotating drive shaft 28 will impart a rotative movement to the cross-shaft 34 in either direction through the large bevel gear 33 depending on whether the clutch gears 29 and 30 are operatively engaged to drive the gear 33 in one direction through the bevel pinion 32, or whether the clutch gears 41 and 42 are operatively engaged to drive the gear 33 in the opposite direction through the bevel pinion 44. The lateral shifting of the control rod 40 through the brackets 39 and 49 determines whether one set of clutch gears 29 and 30 or the other set of clutch gears 41 and 42 are in engagement with one another. When one set is disengaged its particular bevel pinion (32 or 44) is free to rotate on the shaft 28 through the gear 33 and is not driven by its set of clutch gears (29 and 30 or 41 and 42) which happen to be disengaged so as not to interfere with the predetermined direction of rotation to be imparted to the cross shaft 34.

Fastened to the cross shaft 34 is the pinion 50 which through a pair of idler gears 51 and 52 drives the pinion 53 fastened to the end of the shaft 54 journalled in the housing 27 and press frame 11 in either direction as shown in Figs. 1, 2 and 7.

Pivoted to the press frames 11 and 12 are the two swinging arms 55 and 56 which support the end brackets 57 and 58 respectively in which is mounted a novel type of ink fountain and ink distribution devices adapted to be located on either side of the printing cylinder 18 as shown in Fig. 2 depending upon the direction of rotation of the cylinder 18 and also permits this cylinder to be exchanged in the reentrant press frames without interference with the ink fountains and doctor blades by mechanism hereinafter described.

The shaft 54 imparts a rotary movement by bevel gears (not shown) to the adjustable shaft 59 carrying mechanism to rotate the shaft 60 which carries the cam-operated devices for reciprocating the usual doctor blade for removing surplus ink from the printing cylinder 18 in gravure presses.

Since this ink distribution system is the subject matter of a co-pending application, it is not necessary to describe the structural details in this case. Such mechanism is a peculiar advantage in web gravure presses such as are shown herein.

Referring to Figs. 1 and 10, the inner end of the cross shaft 34 has fastened thereto the wide-toothed gear 61 of similar size and teeth to, and in transverse alinement with, the gear 23 on the cylinder shaft 21. Surrounding both the gear 23 and the gear 61 is the interiorly tooth gear sleeve 62 which is slidable on the gears 23 and 61 and is fastened in any predetermined position on the gear 61 by the screw-pin 63. By sliding the sleeve 62 to the left in Fig. 1, the gears 23 and 61 are thereby disconnected and the cylinder 18 may be removed from the press. In Fig. 1, the gears 23 and 61 are operatively connected to rotate the cylinder 18 in either direction by the mechanism within the housing 27 hereinbefore described.

Means are provided for laterally adjusting the printing cylinder 18 in the press frames 11 and 12 best shown in Figs. 1 and 8: Mounted on the bracket 64 fastened to the frame 12 is the interiorly threaded standard 65 through which passes the screw-bolt 66 having the handle 67 fastened to its outer end. The iner end of the bolt 66 passes through the hole 68 of circular plate 69 removably held to the outer reduced end of the coupling 70 for the cylinder shaft 21 by screw-bolts 71.

Within a socket cut in the end 69a, the screw-bolt 72 portion of the screw-bolt 66 projects, this screw-bolt portion 72 being of smaller diameter than the screw-bolt 66 as shown in Fig. 8. The sleeved collar 73 carried by the bolt 72 divides a double set of ball bearings 74 and 75 which are held in position by the outer washers 76 and 77 within the socketed opening of the coupling 70. The lock nut 78 threaded on the inner end of the bolt 72 holds the various parts in operative position. By manipulating the handle 67 the cylinder 18 may be laterally shifted in its bearings through the coupling 70 to make the proper adjustments in either direction, and the screw-bolt 66 is locked in any predetermined position by the locking bolt 79 tapped into the standard 65 and bearing on the plate 80 above the bolt 66. The handle 81 is removably secured to the head of the locking bolt 79 as shown in Fig. 1. The coupling 70 is fastened to the end 24 of the cylinder shaft 21 by the clamping nuts 81a as shown in Fig. 1.

By these devices I have provided a ball thrust bearing for this end 24 of the cylinder shaft 21 by which the cylinder 18 may be laterally adjusted, and at the same time have provided means for disengaging the end 24 of the cylinder shaft 21 within the space 15 so that the cylinder 18 may be readily removed and a different cylinder installed in the press when required.

