

Nov. 23, 1943.

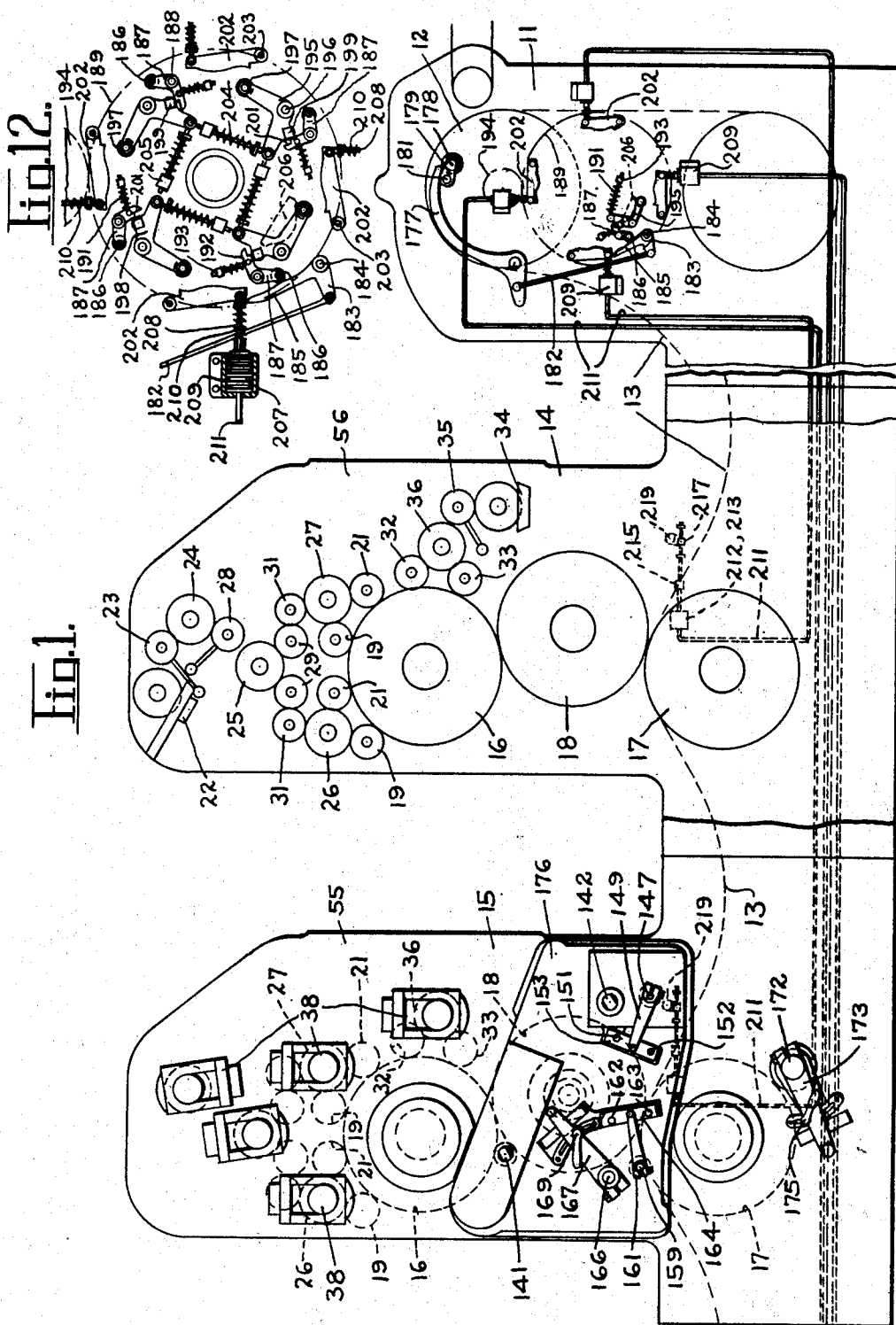
W. F. HUCK

2,335,010

PRINTING MACHINE

Filed Aug. 3, 1940

4 Sheets-Sheet 1



INVENTOR
William F. Huck.

BY *Albion Horton*
ATTORNEY

Nov. 23, 1943.

W. F. HUCK

2,335,010

PRINTING MACHINE

Filed Aug. 3, 1940

4 Sheets-Sheet 2

Fig. 2.

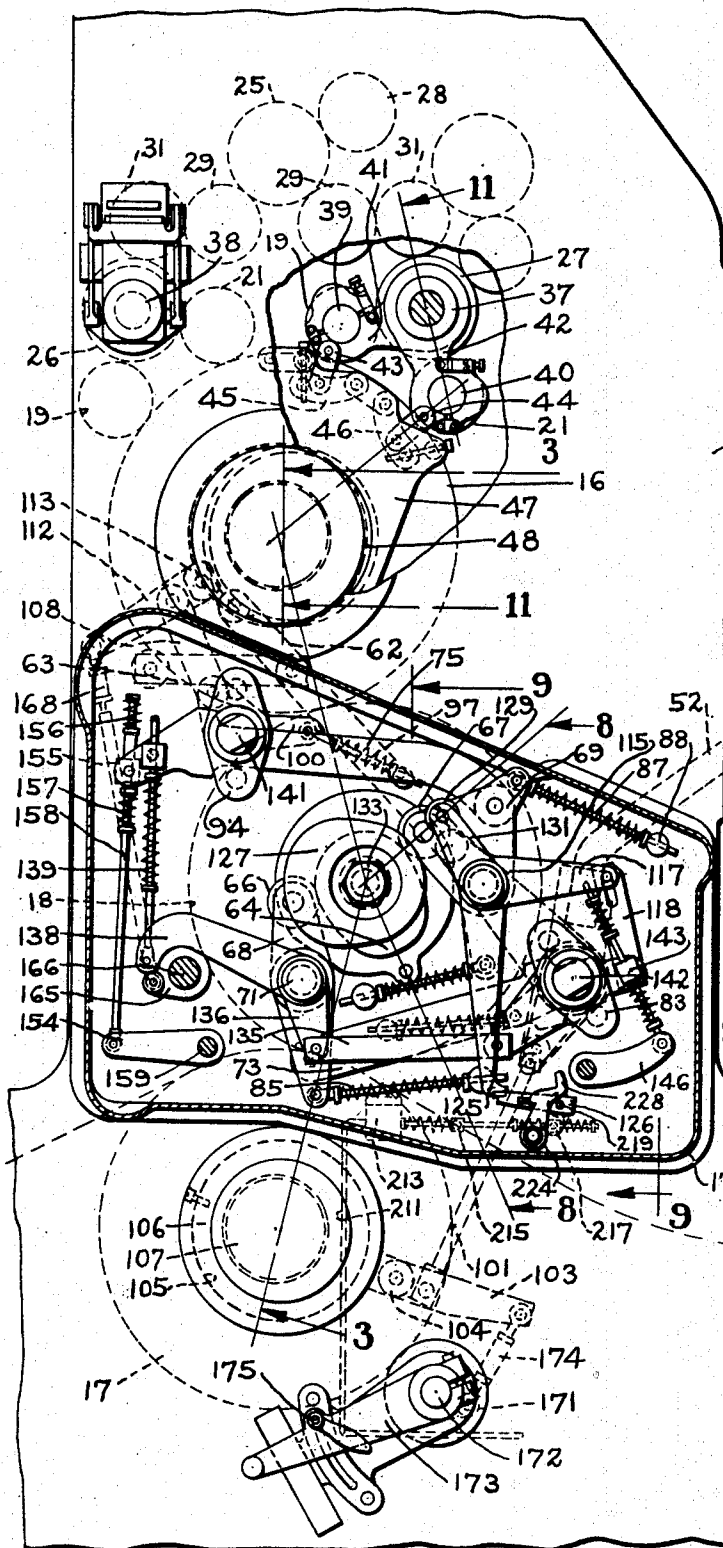
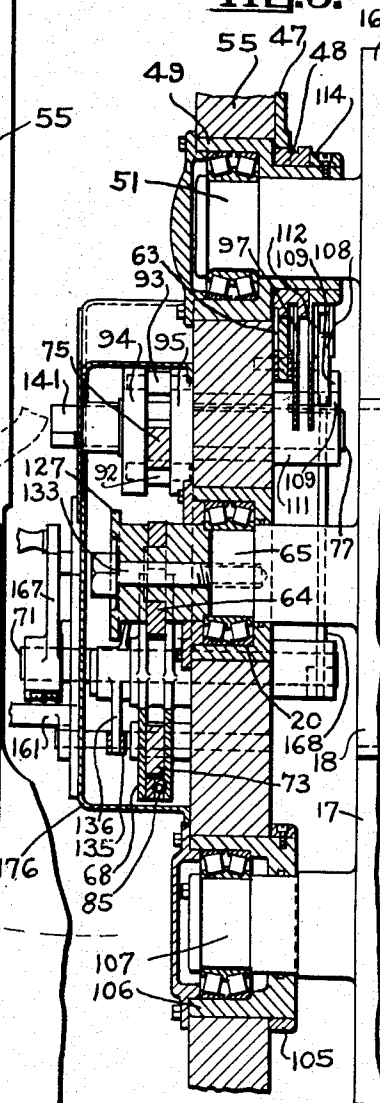


