

Aug. 30, 1932.

C. R. KADDELAND

1,874,013

ROTARY COLOR PRINTING PRESS

Filed April 8, 1927

12 Sheets-Sheet 1

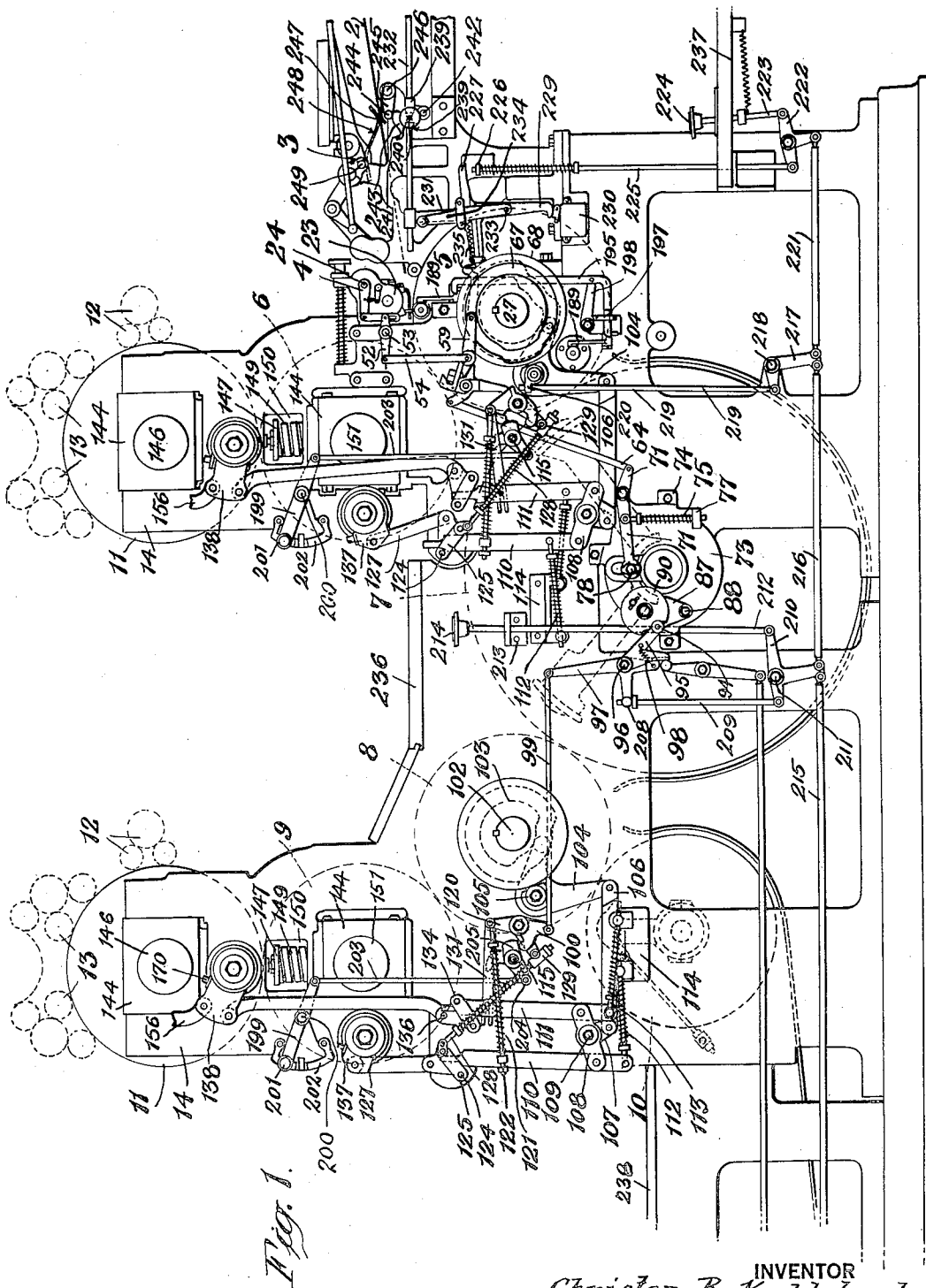


Fig. 1.

INVENTOR
Christen R. Kaddeland
BY
Edwards & Henry
ATTORNEY

Aug. 30, 1932.

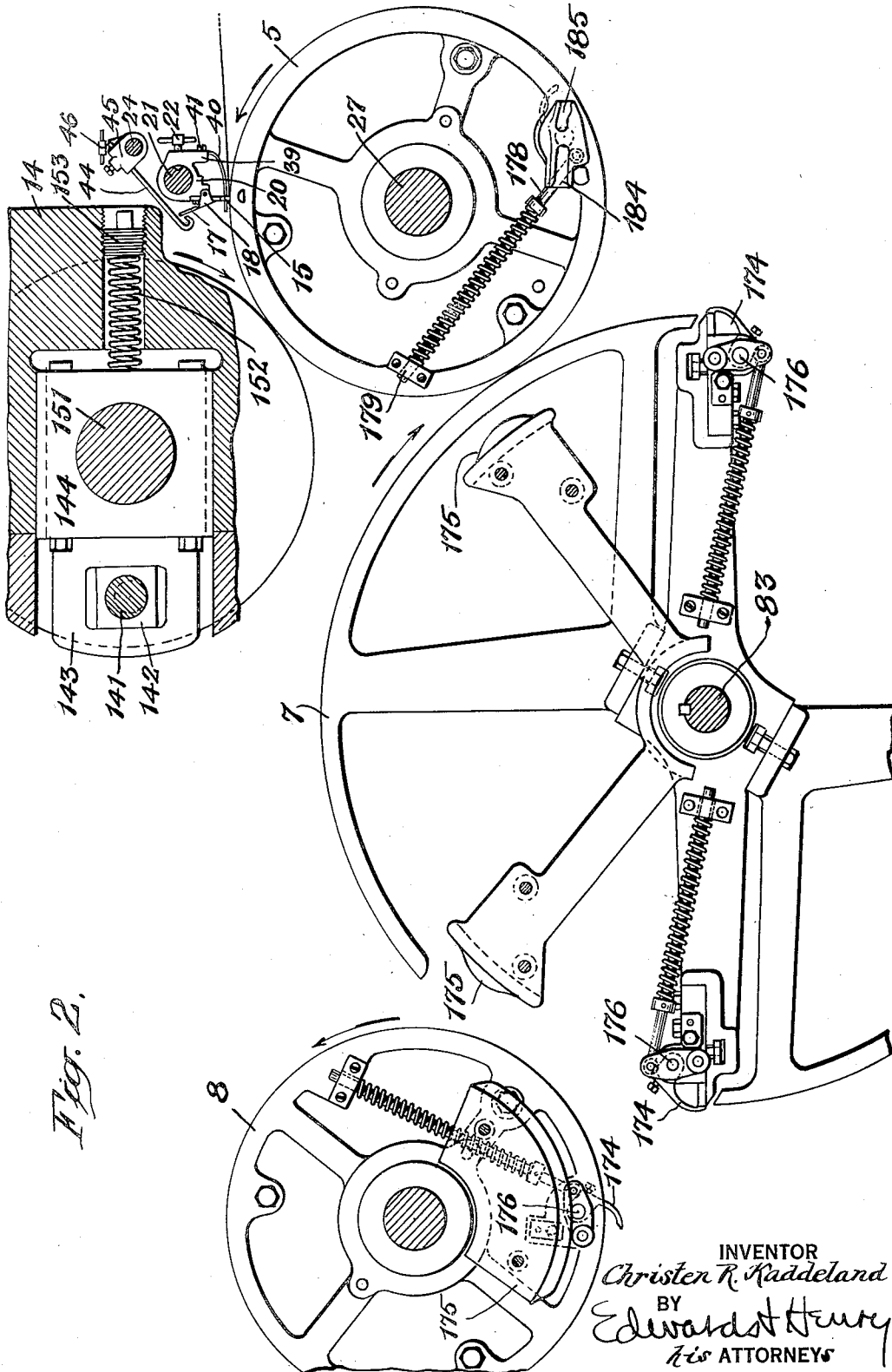
C. R. KADDELAND

1,874,013

ROTARY COLOR PRINTING PRESS

Filed April 8, 1927

12 Sheets-Sheet 2



Aug. 30, 1932.