Means are provided for removing and installing the printing cylinder 18 that are shown in Figs. 1 and 2: Such means are duplicated on either side of the press to be mounted in the standards 16 and 17, and a description of one set will suffice for both.

Such standards 16 and 17 have vertical slots 82 cut therein through which project the arms 83 of the levers 84 pivoted on the stub shafts 85 secured in the standards 16 and 17 such arms 83 being adapted to bear on the under sides of the collars 26. The lower arms 86 of levers 84 are forked

(Fig. 1), through which the threaded bars 87 pass and carry the blocks 88 that are threaded on the bars 87 while the opposite ends of the bars 87 are threaded to pass through plates 89 set in the press frames.

The tips of the bars 87 are squared for a wrench so that the pressman may operate same from either side of the press to rotate the bars 87 and thereby rock the levers 84 on the shafts 85 in either direction. Pivoted to the press frames 11 and 12 in proximity to the stub shafts 85 (Fig. 2) are the runway bars 90 to afford a track upon which the cylinder shaft ends 22 and 24 may roll in removing or installing a cylinder in the press. By raising the arms 82 the cylinder 18 and its shaft ends 22 and 24 will be partly lifted from its operative position in the press, and such cylinder may then be rolled out of the press frames 11 and 12 on the runway bars 90. In installing a cylinder the reverse operation takes place, and the cylinder shaft ends 22 and 24 are lowered into their bearings on the standards 16 and 17 when the arms 83 are lowered through the slots 82 as shown more particularly in Fig. 1 where such arm 82 are no longer in contact with the collars 26 of the cylinder shaft ends 22 and 24.

The impression cylinder 19 is removably mounted in the press by devices that are best shown in Figs. 1–5 which are duplicated on either side of the press; hence a description of one set will suffice for both: The press frames 11 and 12 have the cut-out portions 91 (Fig. 2) inside which the bearings of the cylinders 19 and 20 which are located as shown in Fig. 2. Mounted inside the press frames 11 and 12 are the slidable heads 92 held to the frames by the gibs 93 to permit the heads 92 to be raised and lowered by mechanism hereinafter to be described. The shaft 94 of the cylinder 19 (Fig. 5) has a reduced outer end 95 around which are the ball bearings 96 enclosed between the inner casing 97 and outer casing 98. The inner casing 97 is removably held to the shaft 94 by the washer 99 and the screw-bolt 100 tapped into the shaft end 95. The outer casing 98 bears against the hollowed-out plate 101 that is slidably secured within the guides 102 and 103 to move vertically in the head 92 for floating the cylinder 19, which plate 101 is held in alinement by the keys 104 and 105 respectively, sliding in the head 92 and guides 102 and 103 respectively.

A pair of screw-bolts 106 (Figs. 3 and 5) hold in place the plate 101 on either side which plate bears on the outer casing 98; a pair of screw-bolts 107 pass through the guides 102 and 103 and are tapped into the head 92 to hold these guides in position. To limit the floating of the cylinder shaft 94 (Fig. 3), the right-hand guide 102 has slots 108 through which the screw bolts 107 pass. A bottom plate 109 bears against the bottom of the plate 101 and right guide 102, and is held to the guide 102 by a pair of tapped-in screw-bolts 110. By these devices the cylinder shaft 94 may be adjusted relatively to cylinder 20 when wear on the cylinder 19 occurs, and the cylinder 19 may be removed by detaching the plate 109.

Referring more particularly to Figs. 3 and 4, the shaft 111 of the pressure cylinder 20 has a reduced outer end 112 around which are the ball bearings 113 enclosed between the inner casing 114 and the outer casing 115. The inner casing 114 is removably held to the shaft 111 by the washer 116 and the screw-bolt 117 tapped into the shaft end 112 (Fig. 4). The outer casing 115 bears against the head 92 slidable in the gibs 93, and is removably held in position against the inwardly projecting lugs 118 and 119 comprising a boss on the head 92 by the hollowed-out plate 121 fastened to this boss by the screws 122 (Fig. 4). The shaft 111 projects through the plate 121 as shown. Fastened to the outer side of the head 92 is the removable plate 123 to prevent oil from the ball bearings 113 from being scattered on the press frames 11 and 12.