Fig. 3.



INVENTOR
William F. Huck.

BY *Alfred Horton*
ATTORNEY

Nov. 23, 1943.

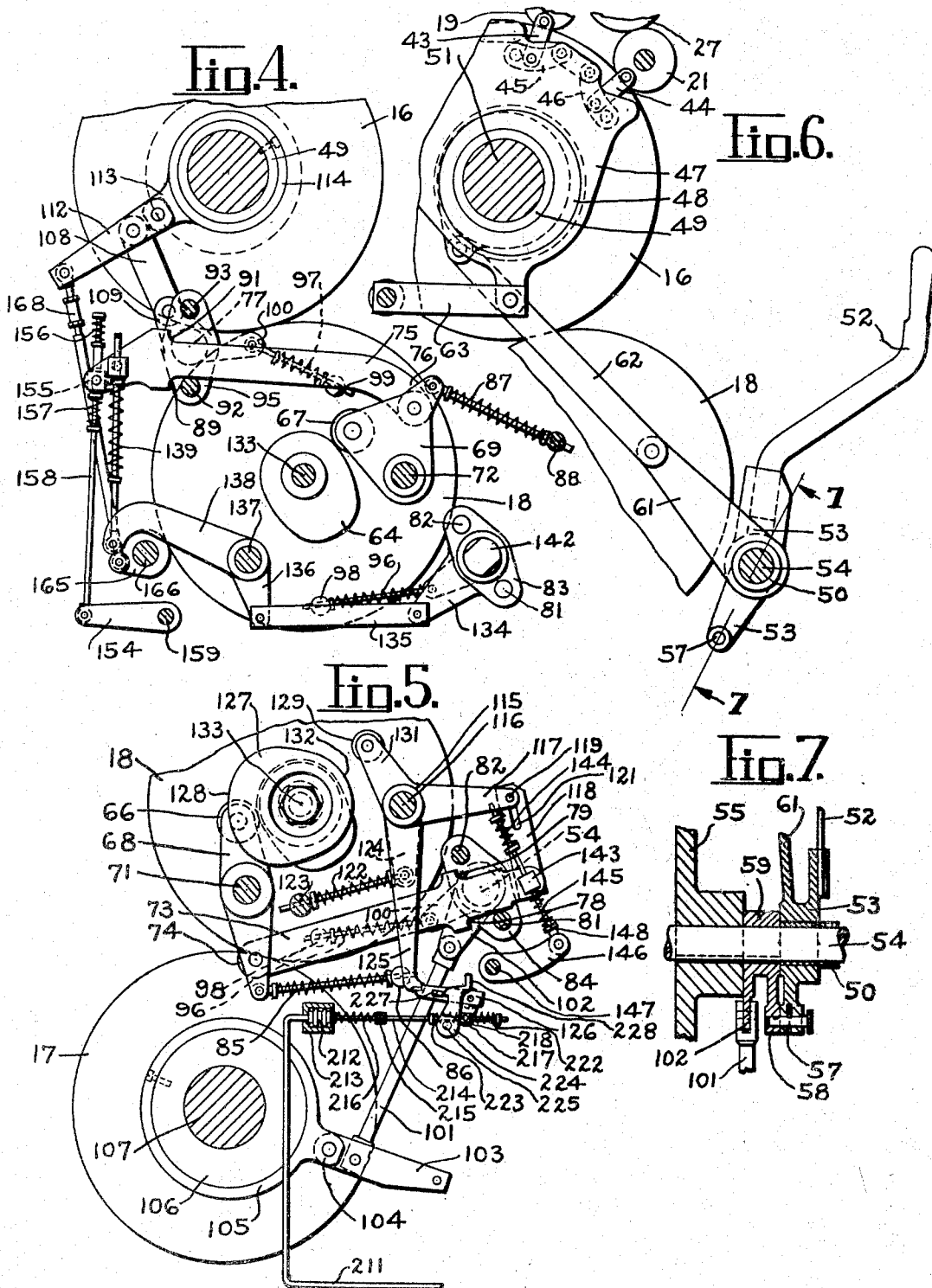
W. F. HUCK

2,335,010

PRINTING MACHINE

Filed Aug. 3, 1940

4 Sheets-Sheet 3



INVENTOR
William F. Huck.
BY *Alburt Horton*
ATTORNEY

Nov. 23, 1943.

W. F. HUCK

2,335,010

PRINTING MACHINE

Filed Aug. 3, 1940

4 Sheets-Sheet 4

Fig. 8.

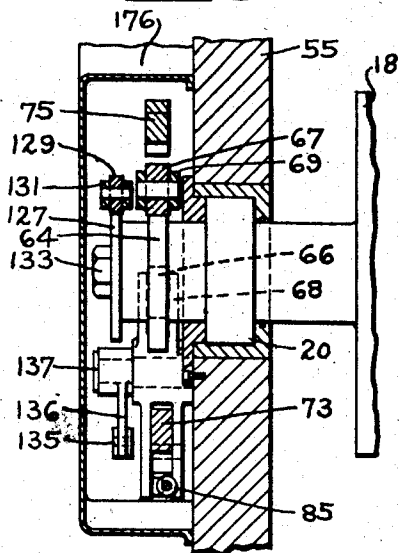


Fig. 9.