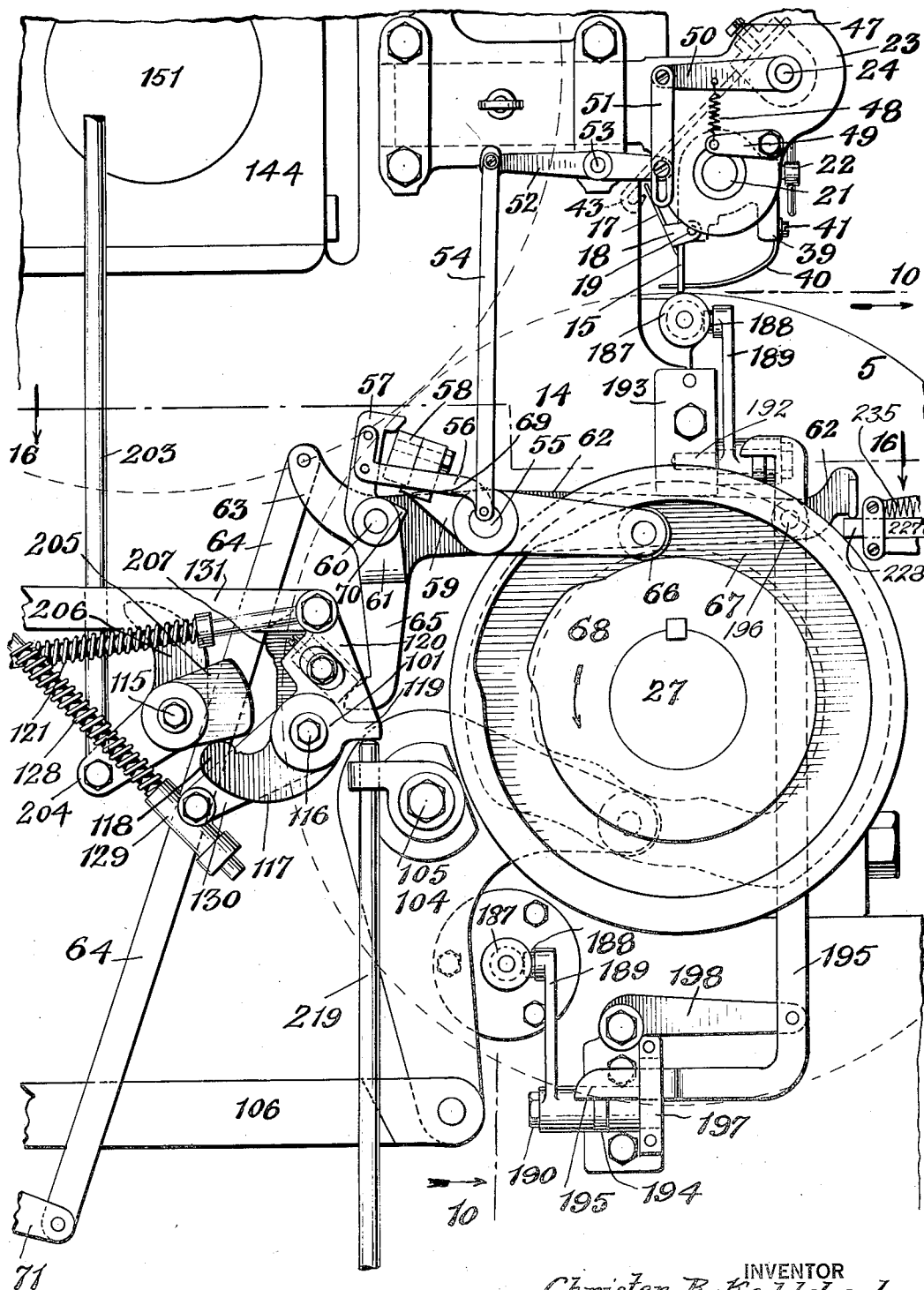
C. R. KADDELAND

1,874,013

ROTARY COLOR PRINTING PRESS

Filed April 8, 1927

12 Sheets-Sheet 3



INVENTOR
Christen R. Maddeland
BY
Edwards & Henry
FIS ATTORNEYS

Aug. 30, 1932.

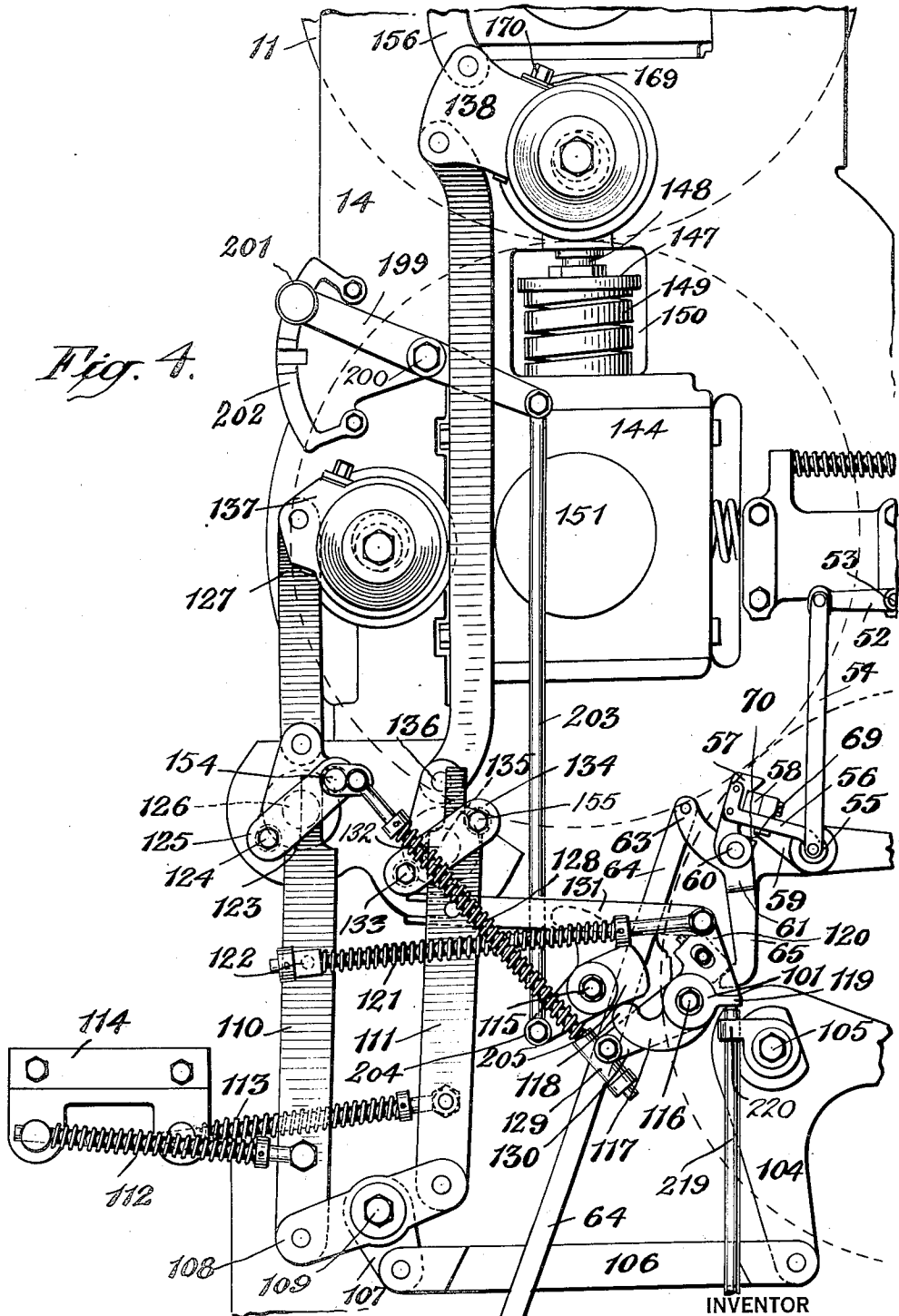
C. R. KADDELAND

1,874,013

ROTARY COLOR PRINTING PRESS

Filed April 8, 1927

12 Sheets-Sheet 4



INVENTOR

Christen R. Kaddeland

BY

Edwards & Henry
ATTORNEYS

Aug. 30, 1932.

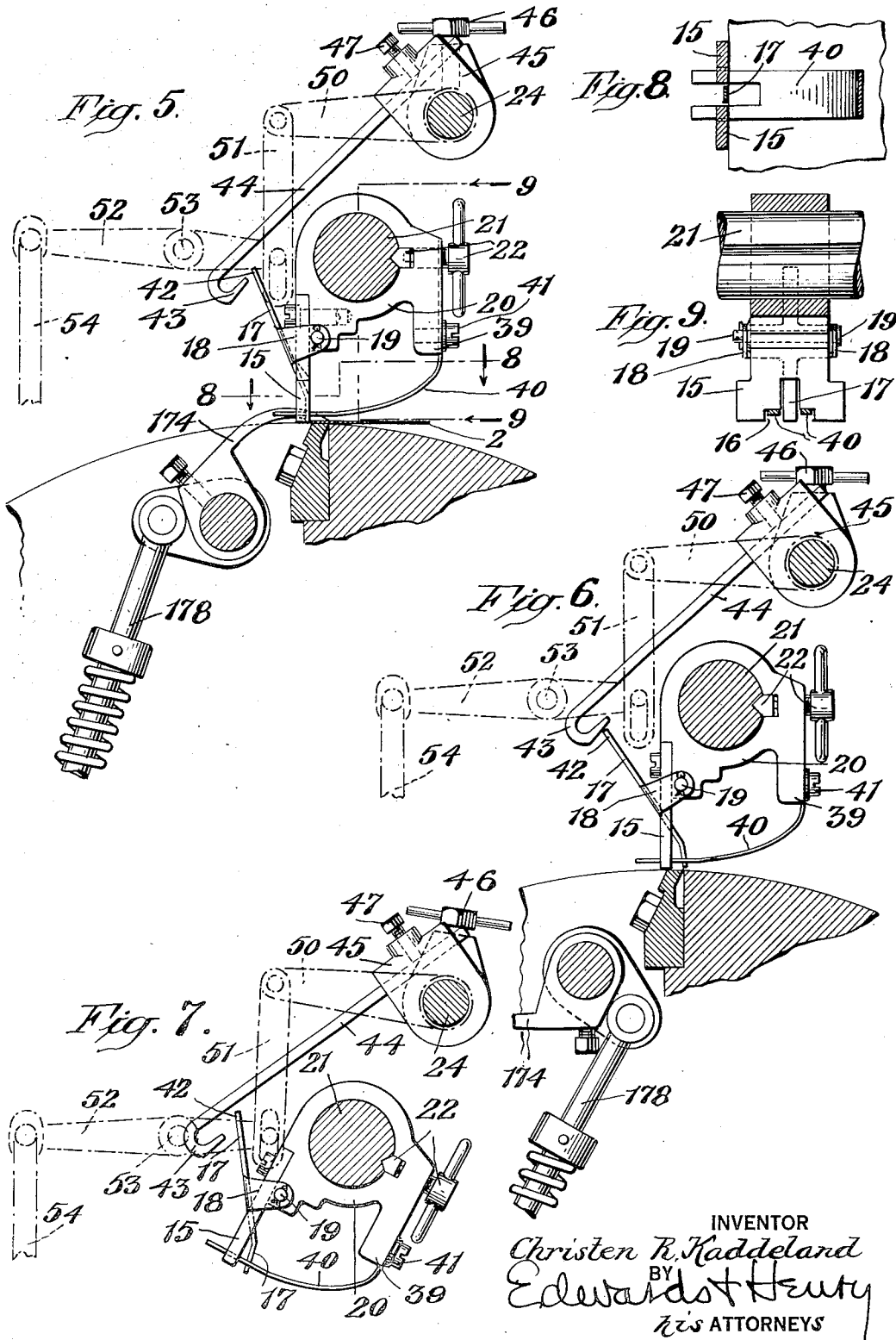
C. R. KADDELAND

1,874,013

ROTARY COLOR PRINTING PRESS

Filed April 8, 1927

12 Sheets-Sheet 5



INVENTOR
Christen R. Kaddeland
BY
Edward St. Henry
his ATTORNEYS

Aug. 30, 1932.