Means are provided for exerting pressure on the cylinders 19 and 20 according to printing requirements, which pressure is adjusting either separately at either side of the press or simultaneously at both ends of the cylinders, coupled with devices for raising these cylinders 19 and 20 out of contact with the cylinder 18, all of which is best shown in Figs. 1–3, 6 and 9.

Such mechanisms are duplicated on either side of the press and a description of one set will suffice for both. In the top of the heads 92 are sockets 124 covered by the inverted cup-shaped cover plate 125 that is fastened to the head 92. Extending through the hole 126 in the plate 125 is the vertically extending bar 127 having the reduced end 128 surrounded by the ball bearings 129 held between the inner casing 130 and outer casing 131 fitted within the plate 125 (Fig. 3). The screw-nut 132 threaded on the tip of the bar 127 bears against the inner casing 130 and holds the lower end of the bar 127 to the head 92 without any vertical play, yet permitting the bar 127 to rotate relatively to the head 92 in the plate 125.

The upper portions of the vertically movable bars 127 are threaded as shown in Figs. 1 and 3, and carry vertical grooves within which slide the keys 133 which fasten thereto two spiral gears 134 and 135 which are held to the press frames 11 and 12 by collar brackets 136. Journalled in the press-frames 11 and 12 is the cross-shaft 137 which carries spiral gear 138 adjacent the press frame 11, which gear 138 meshes with the left spiral gear 134 as shown in Figs. 1 and 3. The right spiral gear 135 meshes with the spiral gear 140 (Figs. 1 and 9) that is fastened to the sleeve 141 through which passes the right end of the cross-shaft 137 with the sleeve 141 journalled in the bearing 142 secured in the press-frame 12. Adjacent the bearing 142 outside the frame 12 is the inner handle 143 keyed to the sleeve 141 by which the spiral gear 135 may be rotated in either direction. This inner handle 143 carries the interiorly geared collar 144 which is adapted to slide over and engage the exteriorly geared collar 145 of the outer handle 146 that is slidably keyed to the cross-shaft 137.

The spring 147 coiled about the outer end of the shaft 137 and held within the cylindrical socket 148 formed in the handle 146 by the cap 149 normally forces the geared collars 144 and 145 into engagement so that by turning either handle 143 or 146 the spiral gears 134 and 135 may be rotated in unison an approximately equal number of degrees to exert pressure at both ends of the cylinders 19 and 20.

However when the outer handle 146 is pulled outwardly (to the right in Figs. 1 and 9), the geared collars 144 and 145 are disengaged so that the handles 143 and 146 may each be rotated separately to make separate adjustment of the respective pressures to be applied to either end of the cylinders 19 and 20 to secure delicate adjustments for proper printing.

Means are provided for raising and lowering the pair of vertically movable bars 127 connected to the head 92 to lift or lower the cylinders 19 and 20, which mechanism is best shown in Figs.

1–3 and 6: Journalled in the press frames 11 and 12 is the cross-shaft 151 the left end of which (Fig. 1) carries the worm gear 152 that is actuated by the worm 153 mounted on the shaft 154 journalled in the housing 155 fastened to the frame 11, this shaft 154 being driven by a suitable motor (Figs. 1 and 6). The devices for actuating the bars 127 are duplicated on either side of the press and a description of those attached to the press frame 11 will suffice. The shaft 151 is provided with eccentric journal 156 which actuates the toggle arm 157, and the cap 158 held on the arm 157 by the screw-nut 158a (Fig. 3). The lower end of the arm 157 is pivoted on the cross pin 159 extending across the slot 160 formed midway in the pivoted cross-head 161 that is formed with the forked end 164 which bears against the bracket 163 and slidably holds the rod 165 that carries the integral stop collar 166 normally located slightly above the bracket 167 fastened to the frame 11 through which bracket 167 the lower end of the rod 165 reciprocates.

Extending across the slot 160 and journalled to the sides of the cross-head 161 is the short stud 168 having a threaded aperture 169 that engages the threads on the bar 127. When the eccentric journal 156 is rotated substantially 180° limited by stops (not shown), the toggle arm 157 is raised which causes the cross-head 161 to bear down on the collar 166 against the bracket 167 to lift the stud 168 and the therewith connected bar 127 to raise the cylinders 19 and 20 out of contact with the cylinder 18.

By a reverse movement of the eccentric journals 156, the parts would take the positions shown in Fig. 3 and the three cylinders 18, 19 and 20 will be brought into printing relation.