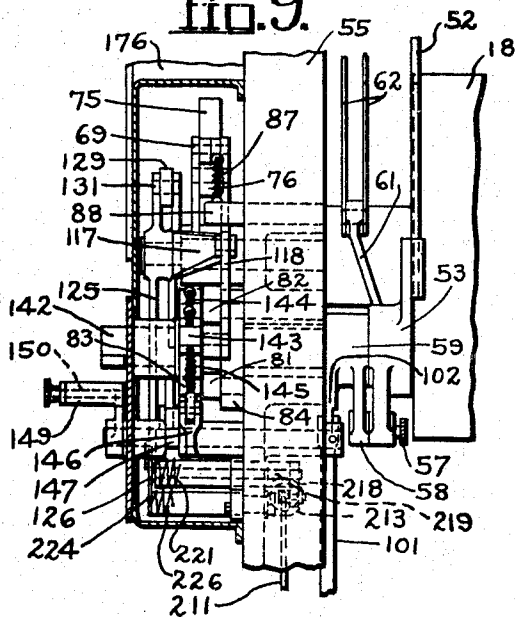


Fig. 10.

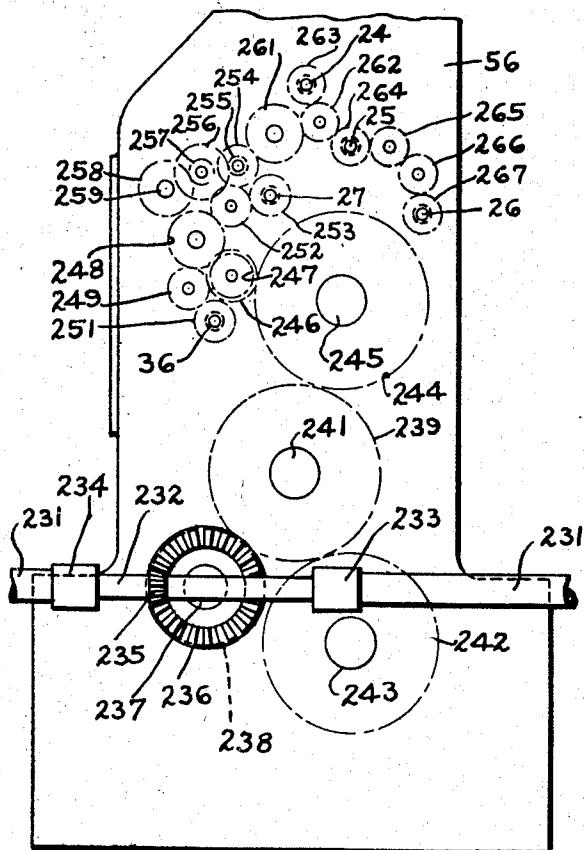
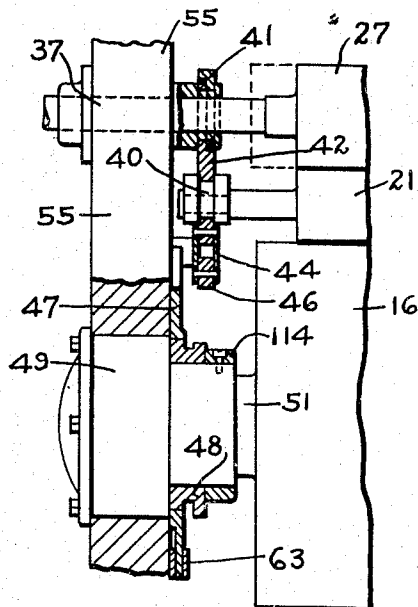


Fig. 11.



INVENTOR
William F. Huck.
BY *Albert Horton*
ATTORNEY

UNITED STATES PATENT OFFICE

2,335,010

PRINTING MACHINE

William F. Huck, Richmond Hill, N. Y., assignor
to R. Hoe & Co., Inc., New York, N. Y., a corpo-
ration of New York

Application August 3, 1940, Serial No. 350,987

16 Claims. (Cl. 101—144)

This invention relates to printing machines and more particularly to improvements in multi-color sheet fed rotary lithographic printing machines, in which it is usual practice to "trip" or move, cooperating printing cylinders away from each other, whenever a sheet is not properly presented for printing.

In the form of tripping mechanism shown herein, there is provided means whereby the plate and impression cylinders are journaled in movable bearings and the blanket cylinder is journaled in a fixed bearing and whereby the plate and impression cylinders may be tripped away from the blanket cylinder by movement of their respective bearings. Provision is made whereby the tripping mechanism may be actuated automatically or manually and wherein the pressure between the printing cylinders can be adjusted to suit conditions in printing without stopping the machine. There is also provided in this mechanism means to trip the ink rollers away from the plate cylinder automatically, and to manually move them toward the plate cylinder after they have been tripped with the plate cylinder so as to ink the plate when making the machine ready for operation. The automatic actuation of the tripping operations may be controlled by the setting of a part thereof by a form of sheet registering mechanism, for instance, such as is disclosed in Patent No. 2,231,914, or by the mechanism illustrated in the drawings herewith.

One object of this invention is to provide in a printing machine of the above or analogous nature, an improved form of tripping mechanism whereby the above mentioned desiderata will be attained.

Another object is to provide in a printing machine of the above nature, cylinder tripping mechanism in combination with means controlled by a sheet registering mechanism for controlling the actuation of such tripping mechanism.

Still another object is to provide means, cooperating with such a tripping mechanism, to individually adjust the pressure of the plate and of the impression cylinders upon the blanket cylinder, and other means to manually move the ink rollers toward and alternatively away from the plate cylinder, independently of the automatic tripping mechanism.

It is also an object of this invention to provide a sheet printing machine of the above nature with a tripping mechanism of generally improved construction, whereby the same will be relatively simple, durable and inexpensive in construction,

as well as convenient, practical, serviceable and efficient in use.

With the foregoing and other objects in view, which will appear as the description proceeds, the present invention resides in the combinations and arrangements of parts, and in the details of construction hereinafter described and claimed.

A preferred embodiment of this invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a side view, somewhat diagrammatical, of a portion of a multicolor sheet printing machine embodying the features and principles of this invention;

Figure 2 is a partial side view of one of the printing units with a casing and a machine frame sectioned, and broken away, respectively to expose operable portions of the tripping mechanism;

Figure 3 is a sectional view taken generally on the line 3—3 of Figure 2;

Figure 4 is a detached view of the operable and associated parts, included in the tripping mechanism of this invention, for tripping the plate cylinder;

Figure 5 is a detached view of the operable and associated parts, included in the tripping mechanism, for tripping the impression cylinder;

Figure 6 is a detached view of the parts of the tripping mechanism whereby the ink rollers may be tripped by hand and independently of the plate cylinder;

Figure 7 is a sectional view taken on the line 7—7 of Figure 6;

Figure 8 is a broken sectional view taken generally on the line 8—8 of Figure 2;

Figure 9 is a broken sectional view showing the casing taken generally on the line 9—9 of Figure 2 to show a side view of the tripping mechanism therein;

Figure 10 is a somewhat diagrammatical view of the driving gear arrangement of the printing unit illustrated in Figures 1 and 2;

Figure 11 is a broken sectional view on the line 11—11 of Figure 2; and

Figure 12 is an enlarged view of the control device at the registering cylinder.