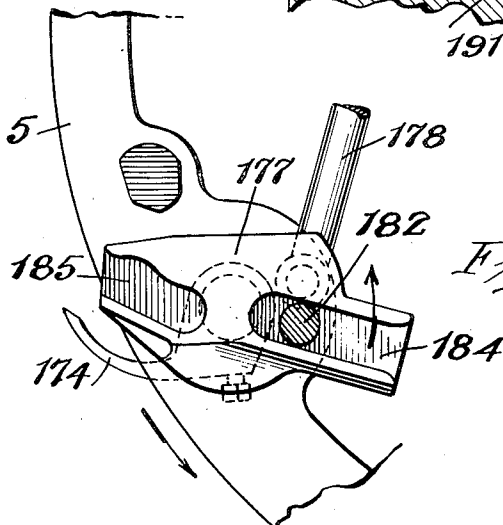
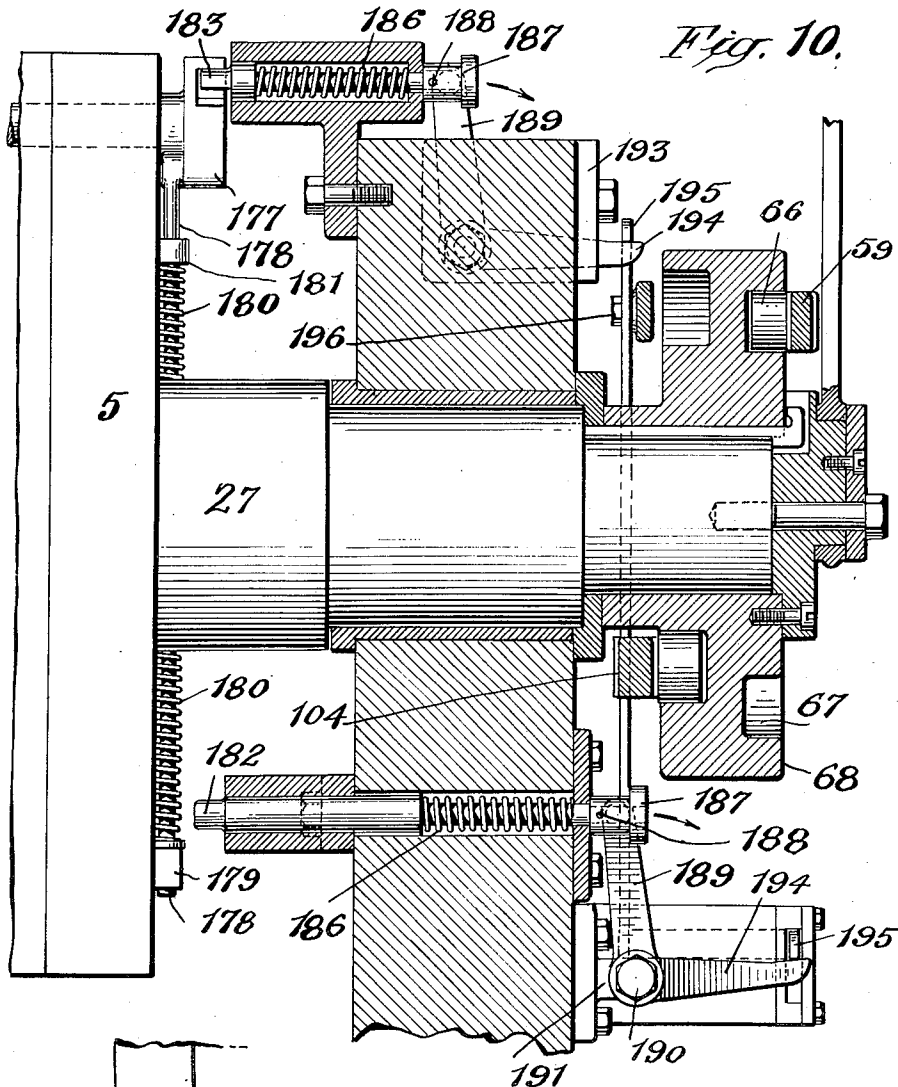
C. R. KADDELAND

1,874,013

ROTARY COLOR PRINTING PRESS

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12 Sheets-Sheet 6



INVENTOR
Christer R. Kaddeland
 BY
Edwards & Henry
 ATTORNEYS

Aug. 30, 1932.

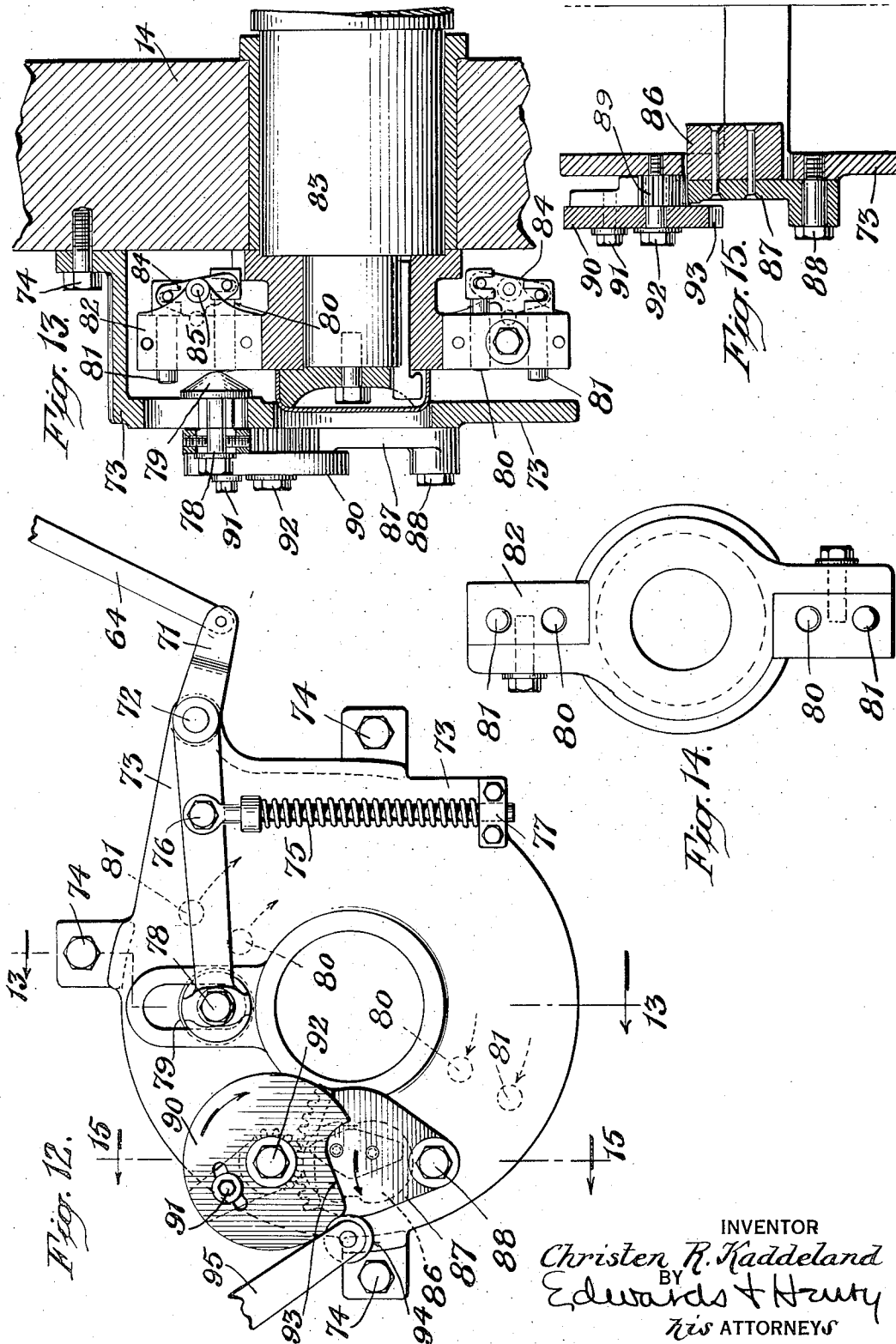
C. R. KADDELAND

1,874,013

ROTARY COLOR PRINTING PRESS

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12 Sheets-Sheet 7



INVENTOR
Christen R. Kaddeland
BY
Edwards & Hunt
ATTORNEYS

Aug. 30, 1932.