The up and down movement of the bars 127 to exert the required pressure on the cylinders 19 and 20 is adjusted through either or both of the handles 143 and 147 relatively to the printing cylinder 18 which has been hereinbefore described is coupled with separate fluid pressure indicators and connecting mechanism so that the pressman may readily ascertain and adjust the pressures applied at either end or at both ends of the cylinders 19 and 20. Such devices are best shown in Figs. 2 and 3 and are duplicated on either side of the press: The forked end 164 of the cross-head 161 when raised bears against the collar 170 having the upwardly projecting sleeve 171 that slides up and down on the rod 165. Coiled about the sleeve 171 and rod 165 is the compression spring 172, the upper end of which bears against the piston 173 mounted on the end of the rod 165. The piston 173 is movable within the piston chamber 174 secured to the frame 11, and a pair of screw-nuts 175 on the sleeve 171 adjust the preloading of the spring 172 that is yieldingly interposed between the piston 173 and the sleeve 171 with the collar 170 acting against the forked end 164 to yieldingly apply the pressure to the cylinders 19 and 20. The packing washer 176 is fastened to the piston 173 by the screw-nut 177 threaded to the end of the rod 176, to form a fluid seal within the piston chamber 174.

The fluid pressure indicating mechanism is shown in Figs. 2 and 3: The reservoir 178 is connected to atmosphere by the hole 179 in the cover 180 and is partly filled with any suitable liquid, such as oil 181. The bottom of the reservoir 178 is connected by the pipe 182 to the cross-pipe 183 having the ball check valves 184 and 185 seated by the springs 186 held by the screw plugs 187. The upper end of the cross-pipe 183 is connected by the pipe 188 having the ball check valve 189 to the upper part of the piston chamber 174 (Fig. 3) with the branch pipe 190 leading from the pipe 188 to the indicator gauge 191.

In like manner the lower end of the cross-pipe 183 is connected by the pipe 191a having the ball check valve 192 through the pipe 200 to the upper part of a piston chamber (not shown) that is similar to the piston chamber 174 and is located on the press-frame 12 on the opposite side of the press with the branch pipe 193 leading from the pipe 191a to the indicator gauge 194 the check valves 184, 185, 189 and 192 automatically replenish any loss of liquid within the pressure system by permitting liquid to be drawn from the reservoir 178, when the pressure within the pressure system falls below the atmospheric pressure and prevents the liquid from returning from the pressure system to the reservoir. For convenience the two gauges 191 and 194 are preferably arranged adjacent each other (see Fig. 2) to enable the pressman to observe the pressures and make proper adjustments from one position. The variable pressure exerted against the two pistons 173 creates a corresponding liquid pressure within the chamber 174 in the chambers 174 and the respective pipe connections leading back to the gauges 191 and 194 accurately register the fluid pressures in either of the cylinders 19 and 20. A modified arrangement may be used whereby the pressures within the two piston chambers 174 are equalized and indicated on the gauges 191 and 194. The pipe 188 carries the T-union 198 to which the pipe 196 is fastened; such pipe 196 carries the valve 197 and is connected to the T-union 198 carrying the pipe 200 leading to the piston chamber 174 (not shown).

The T-union 198 is also connected to the fitting 199 on the pipe 191a. When the valve 197 is open the pressures on the cylinders ends become equalized through the pressure liquid. When the valve 197 is closed the pressure indicating mechanism operates as heretofore described.

The operations of the various different mechanisms and devices in my improved press have been described in conjunction with the separate descriptions of their structural details. However the general operations may be summarized as follows: When it is desired to install or remove a printing cylinder 18 in the press, the mechanism shown in Figs. 1 and 2 with the runway bars 90 coacting with the lever arms 84 is used either to install or remove the cylinder 18 in the press frames with the reentrant spaces 14 and 15 affording sufficient width for the shaft ends 22 and 24 and the cylinder travelling on the runway bars 90 and arms 84 to or from its bearings in the press.

Then the gear sleeve 62 is laterally shifted to engage both the gears 23 and 61, and is fastened by the pin 63 to connect up the driving apparatus contained in the housing 27. The control rod 40 is then shifted to determine the direction of rotation of the cylinder 18, the whole constituting a reversible clutch drive that is detachably connected to the cylinder shaft end 22, such drive being laterally movable within the reentrant space 14 to free the shaft end 22 when required to remove a printing cylinder in the press. A lateral adjustment of the cylinder

18 is secured by manipulating the handle 67 as before described.