The printing machine selected to illustrate the features and principles of this invention (see Figure 1) includes a sheet receiving, registering, and detecting unit 11 having a sheet receiving and registering cylinder 12, the detail construction and operation of which is fully disclosed in Patent No. 2,231,914. From the cylinder 12, sheets to be printed are carried by a sheet carrying

means, such as a conveyor having a chain 13 to a first printing unit 14 and by the same means successively to any number of additional printing units 15.

Each of the printing units includes a plate cylinder 16, an impression cylinder 17 both being mounted in movable bearings and cooperating in printing relation with a blanket cylinder 18 mounted in fixed bearings 20, one of which is shown in Figure 3. Suitable pairs of ink rollers 19 and 21 are arranged about the plate cylinder 16 and are supplied with ink from an ink fountain 22 by means of a ductor roller 23, reciprocating ink cylinders 24, 25, 26 and 27 and intermediate ink transfer rollers 28, 29 and 31. A suitable pair of water rollers 32 and 33 with a water fountain 34 and ductor roller 35 and a water cylinder 36 are also provided for the plate cylinder 16.

The ink cylinders 26 and 27 (Figures 1, 2 and 11) are mounted to be axially reciprocated in fixed bearings 37, preferably by mechanism indicated at 38 and fully disclosed in Patent 2,300,549. The ink rollers 19 and 21 are arranged to be tripped away from the form or plate cylinder 16 by means including mechanism similar to that shown in the last mentioned patent. This mechanism is arranged to be actuated automatically, and includes bearings 39 and 40, for the respective ink rollers, which are mounted in arms 41 and 42 rotatably supported to swing about the axis of the respective ink cylinders 26 and 27 (see Figures 2, 6 and 11) to move the ink rollers 19 and 21 away from the plate cylinder 16.

The arms 41 and 42 are connected by links 43 and 44 respectively, to adjustable arms 45 and 46 mounted on, and carried by, a plate 47. The plate 47 is journaled on an eccentric ring 48 (Figures 3 and 6), which is, in turn, journaled on an eccentric bearing sleeve 49 supporting a bearing for the shaft end 51 of the plate cylinder 16. Rotation of the eccentric ring 48 upon the sleeve 49 will, due to its eccentricity, move the plate upwardly with respect to the axis of the plate cylinder 16 and through the arms 45 and 46, and links 43 and 44, swing the bearing supporting arms 41 and 42 to carry the ink rollers 19 and 21 away from the plate cylinder 16. This action is accomplished by the cylinder tripping means to be hereinafter described.

The rollers 19 and 21 may be moved toward the plate cylinder 16, while it is tripped away from the blanket cylinder 18 by manual manipulation of a handle 52, to engage these rollers with a plate on the cylinder 16, to ink it prior to beginning printing. The handle 52 is arranged to be temporarily connected to a lever 53 secured upon a sleeve 50 that is rotatably mounted on a strip shaft 54 for the impression cylinder 17 (Figures 6 and 7). The trip shaft 54 is journaled in and extends between the machine side frames 55 and 56, and the sleeve 50 extends between levers 59 at each side of the machine. The lever 53 is arranged to be operably connected and disconnected to and from the shaft 54 by a pin 57 which is slidably mounted in the lever 53 and adapted to slide into and out of an arm 58 on a lever 59 keyed to the shaft 54. An arm 61 of the lever 53 is connected by a link 62 to the eccentric ring 48 whereby swinging movement of the lever 53 by a handle 52 will move the plate 47 to move the ink rollers 19 and 21 toward and away from the cylinder 16. The plate 47 is held against rotative movement by a link 63 connected thereto and to the machine frame 55. 75

The plate 47 and its operating mechanism with the exception of the portion of the lever 53 that receives the handle 52 is duplicated at the opposite side of the machine.

The tripping mechanism of this invention is automatically operated, while the machine is in operation, when conditions exist requiring such action, as for instance, when no sheet to be printed is being fed to the units by the carrier chain 13 from the registering cylinder 12. The tripping is effected by a cam 64, continuously rotating with the blanket cylinder 18, by being mounted on and connected to its shaft end 65 adjacent the side frame 55, (Figures 2, 3, 4 and 5). Cam engaging rollers 66 and 67 ride on the cam 64 and are carried by rockable levers 68 and 69 respectively. The levers 68 and 69 are rockably mounted on stud shafts 71 and 72 respectively, which extend out from the side frame 55. The peripheral spacing of the cam rollers 66 and 67 about the cam 64 is proportional to the length of the plate on the plate cylinder 16, and the cam 64 is timed so that no tripping will occur while a sheet is being printed, and the arrangement is such that the impression cylinder 17 will be tripped in advance of the plate cylinder 16.

The rockable lever 68 (Figure 5) reciprocates a trip bar 73 which is pivoted at its rear end 74 to the lever 68 and extends toward and beyond the trip shaft 54. A similar trip bar 75 (Figure 4), is pivoted at its rear end 76 to the lever 69 and extends toward and beyond a trip shaft, 77 for the plate cylinder 16. The trip bar 73 (Figure 5), at its forward end is provided with forwardly directed transversely spaced apart shoulders 78 and 79 adapted to engage spaced apart pins 81 and 82 respectively, which extend between plates 83 and 84 and between which the bar 73 slides by the action thereon of the cam 64 through the cam roller 66 and the lever 68. When the bar 73 is in normal, or down position, (Figure 5), the shoulder 78 will engage the pin 81 to swing the plates 83 and 84 to rock the shaft 54 in one direction, and it will be necessary to raise the bar 73 to cause the shoulder 79 to engage the pin 82 to rock the shaft 54 in the other direction. The plate 84 is secured to the shaft 54, in this instance, by being formed on the end thereof. A spring 85 reacting between a stud 86 and the lever 68 maintains the cam roller 66 against the cam 64.

The rockable lever 69 (Figure 4) reciprocates the trip bar 75 due to the action of the cam 64 upon the roller 67, which is maintained against said cam 64 by a spring 87, reacting between a stud 88 and the lever 69. The bar 75 is provided with rearwardly directed transversely spaced apart shoulders 89 and 91 adapted to engage spaced apart pins 92 and 93 respectively, which extend between plates 94 and 95 and between which the bar 75 slides when reciprocated by the cam 64. When the bar 75 is in normal, or down position, see Figure 4, the shoulder 89 will engage the pin 92 to rock the shaft 77 in one direction through the plate 95, which is secured to or formed on, the end of the shaft 77, and it will be necessary to raise the bar 75 to cause the shoulder 91 to engage the pin 93 to rock the shaft 77 in the other direction. Springs 96 and 97 react between studs 98 and 99 respectively and an arm 100 provided therefor on each of the plates 84 and 95 respectively to maintain the plates 84 and 95, and through them, the shafts 54 and 77 in their rocked posi-

tion until the respective bars 73 and 75 again act thereon to change such position.