C. R. KADDELAND

1,874,013

ROTARY COLOR PRINTING PRESS

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12 Sheets-Sheet 8

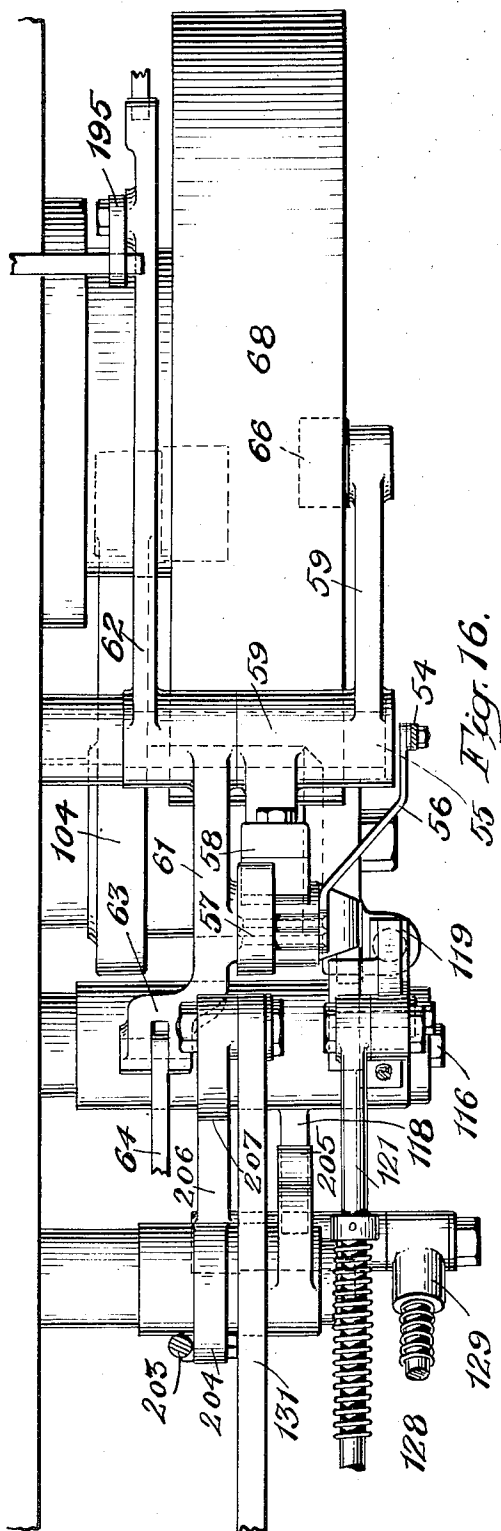


Fig. 16.

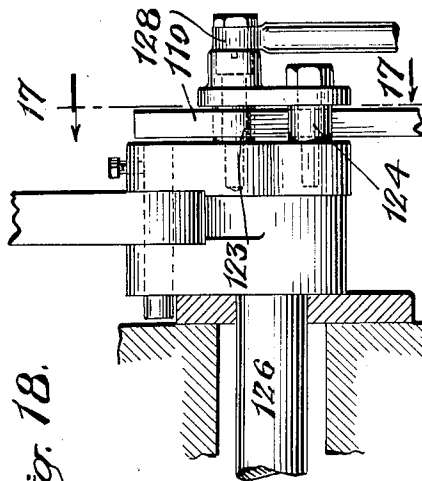


Fig. 18.

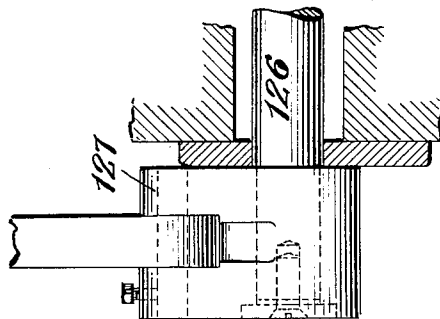


Fig. 17.

INVENTOR
Christen R. KaddeLand
BY
Edwards & Henry
ATTORNEYS

Aug. 30, 1932.

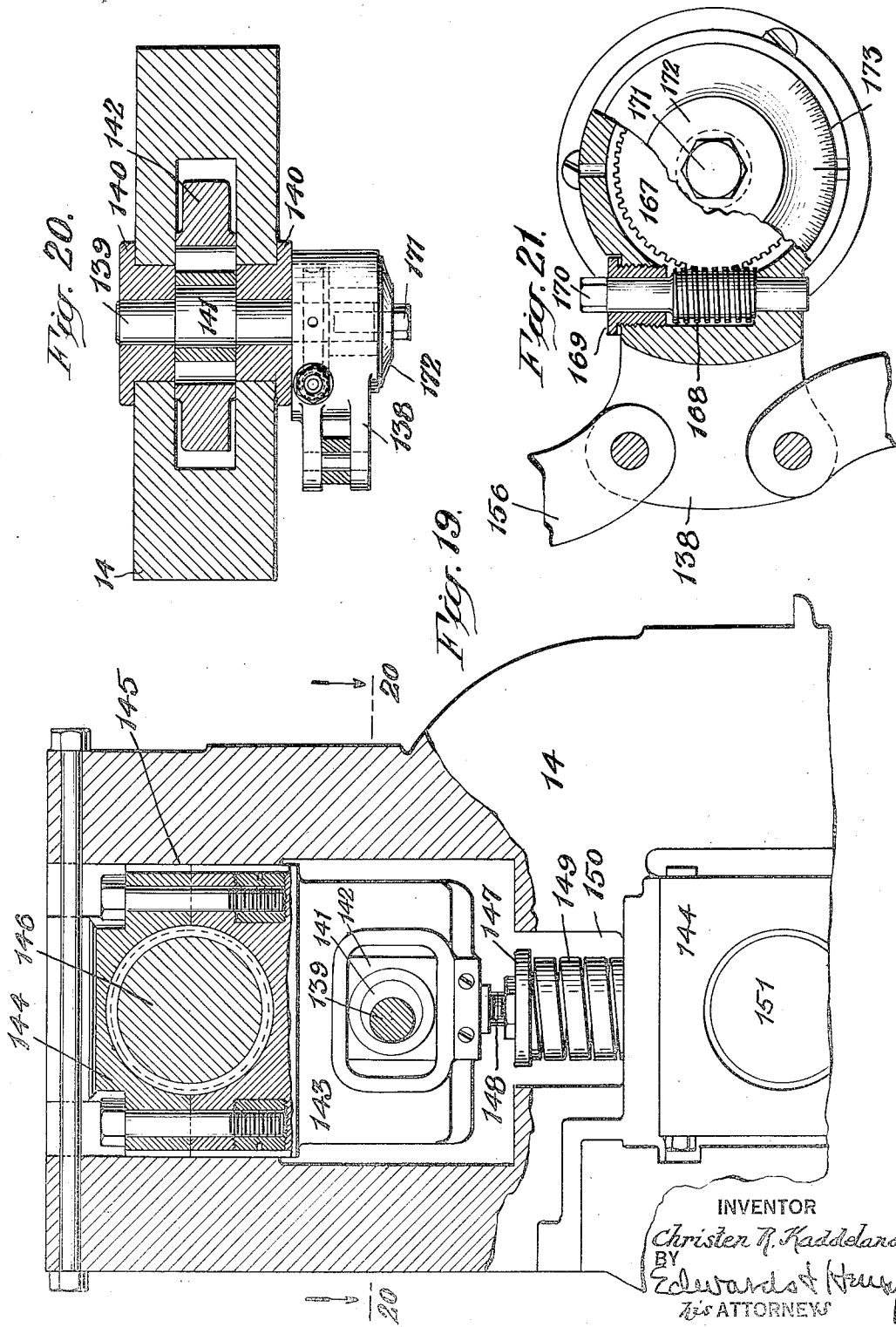
C. R. KADDELAND

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ROTARY COLOR PRINTING PRESS

Filed April 8, 1927

12 Sheets-Sheet 9



Aug. 30, 1932.