To bring the cylinders 19 and 20 into printing relation with a newly installed cylinder 18, the cylinders 19 and 20 are lowered by depressing the heads 92 through the downward movement of the vertical bars 127 actuated by the eccentric journals 156 on the rock-shaft 151 driven from the motor shaft 154 shown in Fig. 6. Then the pressman adjusts the relation between cylinders 18 and 20 until the required pressure is obtained by revolving the rock shaft 151 with its eccentric journals 156, substantially 180° from its predetermined tripped position to its also predetermined impression position. The revolving of the rock shaft may be performed either manually, mechanically, or as indicated on Figure 6 by an electric motor controlled in suitable manner well known in the art. The position of the eccentric journals 156 in their impression or down position co-acts with toggle arms 157 to positively lock the cross pin 159 in its impression position which allows the cross-head 161 and stud 168 to assume their lowermost position by manipulating either or both of the handles 143 and 146 that actuate the spiral gears 134 and 135 to move the bars 127 in either direction, the pressures applied are indicated in the gauges 191 and 194 by the detailed mechanisms centered about the movements of the forked end 164 of the cross-head 161 as hereinbefore described.

It will be observed that the printing relation of cylinders 19 and 20 with cylinder 18 may be tripped by revolving the rock shaft 151, substantially 180°, until the eccentric journals 156 are in their uppermost position and the previous adjusted printing relation reestablished by revolving rock shaft 151 to its predetermined impression position and that the printing pressure is always visible on gauges 191 and 194.

My invention, in its broader aspects, is not limited to the particular construction and arrangement of the cylinders and associated mechanism as shown in the rotary web gravure printing-press illustrated in the drawings, since many changes may be made without departing from the main principles of the invention and without sacrificing its chief advantages in use. Furthermore my improvements may be embodied in rotary printing-presses of various types where it is particularly desirable to secure delicate pressure adjustments between the cylinders comprising the printing unit as well as to provide simplified means for exchanging cylinders as required.

I claim as my invention:

1. In a printing-press, a plurality of cylinders comprising the printing unit, means for exerting a previously set pressure upon said cylinders, and means for indicating the total amount of pressure between the cylinders applied by said pressure exerting means.

2. In a printing-press, a plurality of cylinders comprising the printing unit, means for exerting a previously set pressure upon one of said cylinders at each end thereof, including means for indicating the total amount of the pressure between said cylinders applied by said pressure exerting means.

3. In a printing-press, a plurality of cylinders comprising the printing unit, means for exerting a previously set pressure upon one of said cylinders at each end thereof, and separate means for indicating the total amount of pressure between said cylinders applied by said pressure exerting means.

4. In a printing-press, a plurality of cylinders comprising the printing unit, means for adjusting the pressure to be exerted upon one of said cylinders at either end thereof, said means being adapted to operate separately or simultaneously in applying such pressures to said cylinder, and separate fluid pressure means for indicating the total amount of pressure between said cylinders applied by said pressure exerting means.

5. In a rotary gravure printing-press, a printing cylinder and a therewith coacting impression cylinder, means for forcing said impression cylinder bodily into printing relation with said printing cylinder, including means separately or simultaneously operable to adjust the pressure at either end or both ends of said impression cylinder, and fluid pressure means for indicating the total amount of pressure between said cylinders applied by said pressure exerting means.

6. In a printing couple, a printing-cylinder, a pressure roller, an impression mechanism for said impression roller comprising an eccentric rock-shaft, an adjustable connection between said rock-shaft and the pressure roller, including an adjustable yielding connection within a pressure chamber, a piston movable therein, a pressure liquid, and gauges registering the pressure of said liquid.

7. In a printing-press, a plurality of cylinders to form a printing couple, means including a toggle-actuating rock-shaft for moving one of said cylinders into printing relation, and means including a preloaded yielding pressure member coacting with said rock-shaft to maintain said printing relation between the cylinders.

8. In a printing-press comprising a printing cylinder and a coacting pressure roller, means for moving said roller into printing relation with the cylinder including a rock-shaft, a yielding pressure member coacting with said rock-shaft and said pressure roller to yieldingly maintain said printing relation, coacting means for tripping the roller from the cylinder, and means for adjusting said pressure roller relatively to said tripping means.