Rocking movement of the plates 83 and 84, (Figures 2, 3 and 5), and by them of the trip shaft 54, rocks the lever 59. The lever 59 is connected through a link 101, attached to an arm 102 of the lever 59, to a link 103, which is connected to a lug 104 on a ring 105. The ring 105 is secured as by a screw to an eccentric bearing sleeve 106 which supports a bearing in which the shaft end 107 of the impression cylinder 17 is journaled. Thus, rocking movement of the lever 59 in one direction, will rotate the eccentric bearing for the impression cylinder 17 and trip or move this cylinder away from the blanket cylinder 18. In like manner, rocking movement of the plates 94 and 95 by the bar 75 will, through a link 108 connected to an arm 109 on a sleeve 111 keyed to the shaft 77, (Figure 3), and to a link 112 secured to a lug 113 on a ring 114 which is connected as by a screw to the eccentric bearing sleeve 49, rock the eccentric bearing for the plate cylinder 16 to trip or move it away from the blanket cylinder 18. Rocking movement of the lever 59 when it is connected by the pin 57 to the lever 53, as above described, will also move the plate 47 to cause the ink rollers 19 and 21 to be tripped away from the plate cylinder 16.

The trip bar 73 is raised into the above described tripping position by a lever 115, see Figures 2, 3, 5 and 9, rockably mounted on a stud shaft 116. An arm 117 of the lever 115 is connected to a link 118 by a pin 119 which rides in an elongated slot 121 provided in one end of the said link 118. The other end of the link 118 is connected to the outer end of the bar 73. A spring 122 reacting between a stud 123 and a short arm 124 also of the lever 115, tends to rock this lever to raise the bar 73, but is restrained from doing so by a catch arm 125 which is normally held in such restraining position by a swingable spring catch 126. When the catch 126 is moved out of catch arm 125 holding position, the spring 122 tends to rock the lever 115 to raise the bar 73, but may be restrained from doing so by a timing cam 127 which is shaped so as to prevent such action while an impression is being printed on a sheet between the blanket and impression cylinders 17 and 18 respectively. The cam 127 is provided with a high land portion 128 which when engaged by a cam roller 129 mounted on an arm 131, also of the lever 115, holds this lever against the urge of the spring 122. When the cam 127 is rotated to present its low land portion 132 to the roller 129, the lever 115 is rocked by the spring 122, provided the catch arm 125 is released from the catch 126, and the arm 73 is raised into tripping position, whereby the impression cylinder 17 will be tripped as above described when the cam 64 reciprocates the bar 73. The cam 127 is mounted upon the end of the shaft end 65 of the blanket cylinder 18 along with the cam 64 to rotate therewith, (Figure 3), by a bolt 133.

Raising movement of the trip bar 75 is also under the control of the catch 126, the catch arm 125, and the cam 127 indirectly through the plates 83 and 84. The arrangement is such that after the bar 73 has been raised, as above described, and the cam 64 has reciprocated this bar to rock the plates 83 and 84 to trip the impression cylinder 17, the bar 75 is raised into tripping position as above described. This action takes place when the plates 83 and 84 are rocked

by means, (Figures 2, 3 and 4), of an arm 134, secured to or formed as a part of the plate 83. The arm 134 is connected by a link 135 to an arm 136 of a lever pivoted upon a stud shaft 137. The other arm 138 of this lever is operably connected by a spring 139 to the outer end of the bar 75, which is urged upwardly thereby so that it will actuate the plates 94 and 95 to rock the trip shaft 77, whereby the plate cylinder 16 will be tripped as above described, when the cam 64 reciprocates the bar 75.

Provision is included in the mechanism of this invention, whereby either the plate cylinder 16, or the impression cylinder 17, may be manually tripped. The plate cylinder 16 may be manually tripped by rocking the plates 94 and 95 and through them, the trip shaft 77, by applying a wrench (not shown) to the outer end of a stud 141, (Figures 2 and 3), connected to or formed as a part of the outer plate 94. Likewise, the trip shaft 54 may be rocked to manually trip the impression cylinder 17 by the application of a wrench (not shown) to the outer end of a stud 142, (Figures 2, 3, 4 and 9), connected to or formed as a part of the outer plate 83.

Means to individually set the trip bars 73 and 75 in raised "trip on," or lowered "trip off" positions, while the machine is operating, for instance, for the purpose of silencing a unit, is also included in the mechanism of this invention (Figures 1, 2, 3, 4, 5 and 9). The means for so setting the trip bar 73, includes a post 143 mounted on the outer end of said bar and adapted to be acted upon by either of the opposing springs 144 and 145 connected by a rod 148 to an arm 146 secured to a shaft 147. The arm 146 is arranged to be swung in either direction by an operating handle 149 (Figure 1), secured to the outer end of the shaft 147. A spring pin 150 (Figure 9), located in the hand gripping end of the handle 149 is adapted to snap into holes 151 and 152 in a plate 153 provided for this purpose to releasably hold the handle and through the shaft 147, the arm 146 in the selected set position. Rocking of the arm 146 (Figure 5) by the handle 149, imposes an increased tension on either the spring 144 or 145 to force and hold the bar 73 into the desired set position. The provision of the elongated slot 121 in the link 118 permits movement of the bar 73 into raised position.

The means to set the trip bar 75 (Figure 4) in raised "trip on" or lowered "trip off" position includes an arm 154 connected to a post 155 mounted on the outer end of the bar 75, by opposing springs 156 and 157 and a rod 158. The arm 154 is secured to a shaft 159 which has an operating handle 161 secured upon its outer end. As in the case of the handle 149, a spring pressed pin (not shown) is provided in the hand gripping end of the handle 161 (Figure 1) and is adapted to drop into holes 162 and 163 provided in a plate 164 to releasably hold the arm 154 in its set position. The springs 156 and 157 when increased in tension by the setting manipulation of the handle 161 overcomes the action of the spring 139 connecting the lever arm 138 to the bar 75 to swing and hold said bar in the selected set position.

Provision is also included to adjust the pressure between the cooperating plate and blanket cylinders and between the impression and blanket cylinders. The means for so adjusting the pressure between the plate cylinder 16 and the blanket cylinder 18 includes, an arm 165 secured to a shaft 166 having an operating handle 167

secured to its outer end (Figures 1, 2, 3 and 4). The arm 165 is connected by an adjustable rod 168 to the outer end of the link 112. Swinging of the arm 165 in one direction by the handle 167 will, through the rod 168 and the link 112, rock the ring 114 to move the plate cylinder 16 closer to the blanket cylinder 18 through the medium of the eccentric bearing of the plate cylinder 16. A clamp 169 is provided to act upon the handle 167 to retain it in adjusted position.

The means for adjusting the impression cylinder 17 in respect to the blanket cylinder 18 to increase the pressure therebetween includes an arm 171 (Figure 2) connected to a shaft 172 having an operating handle 173 secured upon its outer end (see Figures 1 and 2). The arm 171 is connected by an adjustable rod 174 to the outer end of the link 103. Swinging movement of the arm 171 in one direction will, through the rod 174 and the link 103, rock the ring 105 to move the impression cylinder closer to the blanket cylinder 18 through the medium of the eccentric bearing of the impression cylinder 17. A clamp 175 is provided to act upon the handle 173 to retain it in adjusted position.