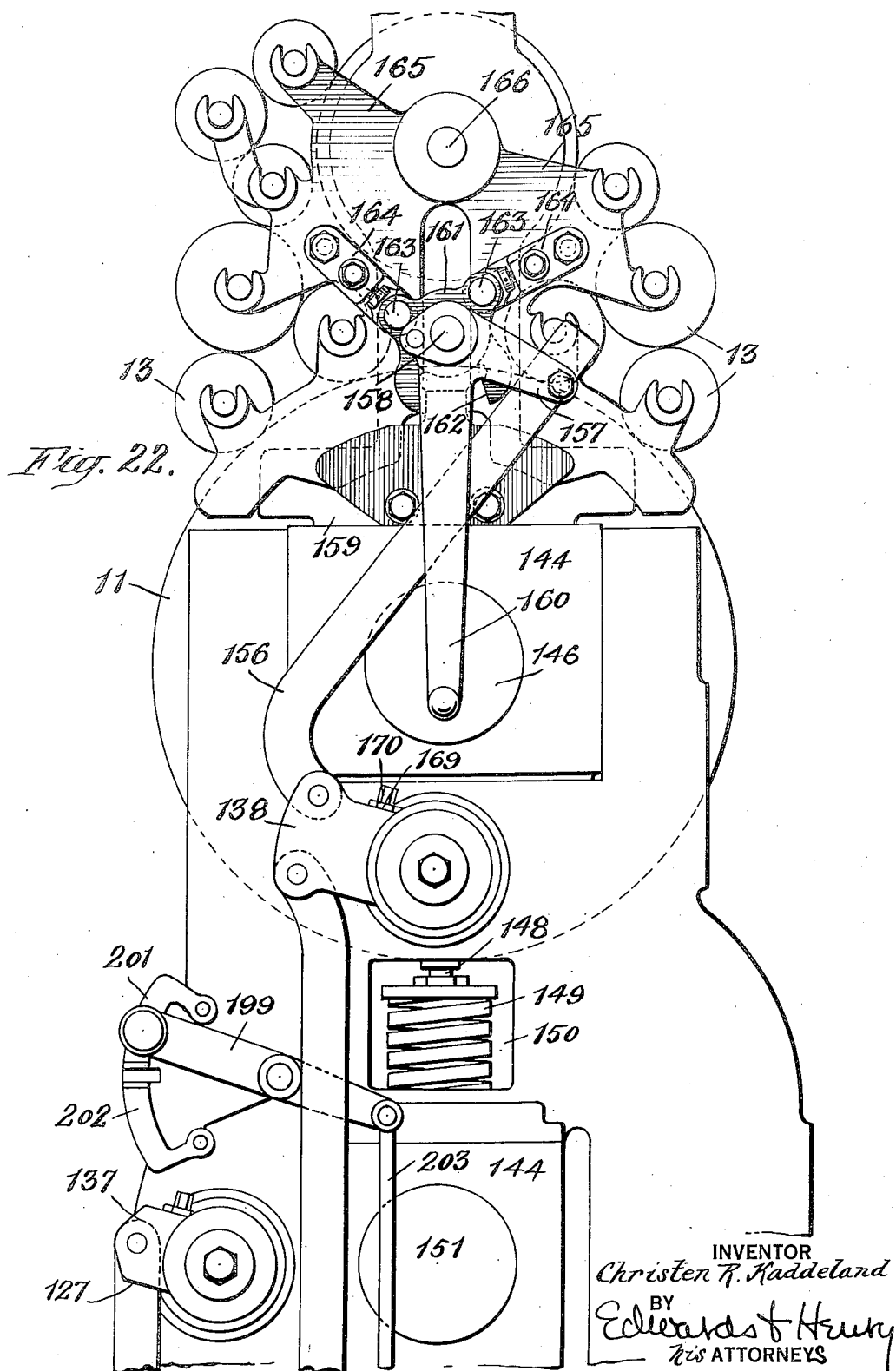
C. R. KADDELAND

1,874,013

ROTARY COLOR PRINTING PRESS

Filed April 8, 1927

12 Sheets-Sheet 10



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C. R. KADDELAND

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ROTARY COLOR PRINTING PRESS

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12 Sheets-Sheet 11

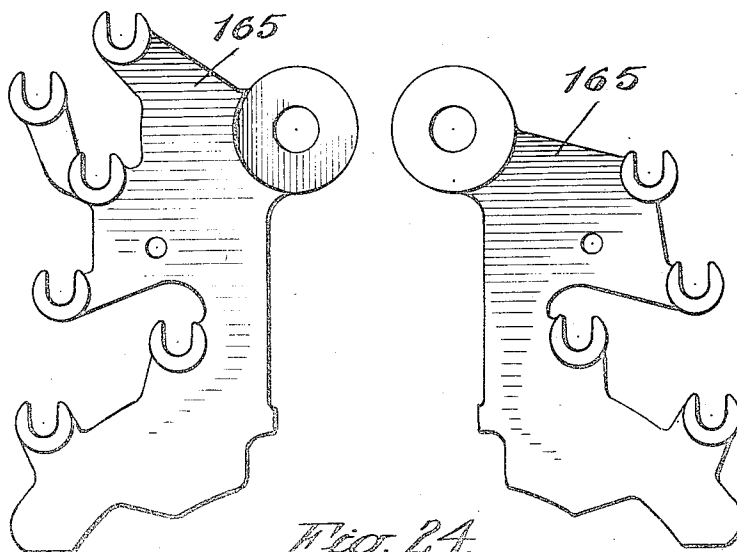
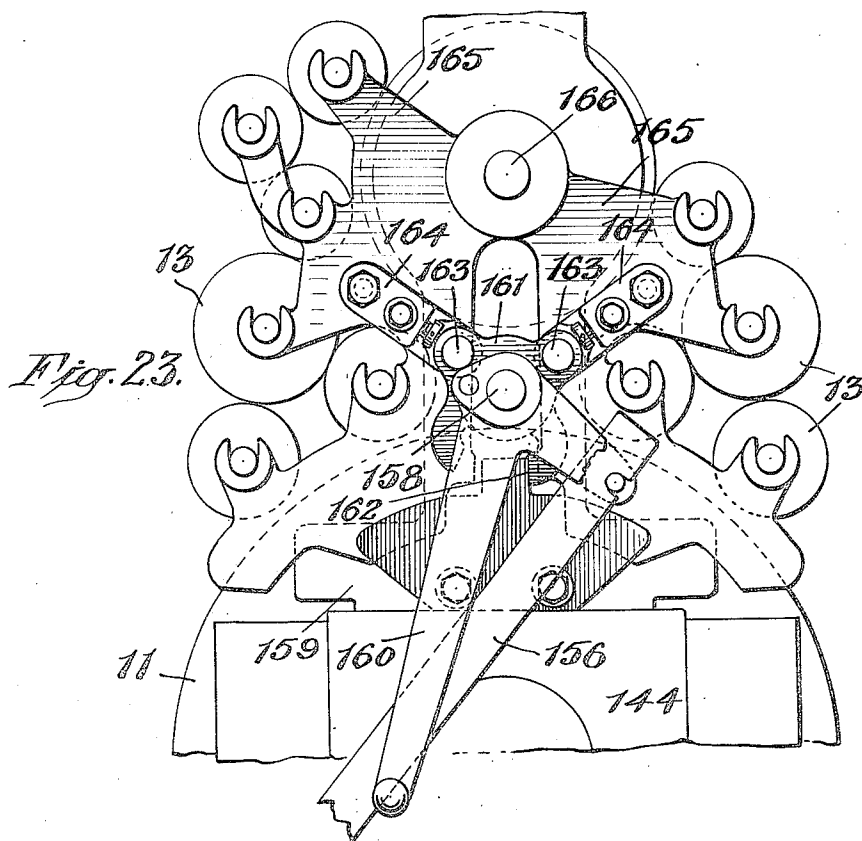


Fig. 24.

INVENTOR
Christen R. Kaddeland
BY
Edwards & Henry
ATTORNEYS

Aug. 30, 1932.

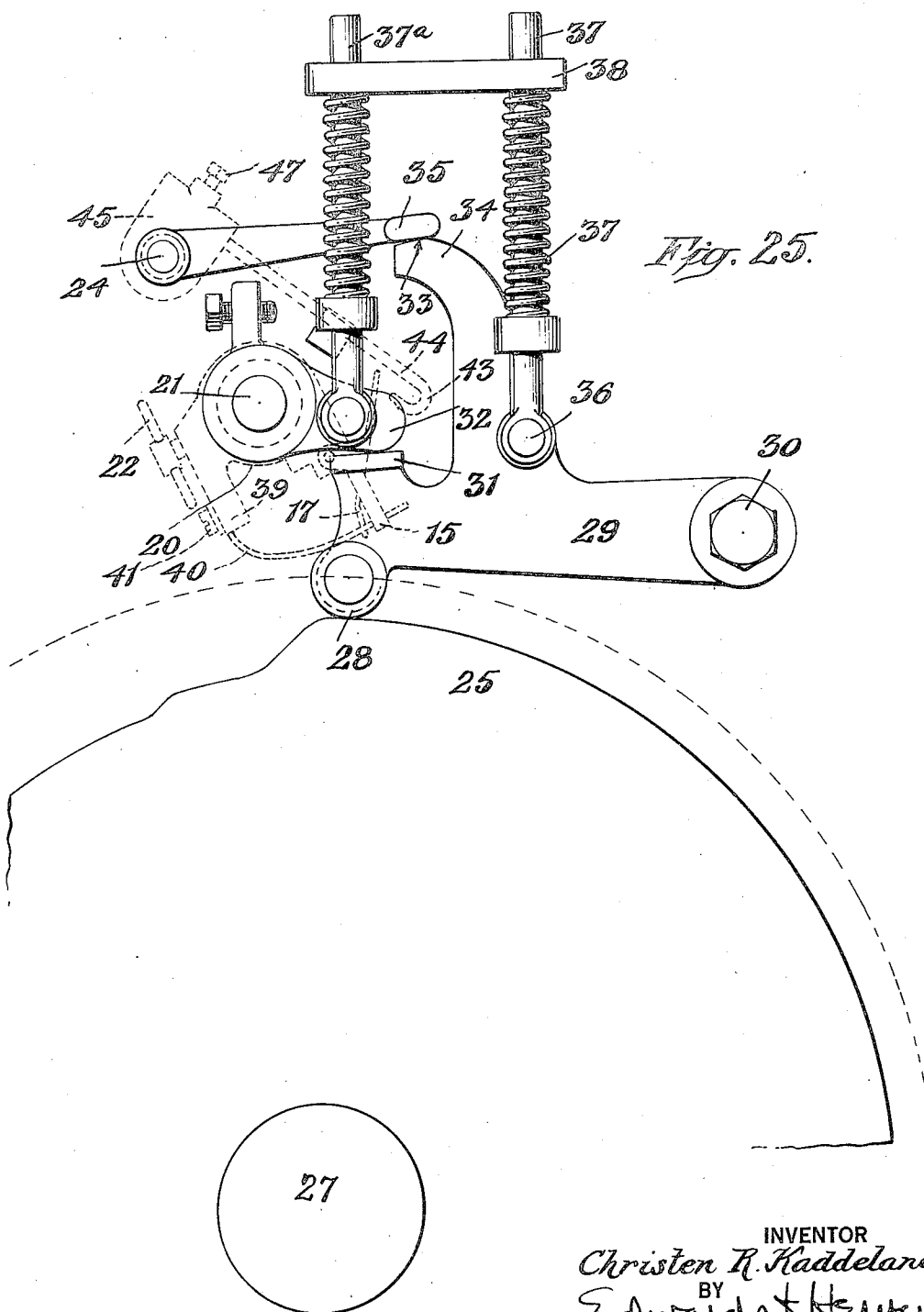
C. R. KADDELAND

1,874,013

ROTARY COLOR PRINTING PRESS

Filed April 8, 1927

12 Sheets-Sheet 12



INVENTOR
Christen R. Kaddeland
BY
Edwards & Henry
ATTORNEYS

UNITED STATES PATENT OFFICE

CHRISTEN R. KADDELAND, OF SHELTON, CONNECTICUT, ASSIGNOR TO HARRIS, SEYBOLD, POTTER COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF DELAWARE

ROTARY COLOR PRINTING PRESS

Application filed April 8, 1927. Serial No. 181,966.