9. In a printing-press, a plurality of cylinders comprising the printing unit, means for exerting a previously set pressure upon the cylinders, said means being adapted to reapply said previously set pressure to said cylinders, a fluid pressure mechanism indicating the pressures so applied by said pressure exerting means to the ends of the cylinders, and means for automatically supplying liquid to the fluid pressure system in the event of losses therefrom.

10. In a printing-press, a plurality of cylinders comprising a printing unit, means for applying a previously set pressure upon said cylinders comprising a toggle-operated member, an adjustable connection between said toggle-operated member and one of said cylinders, and a yielding member cooperating with said toggle mechanism and said pressure applying means.

11. In a printing-press, a plurality of cylinders comprising a printing unit, means for exerting a previously set pressure upon said cylinders comprising a rock-shaft, an adjustable connection between the rock shaft and one of said cylinders, a preloaded yielding member cooperating with said rock shaft yielding connection to exert pressure on a liquid, gauges for registering the pressure of said liquid, and means for automatically supply-

ing liquid to the pressure system in the event of losses therefrom.

12. In a printing-press, a plurality of cylinders to form a printing couple, means for bodily moving one of said cylinders into printing relation, means including an adjustable yielding member coacting with said cylinder moving means to apply a previously set pressure upon said cylinders at either end thereof and fluid means for indicating the amount of the pressure so applied to the ends of said cylinder.

13. In a printing-press, a plurality of cylinders to form a printing couple, means for moving one of said cylinders into printing relation, means including an adjustable yielding pressure member coacting with said cylinder moving means to apply a previously set pressure upon said cylinder, and fluid means for indicating the amount of the pressure so applied to either end of said cylinder.

14. In a printing couple, coacting cylinders, means for tripping and reestablishing printing relations between said cylinders including a shaft adapted to move a coacting member between two predetermined points and to lock said member at said points, and means operatively connected with said member and one of said cylinders including a preloaded yielding member to maintain printing relation between said cylinders.

15. In a printing couple, coacting cylinders, means for tripping and reestablishing printing relation between said cylinders including means for yieldingly maintaining said printing relation, and a fluid pressure system including gauges for indicating the total amount of pressure between said cylinders.

16. In a printing couple, coacting cylinders, separate means operatively connected to each other for simultaneous operation, said means being operatively connected to opposite journals of one of said cylinders for tripping and reestablishing printing relation between said cylinders, means for yieldingly maintaining pressure against opposite journals of one of said cylinders, and means for indicating the total amount of pressure applied to between said cylinder journals.

17. In a printing couple, coacting cylinders, separate means operatively connected to each other for a simultaneous operation, said means being operatively connected to opposite journals of one of said cylinders for tripping and reestablishing printing relations between said cylinders, means for separately maintaining a yielding printing pressure against opposite journals of one of said cylinders, and connected fluid means for equalizing the pressure exerted on said journals and for indicating the total amount of said pressure.

18. An impression and tripping mechanism for a printing press, means including a toggle mechanism for imparting a definite amount of tripping and impression movement to one of the coacting members of the press and to lock said means in both tripped and impression positions, other means including a spring to yieldingly apply pressure to one of said members, and fluid means having coacting gauges for indicating the pressure so applied.

19. In a printing couple, coacting cylinders therein, an impression and tripping mechanism for one of the cylinders of said couple including a coacting member, means for moving said member between two points located in fixed relation to one of the other cylinders and to lock said member at one of these points, means for limiting the rocking movement of said member in its tripped position, and an adjustable connection between said tripped cylinder and said member.

20. An impression and tripping mechanism for a printing couple comprising a rectilinearly and rockingly guided crosshead, means for effecting the tripping and impression relation within said couple by moving a rocking point within said crosshead and to lock said point in the impression position, means for limiting the rocking motion of said member, and adjustable connections between said crosshead and one of the cylinders with the said printing couple.

21. An impression and tripping mechanism for a printing couple comprising a rectilinearly and rockingly guided crosshead, means for locking a rocking point within said cross head in a fixed impression position, means including a spring to limit the rocking motion of said crosshead to cooperate with said locking means to yieldingly maintain said crosshead in its impression position, and means for varying the pressure of the impression including adjustable connections between crosshead and one of the members of said couple.

22. An impression and tripping mechanism for a printing couple comprising a rectilinearly and rockingly movable crosshead, means for moving and locking a rocking point within said crosshead, means coacting with said moving and locking means to limit the rocking movement of said crosshead in impression direction, and fluid means to indicate amount of pressure applied against one of the members in said printing couple.