A casing 176, which is preferably oil-tight, is provided to cover all of the levers, links, arms, and cams associated and forming the mechanism of this invention which are mounted or disposed upon, or at the outside of the frame member 55. The wrench receiving ends of the studs 141 and 142 extend through this casing 176 (see Figures 1, 3 and 9) to be readily accessible to the machine operator. For a like purpose, the shafts 147 and 159 for the setting handles 149 and 161 also extend through the casing 176, the handles 149 and 161 being disposed on the outer surface thereof. The shaft 166 for the plate cylinder pressure adjusting handle 167 is also extended through the casing 176 for the same purpose. The shaft 172 for the impression cylinder pressure adjusting handle 173 extends outwardly through the frame 55 for a like purpose. The shafts 166 and 172 also extend through the frame 56 to have the arms 165 and 171 respectively, disposed adjacent the inner face thereof, secured thereto. The shafts 54 and 77 also extend through the frame 55 to have the levers 59 and arm 109 respectively, disposed adjacent the inner face thereof, secured thereto.

The automatic operation of the above described improved cylinder and ink roller tripping mechanism is controlled by means associated with the sheet registering cylinder 12, and in this instance includes a lever 177 (see Figure 1), which is acted upon by a roller 178 carried by an arm 179 on a shaft 181. The lever 177, arm 179, and shaft 181 correspond to elements numbered 193, 187, and 185 respectively, shown in Figures 9 and 10 of the drawings of the hereinbefore mentioned Patent No. 2,231,914, and are actuated in accordance with the description thereof in that specification. Briefly, a sheet misplaced, absent, or out of register, on the registering cylinder 12 will be detected by mechanism thereon, which acts to maintain the roller 178, on the arm 179, in its normal "up" position, whereby it will engage a long arm of the lever 177 to rock it as the registering cylinder 12 is rotated.

Rocking movement of the lever 177 through a rod 182 connecting the lever 177 to a lever 183 (see Figures 1 and 12), rocks the lever 183, which is pivoted at 184 to an adjacent frame member, to move a camming arm 185 out of the path of each of a plurality of rollers 186. Each roller

186 is carried on an arm of a lever 187 which is pivoted at 188 to a gear 189 indicated by dot and dash lines. The levers 187 are spaced about the gear 189. A spring 191 reacts between the other arm 192 of each of the levers 187 and a post 193 on the gear 189 to constantly urge the roller 186 toward the camming arm 185. The gear 189 is in mesh with a pinion 194, which rotates with the cylinder 12, and is timed so that the interval between the engagement of the rollers 186 with the camming arm 185 is proportional to the length of a sheet to be printed.

A plurality of levers 195, there being one for each of the catch levers 187, are each pivoted as at 196 to the gear 189. An arm of each lever 195 carries a roller 197 while the other arm 198 thereof has a post 199 thereon adapted to be engaged by a catch notch 201 formed at the end of the arm 192 of the lever 187, when the lever 195 is swung in one direction to dispose the roller 197 thereon in an outstanding position whereby it will engage an arm 202 pivoted at 203 to an adjacent frame member. A spring 204 reacts between a post 205 on the gear 189 and the arm 198 of the lever 195 to urge the lever 195 in a direction to dispose the roller thereon inwardly as shown in Figures 1 and 12.

In this instance, four catch levers 187, four levers 195 and four arms 202 are provided one for use with each of four printing units, two only of which are shown, as 14 and 15. A stationary cam segment 206 is provided and disposed in position to be engaged by each of the rollers 197 as the gear 189 rotates, to swing the roller carrying arm of the lever 195 outwardly. The cam segment 206 and the camming arm 185 are disposed in co-operating relation so that, when the lever 195 is swung by the cam segment 206 to dispose the roller 197 in outstanding position, the catch notch 201 will engage the post 199 to hold the lever 195 in such position, provided the camming arm 185 adjacent this lever 195 has been moved away from the roller 186 on the lever 177. Thus, when a sheet is displaced, absent, or out of register, on the cylinder 12 and the camming arm 185 is moved in consequence thereof, a roller 197 will be disposed in outstanding position and will successively engage the arms 202 to swing each, outwardly on its pivot 203.

In the preferred construction, each of the arms 202 is operably connected to a metallic bellows 207 by a rod 208, the bellows 207 being contained in a casing 209 secured to an adjacent frame member. A spring 210 reacts between the casing 209 and the arm 202 to return it to its normal position, as soon as the roller 197 passes by due to the rotation of the gear 189. A tube 211 (Figures 1, 2, 5 and 12) extends from each bellows 207 to a corresponding bellows 212 at each of the printing units 14, 15, etc., in consecutive order so that, as the bellows 207 are successively compressed by the outstanding roller 197 moving the arm 202 to compress the spring 208, the bellows 212 at the units will be expanded in turn, starting with the first unit 14 next to the registering cylinder 12. The bellows 207, tube 211 and bellows 212 are preferably filled with a substantially non-compressible fluid and sealed so that a non-leakable hydraulic system will be provided and no lost motion will result.

The bellows 212 at each unit (see Figures 1, 2, 5 and 9) is held in a casing 213, secured to the frame member 55 and actuates a push rod 214 slidably supported in a stationary post 215. A spring 216 is provided to react between the post

215 and the bellows 212 tending to maintain said bellows in contracted condition. The rod 214 is extended through a post 217 mounted on an arm 218 secured to a shaft 219 (Figure 9) which passes outwardly through the frame member 55 and has the catch 126 pivotally secured on its outer end. A coiled spring 221 is provided at this point and is adapted to constantly urge the catch 126 upwardly into the path of the catch arm 125 of the lever 115.

Centralizing springs 222 and 223 are provided reacting between the post 217 and the rod 214. With this structure, expansion of the bellows 212 will swing the catch 126 downwardly to release the arm 125 to allow the roller 129 to follow down the periphery of the cam 127 to the low land portion 132 thereof, whereby the trip arm 73 will be raised and the automatic tripping operation will be started. A catch 224, pivoted at 225 to the frame 55, is acted upon by a coiled spring 226 (see Figure 9), to urge it toward and into engagement with a boss 227 provided on the catch 126 to hold said catch down after it has been so moved by the bellows 212. A tongue 228 provided on the latch 224 is disposed in the path of the arm 125 to be engaged thereby, when it swings outwardly due to the roller 129 riding upon the low land portion 132 of the cam 127, to release the catch 126 whereby it will swing into position to engage the catch arm 125 when said arm is again swung inwardly by the roller 129 riding upon the high land portion 128 of the cam 127.

The driven members of each unit, including the cylinders 16, 17 and 18 and the reciprocating ink and water cylinders 24, 25, 26, 27 and 36 respectively, are driven from a drive shaft 231 (Figure 10), formed of sections extending between each unit and connected to a short shaft portion 232, journaled in bearings (not shown) at each unit, by universal joints 233 and 234. The shaft 232 has a bevel gear pinion 235 secured thereto which is in mesh with a bevel gear 236 secured upon a cross shaft 237. A gear 238 is secured upon the shaft 237 and is in mesh with a gear 239 secured upon the shaft end 241 of the blanket cylinder 18 adjacent the machine frame 56. The gears 238, 239 and all subsequently described gears of this driving arrangement are indicated in dot and dash lines for the sake of clearness and brevity.