The object of my invention is to provide a press of this character with a number of printing couples each composed of suitable water and inking rollers, a plate cylinder, a blanket cylinder, an impression cylinder and between each couple is placed a transfer cylinder of greater diameter than any of the cylinders in any couple and preferably twice the diameter so that any number of couples may be put in one frame and any desired number of colors may be successively applied to a sheet of paper passing through the press so that color effects in infinite variety may be produced. In the preferred embodiment of my invention, the plate and blanket cylinders are placed vertically, one above the other, the impression cylinders a little below and to one side of the blanket cylinders with which they cooperate and each couple is symmetrically placed in the machine so as to allow ample facilities for cleaning and handling and operating in addition to the other advantage above set forth.

A further object is to provide certain tripping mechanisms which operate either automatically in cooperation with paper feed devices or manually so that the machine may properly function at all times, and yet a further object is to provide means for throwing out one or more couples without disturbing in any way the action of the remaining couples.

Yet a further object is to provide a press complete in every respect with many details of construction incidental to the principal objects above set forth. These and other objects are accomplished by my invention, one embodiment of which is hereinafter more particularly set forth.

For a more detailed description of my invention, reference is to be had to the accompanying drawings, forming a part hereof, in which

Figure 1 is a side elevation of a machine embodying my invention.

Figure 2 is a fragmentary sectional view showing the sheet registering mechanism, the first impression cylinder, a transfer cylinder and a second impression cylinder.

Figure 3 is an enlarged view of the mechanism for automatically establishing or breaking printing relations between the various printing elements of each couple.

Figure 4 is an enlarged view showing the continuation of this mechanism, Figure 4 being taken through to the left and higher than Figure 3.

Figure 5 is a sectional view showing the sheet registering mechanism with the sheet detector and gripper mechanism on the first impression cylinder in which the sheet detector has been positioned by the presence of a sheet to establish printing relations between the printing couples.

Figure 6 is a view through the same mechanism in which the sheet is missing and the mechanism, therefore, is positioned with a view to breaking the printing relations between the printing couples.

Figure 7 also represents the same mechanism in which the sheet registering guide is swung inward to permit the sheet to pass through the press.

Figures 8 and 9 are sectional views on the lines 8—8 and 9—9 of Figure 5, looking in the direction of the arrows.

Figure 10 is a sectional view, taken on the line 10—10 of Figure 3, looking in the direction of the arrows.

Figure 11 is a view of the gripper operating trundle cam.

Figure 12 is a view of the lug trip or latch relay mechanism by which the tripping of the second or succeeding printing units is delayed or timed with reference to the first printing unit.

Figure 13 is a sectional view taken on the line 13—13 of Figure 12.

Figure 14 is a detailed view of the delay tripping operating studs.

Figure 15 is a sectional view, taken on the line 15—15 of Figure 12, looking in the direction of the arrows.

Figure 16 is a sectional view, taken on the line 16—16 of Figure 3.

Figure 17 is a detailed view of the trip actuating boss, the section being taken on the line 17—17 of Figure 18 which shows the trip actuating boss and connections at each side.

Figure 18 is a detailed view of the trip actuating boss and connections at each side.

Figure 19 is a detailed view of the trip actuating boss and connections at each side.

Figure 20 is a detailed view of the trip actuating boss and connections at each side.

Figure 21 is a detailed view of the trip actuating boss and connections at each side.

Figure 22 is a detailed view of the trip actuating boss and connections at each side.

Figure 19 is a view showing the sliding journal box for a plate or form cylinder.

Figure 20 is a sectional view, taken on the line 20—20 of Figure 19, looking in the direction of the arrows.

Figure 21 is a fragmentary view showing the adjusting mechanism for adjusting the blanket and plate cylinders of each couple with reference to each other. A similar construction is used to adjust the relative positions of the blanket and impression cylinders.

Figure 22 is a side elevation of an upper portion of a printing couple showing a portion of the inking mechanism, the inking rollers being shown in functioning relation to the plate cylinder, and

Figure 23 shows these rollers tripped away from the plate cylinder.

Figure 24 is a detailed view showing the inking roller brackets.

Figure 25 is a view of the cam actuating mechanism for the front guides and detector mechanism.

Throughout the various views of the drawings, similar reference characters designate similar parts.

By referring to Figure 1, it will be seen that a printing press is shown with two couples connected by a transfer cylinder. It is obvious that it is a mere matter of duplication to increase the number of couples and transfer cylinders and no change whatsoever, except enlargement, will be required excepting that the delivery mechanism will be shifted to correspond so that it is unnecessary to describe in this case more than what is shown, it being understood that it is within the purview of my invention to use as many couples as desired.

My improved multi-color press 1 receives paper 2, of the conventional kind, which is in the form of sheets which have been cut to the requisite dimensions. This paper is fed to the machine by a suitable paper feeding mechanism, not shown, but connected at 3 in Figure 1, and is brought to the guiding mechanism 4 and from there passes to the first impression cylinder 5 where it is given one color from the blanket cylinder 6 and from the first impression cylinder 5 the paper passes to the transfer cylinder 7 which is larger than the impression cylinder 5 for the reasons above given and from there to the second impression cylinder 8 and in a similar manner, if there be more than two couples, is passed from impression cylinder to transfer cylinder until the last couple is reached, each secondary impression cylinder 8 having its blanket cylinder 9 corresponding to the blanket cylinder 6 and functioning in exactly the same manner. From the last impression cylinder 8 the sheet is delivered to the usual chain carrier or cylinder mechanism 10, in the conventional manner.

Each blanket cylinder 6 or 9 receives its design from a plate cylinder 11 which is supplied with water rollers 12 and ink rollers 13 which may be mounted in the conventional manner or in any other suitable manner, as desired. By means of mechanism described below the inking rollers 13 are always separated from their respective plate cylinders 11 when the plate cylinders become inoperative.

The printing couples and attendant mechanisms are mounted in the frame 14 of the machine. As will appear below, the paper carrying cylinders all have fixed bearings, that is the cylinders 5, 7 and 8, and the blanket cylinders and plate cylinders have movable bearings, as will appear below. These cylinders are always geared together, as usual.

The tripping mechanism

It is obvious that if the machine is to function properly, the paper fed to the machine must be set absolutely true before it enters the machine and if the paper does not set true or if no paper be fed, the printing couples should be rendered inoperative and the inking rollers should be separated from the plate cylinders.

The paper truing and machine tripping mechanism will now be described in detail. When the paper 2 is fed by and from the paper feed mechanism located at 3, the front edge of each sheet eventually arrives at the aligning and tripping mechanism 4, as indicated in Figure 5. Assuming that this paper comes true, as it normally does, its front edge comes against the registering plates 15, any suitable number of which may be employed, although I have found that two, one near each side of the machine, are sufficient. Each plate has a bottom recess 16 to receive the lower end of a bar which may be called a pendulum 17 which has ears 18 at each side that are perforated and pivoted on a suitable pin 19 let into the boss 20 which is mounted on an oscillating shaft 21 and held in fixed relation thereto by means of a set screw and key 22. The shaft 21 is mounted in adjustable bearings 23, one at each side of the machine, and a similar shaft 24 is also mounted in said bearings and runs parallel to the shaft 21. These shafts are oscillated together by means of a cam 25 fixed on a gear 26 which is fixed on the shaft 27 on which the cylinder 5 is mounted. The gear 26 is preferably placed at the side remote from the side shown in Figure 1. The cam 25 is an ordinary disc cam which is engaged by a suitable pintle or cam roller 28 carried by a lever 29 pivotally mounted on a suitable stud 30 which is secured to the frame 14 of the machine. The lever 29 has one rub surface 31 which actuates a lever 32 fixed to the shaft 21 and above this is a surface 33 carried on a projection 34 of the lever 29 which

engages a projecting finger 35 which is fixed to the shaft 24. The lever 29 also has a suitable stud 36 extending therefrom which carries a spring rod 37 which passes through a bracket 38 fixed to the frame 14 of the machine and the tension of the spring on the spring rod 37 holds the cam roller 28 on its cam 25. The cam 25 is shaped so as to raise the lever 29 at the proper time in the cycle of operations and the spring rod 37 lowers this lever, in the conventional manner. From this it appears that both the parts 33 and 35 may be held off the cam lever 29, or either of them may be held off if the functioning of the apparatus so requires. A spring rod 37a, similar to 37, keeps the arm 32 in place.