23. An impression and tripping mechanism for a printing press including a rocking crosshead toggle having a plurality of rocking points, means for moving and locking one of the rocking points of said crosshead at extremes of said movement, means for limiting the rocking movement of said crosshead, and adjustable connections between said crosshead and one of the members in said printing press.

24. An impression and tripping mechanism for the cylinders of a printing press including a rocking crosshead having a plurality of rocking points, means for moving one of the rocking points of said crosshead a predetermined amount in either direction and in fixed relation to one of the cylinders, said moving means adapted to lock said rocking point at the completion of its movement, means coacting with said moving and locking means to limit the rocking movement of the cross-head and to re-apply the previously adjusted pressure to one of the other cylinders, and means for indicating the amount of pressure so applied.

25. In a printing press comprising a printing cylinder and a coacting pressure roller, an adjustable pressure applying means including a preloaded yielding pressure member for applying pressure on said roller, and means for indicating the pressure so applied to said roller.

26. In a printing press comprising a plurality of cylinders forming a printing couple, an impression and tripping mechanism including a yielding pressure member adapted to trip one of the cylinders of said couple, said mechanism also being adapted to restore said cylinder to its impression relation within said couple.

27. In a printing press comprising a plurality of cylinders forming a printing couple, an impression and tripping mechanism including a yielding pressure member adapted to trip one of

the cylinders of said couple, said mechanism also being adapted to restore said cylinder to its impression relation within said couple, and means for indicating the amount of pressure exerted between the cylinders when in impression relation.

28. In a printing press comprising a plurality of cylinders forming a printing couple, an impression and tripping mechanism comprising an impression locking means coacting with a yielding pressure member and operatively connected to one of said cylinders to yieldingly apply pressure to said cylinders, and means for indicating the amount of pressure so applied.

29. In a printing press comprising a plurality of cylinders forming a printing couple, an impression and tripping mechanism comprising an impression locking member, a yielding pressure member adjustably connected to one of said cylinders to yieldingly apply pressure thereto, and means for moving said locking member to trip the pressure relation of said cylinder from its locked position, said means by its reverse movement automatically restoring said pressure relation when said member is in its locked position.

30. In a printing press comprising a plurality of cylinders forming a printing couple, an impression and tripping mechanism comprising a member coacting with a spring for sequentially applying pressure to one of said cylinders and yieldingly locking same in its pressure relation within said couple, and means for adjusting the relation between said locking member and said cylinder.

31. In a printing couple adaptable for cylinders of different diameters and pressure requirements, an impression and tripping mechanism comprising a pressure applying member and means for restoring and locking said member in a fixed impression position, and coacting means including a yielding pressure member and an adjusting member whereby the relation between the pressure applying member and one of the cylinders may be varied to accommodate cylinders of different diameters and pressure requirements.

32. In a printing press comprising a printing cylinder and a co-acting pressure roller, separate adjustable pressure applying means including a preloaded yielding pressure member for applying pressure on each end of said roller, means for adjusting the pressure applying means for one end of said roller independently of the other pressure applying means while the press is in operation, and means for separately indicating the pressure applied by said pressure applying means to each end of said roller.

33. In a printing press comprising a printing cylinder and a co-acting pressure roller, separate adjustable pressure applying means including a preloaded yielding pressure member for applying pressure on each end of said roller, means for adjusting the pressure applying means for one end of said roller independently of the other pressure applying means, said adjusting means being operable from substantially a single location, and means for separately indicating the pressure applied by said pressure applying means to each end of said roller.

34. In a printing press comprising a printing cylinder and a co-acting pressure roller, separate adjustable pressure applying means including a preloaded yielding pressure member for applying pressure on each end of said roller, means for adjusting the pressure applying means for one end of said roller independently of the other pressure applying means while the press is in operation, said adjusting means being operable from substantially a single location, and means for separately indicating the pressure applied by said pressure applying means to each end of said roller.

35. In a printing press, a printing couple including a printing cylinder and a co-acting pressure roller, mounting means for said printing couple arranged to accommodate printing cylinders and pressure rollers of different diameters, means for applying a previously-set pressure to said roller when in printing relation and for tripping said roller out of printing relation, said last means being adapted to separate said pressure roller from said printing cylinder a distance substantially independent of the printing position of said roller.

CHRISTEN R. KADDELAND.