The gear 239 is in mesh with a gear 242 secured on the shaft end 243 of the impression cylinder 17, and in mesh with a gear 244 on the shaft end 245 of the plate cylinder 16. A gear pinion 246, is in mesh with the gear 244. A gear pinion 247 rotatable with the gear pinion 246 is in mesh with a gear 248 which is in mesh with a gear pinion 249. The gear pinion 249 is in mesh with a gear 251 which is secured upon the shaft end of the reciprocating water cylinder 36. The gear 248 also meshes with a gear pinion 252 which is in mesh with a gear 253 on the shaft end of the reciprocating ink cylinder 27 and a gear 254 having a pinion 255 rotatable therewith. The pinion 255 is in mesh with a gear 256 having a pinion 257 rotatable therewith which is in mesh with a gear 258 secured on the shaft 259 of a ductor roller operating cam (not shown). The gear 254 is also in mesh with a gear 261 which is in mesh with a gear pinion 262. The pinion 262 is in mesh with gears 263 and 264 secured upon the shaft ends of the reciprocating ink cylinders 24 and 25 respectively. The gear 264 is in mesh with a gear pinion 265 which is in mesh with a gear 266. The gear 266 is in mesh with a gear 267 secured on the shaft end of the reciprocating ink cylinder 26.

Briefly, the operation of the improved tripping mechanism of this invention is as follows, assuming that the absence of a sheet, or the presence of one that is out of register, has been detected by means on the registering cylinder 12 (not shown) and that in consequence the lever 177 has been swung by the roller 178 to move the camming arm 185 outwardly, and thus out of possible engagement with the roller 186 on the lever 187. This action disposes the catch notch 201 on the lever 187 in position to engage the post 199 and thus maintain the roller 197 on the lever 195 in the outstanding position into which it has been swung by the cam segment 206. As the gear 189 is continuously rotating in timed relation to the cylinder 12, the outstanding roller 197 first engages the arm 202 next in its path, this being the arm which actuates the bellows 207 connected by the tube 211 to the first unit 14. Such engagement of the arm 202 compresses the bellows 207 creating a pressure of fluid in the system whereby the bellows 212 is expanded lengthwise to push the rod 214 and through the spring 222 to rock the arm 218. Rocking of the arm 218 in turn rocks the shaft 219 and through it the catch 126 to release the catch arm 125.

Release of the catch arm 125 from the catch 126 allows the spring 122 to act on the lever 115 to cause the roller 129 to engage and ride on the timing cam 127. The cam 127 is rotated with the blanket cylinder 18 in timed relation to the feed of the sheet carrying chain 13 and with the gear 189, as well as with the registering cylinder 12. Therefore, as a gripper bar (not shown) but carried by the chain 13 to feed sheets through the machine from the registering cylinder 12 approaches a desired point in respect to the bite between the impression and blanket cylinders 17 and 18 respectively, without carrying a sheet, the low land portion 132 of the cam 127 is opposite the roller 129 which rides down and upon the same allowing the lever 115 to swing, whereby the arm 117 through the link 118 will raise the trip arm 73. In timed relation with this operation, the cam 64 acts on the roller 66 to rock the lever 68 and reciprocate the trip arm 73, whereupon the shoulder 79 will engage the pin 82 to rock the plates 83 and 84 into trip position.

Rocking of the plates 83 and 84 into trip position first trips the impression cylinder 17 away from the blanket cylinder 18 through the link 101, ring 105, and the eccentric bearing sleeve 106, and at the same time by its arm 134 and through the link 135 to the lever arm 136 swings the other lever arm 138 upwardly to impose a spring tension, by means of the spring 139, upon the trip lever 75 to raise it. Thus, when the cam 64 arrives at the roller 67 the lever 69 is rocked to reciprocate the lever 75 whereupon the shoulder 91 will engage the pin 93 to rock the plates 94 and 95 into trip position. Rocking of the plates 94 and 95 into trip position will cause the plate cylinder 16 to be tripped away from the blanket cylinder 18. At the same time that the impression cylinder 17 is tripped as above described, the ink rollers 19 and 21 are tripped away from the plate cylinder 16 through the medium of the trip shaft 54, the lever 59, pin 57, lever 53, arm 61, link 62 and the eccentric ring 48 which acts, as above described, on the plate 47 for this purpose. The various possible manual operations of the individual mechanism, it is believed, will be fully understood, having

been included in the foregoing description of their structure and need not be repeated at this point.

It will be understood that the above operations will take place to automatically trip the respective cylinders and ink rollers whenever a sheet is absent from its position on the sheet carrier chain 13 when leaving the registering cylinder 12, and that the catches 126 at each unit will be successively tripped to release the associated catch arms 125 at these units due to the revolution of the outstanding roller 197 with the gear 189 whereby it will successively engage the arms 202 to successively compress the bellows 207 peripherally spaced about the gear 189 for this purpose, thus tripping all of the units successively.

If subsequent sheets are misregistered or missing from the registering cylinder 12, the tripping mechanism will continue to function to throw-off the impression as the conveyor brings the gripper bar from which a sheet is missing to each unit, but whenever a sheet is properly presented to the registering cylinder 12 and registered thereby so that it is taken by the gripper bar on the conveyor, that sheet will be carried through the several printing units without tripping off the impression.

From the foregoing, it will be understood that when any one of the levers 195 has been latched in its tripping position, that the gear 189 will make at least a complete revolution, tripping all four units in sequence, but if a sheet is properly registered on the cylinder 12 when the revolution of the gear 189 is completed, the lever 195, just referred to, will then be allowed to assume its normal position and regular operation of the machine will continue. This resetting is effected due to the camming arm 185 now being in normal position because the roller 178 would be depressed and there would consequently be no movement of the lever 177, and thus the roller 186 will be engaged to swing the lever 187 and raise the catch notch 201 away from the post 199 which permits the lever 195 to swing to its normal position wherein it does not engage the arms 202.

It will be understood that the gearing shown in Figure 10 may be enclosed in an oil-tight casing, and that the bearings for the shaft portions 232 may be supported in such a casing, as shown and described in Patent 2,267,100. While omitted for the sake of brevity and clearness, it is contemplated to include in association with the plate cylinder 16, means to adjust it both axially and circumferentially to align the form on its printing plate with those on the plate cylinders of the other units. Such mechanisms are shown and described in Patent No. 2,181,895, granted December 5, 1939.

The provision in a printing machine of the above described improved form of tripping mechanism insures its efficient and automatic operation. Enclosing of the hand and mechanical tripping mechanisms shown herein in a casing, preferably oil-tight, is especially advantageous by obviating the dangerous condition of exposed operating parts and also facilitates maintaining the parts clean and well oiled. By the arrangement disclosed, the various elements constituting this improved mechanism are compactly grouped in a readily accessible position upon the outside of a frame member.

The arrangement herein disclosed, whereby the blanket cylinder is carried in fixed bearings while the bearings of the plate and impression cylinders are movable is also advantageous in that it

reduces the movements required to a minimum amount. Accurate timing of the operations above described, in respect to the blanket cylinder and other elements associated therewith and acting upon a sheet being printed by disposing the operating cams upon the shaft of the blanket cylinder to rotate therewith is also obtained. By the above arrangement, it is possible to connect the drive to the blanket cylinder, insuring a more direct and even drive therefor, and whereby only one gear mesh point is required to each of the operating gears for the plate and impression cylinders.

It will be understood that the invention herein disclosed may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, and it will be further understood that each and every novel feature and combination present in or possessed by the mechanism herein shown and described forms a part of the invention included in this application.