The boss 20 has a projection 39 which carries a guide 40, as indicated, which passes into the recess 16 and astride of the pendulum 17, as shown in Figures 8 and 9. This guide may be given any suitable shape and is preferably shaped, as shown in Figures 5, 6 and 7, and it may be held to the boss in any desired way, but is preferably held by a cap screw 41, as indicated. The function of this guide 40 is to bring the forward edge to the paper 2 against the stop 15, as above stated. When this paper strikes true the pendulum 17 is brought to the position shown in Figure 5. When the paper is fed true, the oscillation of the shaft 21 lets it by. When the paper is not fed or fed in an irregular way so as not to strike the stop 15, the upper end 42 of the pendulum 17 overbalances the lower end, as indicated in Figure 6, and then this end may engage the hook 43 at the lower end of the arm 44 which is fixed in a boss 45 that is held in fixed relation to the shaft 24 by means of a set screw 46 or any other suitable means. A set screw 47 holds the arm 44 in place. When the apparatus is functioning normally and the paper 2 is being fed in the normal manner whenever a front edge of a sheet 2 strikes the stop 15 and pendulum 17, the upper end 42 of the pendulum is carried free of the hook 43 so that the arm 44 can swing without interference and this permits the shaft 24 to turn without interference. This arm, as above set forth, is driven from the cam 25 in one direction and in the other direction it is driven by a coil spring 48 which has its lower end connected to an arm 49 fixed to the bearing 23 and its upper end engaging a crank 50 fixed to the shaft 24. The crank 50 is pivotally connected to a link 51 with a slotted lower end which has a movable pivotal connection with a lever 52 which is pivoted at 53 to a rigid pivot connected to the frame 14 of the machine. The lever 52 has its other end connected to a link 54 by a fixed pivot which runs to substantially the center of a pin 55 fixed in the frame 14 which pin carries a number of levers including a cam lever, as will appear below. The link 54 is connected

to an arm 56 by a pivotal connection and this arm is rigidly secured to a latch 57 adapted to take over a block 58 which is rigidly fixed to a cam lever 59. The latch 57 is pivotally mounted on a stud 60 which is fixed to a lever 61 with several branches. One of the branches carries the pivot 60 and runs to the stud pin 55. Another branch 62 extends towards the front of the machine and connects with mechanism for controlling the grippers on the first impression cylinder, as will appear below, and also the tripping mechanism, as will appear below also. Another branch 63 which extends from the arm 61 is connected by a link 64 to a timing mechanism, described below, which governs the action of the printing couple in a manner which will hereinafter appear, and yet another branch 65 initiates the operation of the tripping mechanism for the first couple. Power for operating this lever 61 is derived through the parts 57 and 58 when they bind together in a manner set forth below. If they do not so bind, the cam lever 59 rocks idle on the pivot 55. Power for actuating the cam lever 59 is derived through a pintle 66 which is carried at its free end, as shown in Figure 3, and this pintle runs in a suitable cam groove 67 in a cam 68 shaped, as shown in Figure 3, and fixedly mounted on the shaft 27. The rear face of the cam 68, looking at Figure 3, is provided with another cam groove indicated in dotted lines and this actuates a cam lever which will be described below.

When paper 2 is fed normally and the apparatus functions, as usual, the arm 50 will rise and fall being raised by the cam action and lowered by the spring action of the spring 48. The loose pivot at the lower end of the link 51 permits the unrestricted movement of this arm according to the cam and spring. When, however, no paper appears properly at the stop 15 at the right time, the pendulum 17 is overbalanced, as shown in Figure 6, and then the arm 44 finds a stop which limits the oscillation of the shaft 24 and this gives a corresponding limitation to the movement of arm 50 and connected parts, including the links 51 and 54 and then the latch 57 is not swung clear of the blocks 58 so that this latch engages the blocks and then the cam lever 59 is locked to the lever 61 and the two move clockwise as a unit under the influence of the cam 68. When this occurs the tripping mechanism is actuated in a manner which will be described below.

When the cam levers 59 and 61 engage, as above set forth, they also engage through projections 69 and 70, as shown in Figure 3.

The timing mechanism

As the mechanisms for moving the blanket and plate cylinders are substantially identical in each printing couple, a description of

them will be given below and here will appear a description of the means for producing successive action beginning with the first couple and so on through the remaining couples.

The link 64 runs to a lever 71 to which it is pivotally connected and which is fulcrumed on a pin 72 fixed in a plate 73 which is offset from the frame 14 and held by bolts 74, as indicated in Figures 12 and 13. The lever 71 is shifted in one direction through the upward pull of the link 64 and against the tension of the spring rod 75 which has one end pivotally connected at 76 with the lever 71 and the other passes through a suitable bracket or guide 77 which is fixed to the plate 73 by means of suitable bolts. The end of the lever 71 which is remote from the link 64 is provided with a pin 78 with a conical head 79 (see Figure 13) which is adjustably mounted, as indicated, and firmly held so that it may engage either the inner pins 80 or the outer pins 81 which are carried in the boss 82 which is fixedly mounted on the shaft 83 of the transfer cylinder 7. It will be noted that the boss 82 carries two sets of pins 80 and 81 and they are diametrically opposite. This is because the transfer cylinder 7 has twice the number of gripper units of the impression cylinders 5 and 8. If the number of gripper units of the transfer cylinder 7 were three times the number on the cylinder 5, it would be necessary to have three such sets of pins, symmetrically placed. From this it is apparent that the number of sets of pins 80 and 81 will vary to correspond with the number of gripper units of the cylinder 7 as compared with the cylinder 5. The boss 82 and connected parts constitute a positively, driven timing mechanism which must keep step with the transfer cylinder because it is fixed to the axle 83 thereof by a key, as shown in Figure 13.

It is also apparent that as the cylinders 5, 7 and 8 are geared together they always rotate together and the gear ratio is such that the cylinder 7 has half the angular velocity of the other two cylinders and the pins 80 and 81 pass the heads 79 twice in each revolution of the cylinder 7 and once for each revolution of the cylinders 5 and 8. In Figure 12 the pins 80 and 81 are shown in dotted lines. Assuming that the direction of movement of the pins is as indicated by the arrows and assuming that the link 64 exerts an upward pull on the lever 71, the spring rod 75 is shifted to compress its spring and the lever 71 is brought to the position shown in Figure 12 with the pin 78 placed so as to have its head 79 in the path of the pins 80. Nothing can happen after this to the pins until one of them strikes the head 79, and as soon as this occurs, such a pin is driven inwardly, as indicated in Figure 13. The pins 80 and 81 in each set are connected by a see-

saw lever 84 pivoted at 85 in the boss 82 and this lever 84 has a loose pivotal connection with the pins at each end so as not to interfere with their rectilinear movement. Assuming the pins 80 to be placed inwardly, as above indicated, it is apparent that the pins 81 will project from the boss, as shown in Figure 13, and then as the revolution of the boss continues, a pin 81 will strike the outside of a cam 86 fixed to a segmental gear 87 which is pivoted at 88 on the plate 73, as shown, and this plate is given an enlarged slot through which this cam 86 projects and in which it moves. As long as these pins 81 strike the outside of this cam 86, the segmental gear 87 remains in the position shown in Figure 12. Thereafter, its lever mechanism functions when the pintle 66 is shifted from the center of the shaft 27 and then the link 64 receives a downward thrust and then acting with the compression rod 75 the lever 77 is shifted so that the pin 78 with its head 79 is in the path of the pins 81 and immediately thereafter these pins 81 are thrust in and the pins 80 are thrust out. When the pins 80, which have been thrust out reach the inside of the cam 86, the first one so reaching will shift this cam to the left in Figure 12 and thereby shift the gear 87. The shifting of the gear 87 causes the segmental pinion 89 of the cam 90 to shift, these two parts being held in fixed relation although adjustably mounted, one with regard to the other, through a slot and bolt connection 91, as indicated. The cam 90 and segmental pinion 89 turn on a stud shaft 92 fixed in the plate 73 and are then turned, as indicated by the arrow, so that the recess 93 of the cam 90 permits a pintle 94 on a lever 95 to swing to the right in an anti-clockwise direction and thereby the lever 95, which is fulcrumed at 96, permits the shifting of a second lever 97 in the same direction which occurs because of a means described below. These two levers 95 and 97 (see Figure 1) are both pivoted on the stud 96 and are connected by a spring 98, as indicated, and this shifting of the lever 97 shifts the link 99 which is pivoted thereto at its upper end and at the other end this link 99 is pivotally connected to a lever 100 which corresponds to the lever 101 which is engaged by the projection 65 of the lever 61. When the cam 90 has an anti-clockwise movement the link 99 is pulled to the right.

It is apparent from what has been said that the first shifting will occur through the lever 101 and thereafter when the pin mechanism 80—81 has functioned, the lever 100 will be shifted and on return of the operation of the apparatus to normal, as will appear below, the lever 101 is shifted first and thereafter after another functioning of the pin mechanism 80—81, the lever 100 will be shifted. This is because it is essential that when the machine operates automatically and the

paper fails to feed properly the cylinders 6 and 11 should immediately be put out of action after the paper in process between the cylinder 6 and the cylinder 5 has been printed and the second couple should continue to function until this sheet has been printed by it and so on through all the couples, each one going out of operation when the last sheet passes through it and when again a new sheet starts through and the apparatus is restored to normal the first couple should go into operation and thereafter the succeeding couples in time to be properly functioning when the sheet passes through them. The timing of the operation of the couples, as above set forth, provides for just this. When more than two printing couples are employed, the relay mechanism for the third couple is actuated from the lever 95 and in a similar manner, subsequent couples are actuated.

The cylinder shifting mechanism

The cylinder shifting mechanism which is timed to function, as above set forth, will now be described, and as the apparatus is almost identical for each couple, one description will answer for all with a few special descriptions incidental to particular parts.

As above set forth, the cylinder 5 has a shaft 27 and a cam 68 and on the rear side of the cam 68 is another cam shown in dotted lines in Figures 1 and 3. It is necessary for the cam 68 to have two faces, one for the lever 59 and one for a lever which will be set forth below. The impression cylinder 8 has a shaft 102 and this has a cam 103 fixed thereon which is identical with the inner part of the cam 68. Both of these cams engage suitable pintles on bent levers 104 from which power is derived for shifting the cylinders. These levers are fulcrumed on studs 105 which are fixed to the frame 14 of the machine and the lower ends of these levers are pivotally connected to links 106 which in turn are pivotally connected to cranks 107 pivotally connected to rocking levers 108 which are pivoted at 109 to the frame 14 of the machine.