What I claim is:

1. In a printing machine having cooperating printing cylinders including a first cylinder positioned between a second cylinder and a third cylinder and engaging them simultaneously, means to trip the second and third cylinders away from the first cylinder, a cam secured to the first cylinder to actuate the tripping means, manually operable means to actuate the tripping means independently of the cam, and manually operable means including part of the tripping means, to adjust the pressure between the first and second and between the first and third cylinders without affecting the operation of the tripping means.

2. In a printing machine having cooperating blanket, plate and impression cylinders, separate means to trip the plate and impression cylinders away from the blanket cylinder, and a cam secured to the blanket cylinder to commonly actuate the tripping means, the said separate means being positioned to be engaged in sequence by the cam.

3. In a printing machine having cooperating blanket, plate and impression cylinders, separate means to trip the plate and impression cylinders away from the blanket cylinder, a cam secured to the blanket cylinder to commonly actuate the tripping means, the said separate means being positioned to be engaged in sequence by the cam, and manually operable means to selectively trip the plate and impression cylinders away from the blanket cylinder independently of the cam.

4. In a printing machine having cooperating blanket, plate and impression cylinders, separate means to trip the plate and impression cylinders away from the blanket cylinder, a cam secured to the blanket cylinder to commonly actuate the tripping means, the said separate means being positioned to be engaged in sequence by the cam, manually operable means to selectively trip the plate and impression cylinders away from the blanket cylinder independently of the cam, and manually operable means to selectively set said tripping mechanism for the plate and impression cylinders in the tripped "on" and tripped "off" positions and to prevent its operation by the cam.

5. In a printing machine having cooperating blanket, plate and impression cylinders, separate

means to trip the plate and impression cylinders away from the blanket cylinder, a cam secured to the blanket cylinder to commonly actuate the tripping means, the said separate means being positioned to be engaged in sequence by the cam, manually operable means to selectively trip the plate and impression cylinders away from the blanket cylinder independently of the cam, manually operable means to selectively set the tripping means for the plate and impression cylinders in the trip "on" and trip "off" positions and to prevent its operation by the cam, and manually operable means to selectively adjust the pressure between the plate cylinder and the blanket cylinder and between the blanket cylinder and the impression cylinder.

6. In a printing machine having cooperating engaging printing cylinders, a first one of the cylinders being journaled in fixed bearings and a second one of the cylinders being journaled in rotatable eccentric bushings, ink rollers journaled in bearings movable about a fixed axis and engaging the second cylinder, machine operated means to rotate the bushings to trip the second cylinder away from the first cylinder and to move the ink roller bearings to trip the rollers away from the second cylinder, settable manually operable means to similarly trip the second cylinder, and other means connected to the bushings and manually operable to rotate them while the machine is running, to adjust the pressure between the cylinders.

7. In a printing machine having a blanket cylinder journaled in fixed bearings and plate and impression cylinders each journaled in movable bearings and cooperating with the blanket cylinder, separate machine operated means to move the movable bearings of the plate and impression cylinders to trip them away from the blanket cylinder, and a cam secured to the blanket cylinder, the said separate means being positioned to be engaged in sequence by the cam, to first cause tripping of the impression cylinder and then tripping of the plate cylinder.

8. In a printing machine having cooperating engaging printing cylinders, a first one of the cylinders being journaled in fixed bearings and a second one of the cylinders being journaled in rotatable eccentric bushings, one at each end thereof, machine operated means to rotate the bushings to trip the second cylinder away from the first cylinder, manually operable means to rotate the bushings to similarly trip the second cylinder, other means manually operable while the machine is running, to simultaneously rotate the bushings to adjust the pressure between the cylinders, and a casing covering the aforesaid means and having hand operable elements of the manually operable pressure adjusting means extended therethrough.

9. In a printing machine having a blanket cylinder journaled in fixed bearings, a plate cylinder journaled at each end in a movable bearing, an impression cylinder journaled at each end in a movable bearing, separate machine operated means to move the movable bearings for the plate and impression cylinders to trip them away from the blanket cylinder, a cam secured to the blanket cylinder, and two cam followers disposed about the cam and respectively connected to the tripping means to trip the plate and impression cylinders in sequence.

10. In a printing machine having a blanket cylinder journaled in fixed bearings, a plate cyl-

inder journaled at each end in a movable bearing, an impression cylinder journaled at each end in a movable bearing, separate mechanically operable means to move the movable bearings for the plate and impression cylinders to trip them away from the blanket cylinder, a cam secured to the blanket cylinder, and two cam followers disposed about the cam and respectively connected to the tripping means, to trip the plate and impression cylinders in sequence, means to feed sheets to the cylinders, mechanism affected by the absence of a sheet at a register point to control the action of the tripping means, including a second cam secured to the blanket cylinder.

11. In a printing machine, a first cylinder journaled in fixed bearings, a second cylinder journaled at each end in rotatable eccentric bushings, a machine operated means to rotate the bushings to trip the second cylinder away from the first cylinder, including a link connected to each bushing and to which the tripping means is secured to rotate the bushing, the said link being connected also to a manually movable member operable to rotate the bushing to adjust the pressure between the first and second cylinders.

12. In a printing machine having a first cylinder journaled in fixed bearings and a second cylinder journaled in movable bearings, a cam secured to rotate with one of the cylinders, a tripping mechanism operable by the cam to move the movable bearings, the said tripping mechanism being connected to the movable bearings through link mechanism that is also connected to means operable while the press is running to manually adjust the movable bearings.

13. In an offset printing machine having a blanket cylinder, a plate cylinder and an impression cylinder, movable bearings whereby all of the said cylinders may be tripped apart and also moved one toward another to press them together, machine operated means to move the said movable bearings, including a cam rotating with one of the cylinders, and manually operated adjusting means associated with the machine operated means and operable while the machine is running to adjust the range of movement of the movable bearings.

14. In an offset printing machine, a blanket cylinder journaled in fixed bearings, a plate cylinder journaled in rotatable eccentric bushings, a machine operated means to rotate the bushings to trip the plate cylinder away from the blanket cylinder, including a cam rotatable with the blanket cylinder, a cam follower connected to a shaft and a link mechanism connecting the shaft and each eccentric bushing, and a cylinder adjusting mechanism including a second shaft connected to a manually adjustable member and to each of the said link mechanisms, whereby the impression pressure of the said cylinders may be regulated.

15. In an offset printing machine, a blanket cylinder journaled in fixed bearings, an impression cylinder journaled in rotatable eccentric bushings, a machine operated means to rotate the bushings to trip the impression cylinder away from the blanket cylinder, including a cam rotatable with the blanket cylinder a cam follower connected to a shaft and a link mechanism connecting the shaft and each eccentric bushing, and a cylinder adjusting mechanism including a second shaft connected to a manually adjustable member and to each of the said link mech-

anisms, whereby the impression pressure of the said cylinders may be regulated.

16. In a printing machine having cooperating printing cylinders, a first one of the cylinders being journaled in fixed bearings and a second one of the cylinders being journaled in rotatable eccentric bushings one at each end thereof, machine operated means to rotate the bushings to

trip the second cylinder away from the first cylinder, manually operable means to rotate the bushings to similarly trip the second cylinder, and a member manually operable to rotate the bushings through a small angle to adjust the pressure between the cylinders.

WILLIAM F. HUCK.