It is clear that as the bent levers 104 are continually rocked by their respective cams, a corresponding motion is imparted to the see-saw levers 108 so that the links 110 and 111 which rise at the opposite ends of these arms or levers 108 continually rise and fall, one rising while the other is falling. Normally these links 110 and 111 are kept in inoperative positions by spring pressed rods 112 and 113 which function in the usual manner and extend from brackets 114 fixed to the frame 14 of the machine. The upper ends of these links 110 and 111, when viewed as shown in Figure 1, at the second couple, are swung to the right where they normally remain, but as will appear below, these upper ends may be swung towards the left so as to have an operative connection with the cylin-

der shifting mechanism, as shown at the first couple as will appear below. For each couple there are two pivots 115 and 116 which come from the frame 14 of the machine and run laterally therefrom. The pivot 115 carries a manually controlled cam lever which will be described below. Each pin 116 carries a number of levers. The lever for the second and following printing couples have been referred to above as lever 100. The lever for the first couple is different in detail and is designated by the character 101. Both levers have a tang or cam extension 118 adapted to be engaged by the manually controlled cam lever above mentioned. The lever 101 has another extension 119 adapted to be engaged by another manually controlled mechanism mentioned below. This lever 101 has a portion 120 which is adapted to be engaged by the projection 65 of the lever 61 so as to shift the lever 101 in an anti-clockwise direction when the lever 61 has a clockwise movement about its pivot 55 which is imparted, as described above. A corresponding movement is given to the lever 100 through the link 99 which is pivotally connected to this lever, as described above. Power is transmitted in either case so as to give the lever 100 or the lever 101 an anti-clockwise movement and when this occurs the spring rod 121 which is pivotally connected to the tops of each of these levers imparts a similar movement to the rod 110 through a suitable loose pivot 122 and this movement is sufficiently strong to overcome the tension of the spring rod 112 and thereby shift the rod 110 so that its left shoulder 123 is under the pin 124 of the lever 125 that is fixed to a shaft 126 and turns with it so as to operate its toggle 127 which is at each end, as shown in Figure 18. Immediately after getting under the pin 124 the shoulder 123 must raise the same because of the oscillation of the lever 108, as indicated for the first couple in Figure 1 wherein the raising has been shown as completed.

This raising of the rod 110 is accompanied by a lowering of the corresponding rod 111, as is obvious. The downward movement of the lever 125 gives a thrust to the spring rod 128 pivotally connected thereto and this thrust is imparted to a sleeve 129 through which this rod passes and against which its spring impinges, whereby a lever 130 which is pivoted on the stud 116 close to the lever 101 is shifted and this lever, at its upper end, carries a link 131 which is pivotally connected thereto and has a pin and slot connection with the rod 111 so as to throw the upper end of the same to the left, as indicated in Figure 1. This rod 111 has a shoulder 132 corresponding to the shoulder 123 which takes under a pin 133 in a lever 134 oscillating on a shaft 135 corresponding to the shaft 126 and provided with a toggle 136 at each end precisely similar to the toggle 127.

The toggle 127 is connected to a crank 137 and the toggle 136 is connected to a crank 138. These cranks run to eccentric shafts (see Figures 19, 20 and 21) 139 which turn in suitable bearings 140 set in the frame 14 of the machine and the shafts 139 are provided with integral eccentrics 141 working in suitable slides 142, in the conventional manner, and these slides engage projections 143 extending from the bearings 144. In Figures 19 and 20 are shown the bearings for the plate cylinders 11 which slide between the vertical guides 145 which are vertically disposed and the shaft of a cylinder 11 is shown in Figure 19 and designated 146. The bearing 144 carries the lower extension 143 and this is mounted on a spring cap 147 through a screw connection 148 and the cap rests on a suitable coil spring 149 carried in a suitable recess 150 of the machine frame 14. When the eccentric 141 is given an anti-clockwise movement it is obvious that the shaft 146 and bearing 144 are elevated in each instance and when the shaft 141 is given a clockwise movement the bearing and shaft are lowered against the tension of the spring 149 which acts as a balancing medium in the conventional way. When the toggle 136 is broken the crank 138 is given an anti-clockwise movement and so an elevating influence is exerted on the bearing 144, as is obvious, so that in cooperation with the spring 150 there is a lifting effect. When the toggle is straightened there is a corresponding clockwise movement which brings the cylinder 11 and its connected parts into the lower position. In a similar manner, the breaking of the toggle 127 will throw the eccentric 141 in an anti-clockwise direction and this will cause the corresponding bearing block 144 for the shaft 151 to move to the left when viewed as shown in Figure 2, and a corresponding clockwise movement causes a shifting to the right. This shifting is against the tension of a coil spring 152 let into a suitable recess and adjusted by means of a screw plug 153. As a blanket cylinder is carried by this shaft 151, it is obvious that this blanket cylinder is shifted from the impression cylinder 5, in the manner described above, through the action of the toggle 127 with which it is connected.

From the foregoing, it is apparent that the toggle 127 is first broken through the elevating of the rod 110 and thereafter the toggle 136 is broken through the elevation of the rod 111. Thereafter these toggles will remain broken because both the rods 110 and 111 have their tops shifted to the left and they move the pins out of their respective shoulders to the upper limits. When the paper is again feeding regularly so that the latch 57 disengages the block 58, and the projection 65 is free of the lever 101, the tension of the spring rods 112 and 113 is sufficient to throw the rods 110 and 111 over to the right so that

their tops are in a position to engage their respective pins. The pin on the lever 125 is designated 154 and the rod 111 engages the corresponding pin 155 on the lever 134 and then the rod 110 is shifted first to raise this pin 154 and thereby restore the apparatus to normal by making the toggle 127 and after this has been completed, the rod 111 which has meanwhile been lowered is brought against its pin 155 and elevates the same so as to straighten the toggle 136. This straightening of the toggles 127 and 136 restores the plate and blanket cylinders to proper printing relation. The operation for the first couple is exactly as above set forth. For the second couple it is the same except that instead of having the movement initiated directly from the extension 65 of the lever 61 it is initiated indirectly through the latch relay mechanism and so is delayed according to the timing of the machine so that the second printing couple will be ready for the first paper delivered by the first printing couple and so on through all the couples that may be employed in the machine. It is obvious that on the plate cylinders 11 and the blanket cylinders 6 and 9 there are places where no printing is done and the mechanism is so geared and timed that when the plate and blanket cylinders separate or come together, as above described, they always come together on the vacant spaces so that the printing is never interrupted while in process, but only between printing operations do the interruptions occur.

Any suitable mechanism may be used for separating the inking rollers from the plate cylinders 11 and this mechanism is driven by links 156 pivotally connected to the cranks 138 or they may be operated in any other suitable manner. If operated by the links 156, as shown, the connections are as follows: The link 156 is pivotally connected to a crank arm 157 which is fixed to a shaft 158 that runs transversely of the machine and is suitably mounted in bearings 159 fixed to the axle boxes 144 so as to rise or fall with them. The crank arm 157 has several parts, one a hand lever 160 for manual operation and a toggle disc 161 which at its lower end has stops 162 adapted to engage portions of the brackets or bearings 159, whereby its oscillation is limited and at its upper end it has pivotal connection at 163 with links 164 which are pivotally connected to the ink roller brackets 165 which are pivotally connected to a pin 166 which pin is also carried by the bracket 159 so that whenever the link 156 is given a downward pull, the shaft 158 has a clockwise movement and whenever this occurs the printing rollers are lifted from the plate cylinder 11 to which they are connected. They are shown resting on this plate cylinder in Figure 22 and lifted off of it in Figure 23. Whenever the link 156 has a con-

trary movement the link lowers the rollers until they get into a working engagement with the plate cylinder 11, as shown in Figure 22.

In the particular embodiment of my invention herein shown and described, a micrometer adjustment is placed in the cranks 137 and 138 as follows: Each shaft 139 has a worm gear 167 fixed thereon and this gear is engaged by a worm 168, as shown in Figure 21, which worm is mounted at its lower end in a crank, say the crank 138, as shown in Figure 21, and at its upper end in a bushing 169 which is also let into this crank, as indicated. The top 170 of this worm has a prismatic outline and resembles a hexagonal nut in appearance so that by applying a wrench it is easy to turn the worm. To facilitate holding the parts in place, one end of each shaft 139 is screw threaded to receive a bolt 171 which passes through a washer at 172 which washer is made very strong and sturdy so that when the bolt 171 is screwed tight, the washer is firmly held against its crank. There are markings on this washer and on this crank, as indicated at 173 so that it is possible to have an exact micrometer adjustment through the use of the worm 168 after loosening the bolt 171. Once the adjustment is had, the bolt 171 is tightened so that the parts are held firmly in right relation and the adjustment when once made, is maintained. This adjustment is important because it allows the relation of the cylinders to be adjusted for variations in paper thickness, printing plates and it also allows the pressure to be varied at the will of the operator.

The gripper mechanism

All the grippers used on the impression and transfer cylinders are of the conventional kind with an exception to be mentioned below. It is obvious that these grippers perform the ordinary gripping function during the normal operation of the press and so with the exception noted below any suitable and conventional grippers may be employed. However, it is also obvious that no paper can be fed through the machine if the grippers on the first impression cylinder fail to work and so all that is necessary to prevent feeding, after a sheet of paper leaves the first impression cylinder, is to render the grippers inoperative on the first impression cylinder and all that is necessary to start paper passing through the press again is to start the grippers in operation on the first impression cylinder, assuming that the press is otherwise functioning normally.

The attachment for governing the action of the grippers on the first impression cylinder will now be described.

The impression and transfer cylinders carry the grippers 174 of the conventional kind which are operated with the exception of

the first impression cylinder grippers by suitable cams 175, in the conventional manner, the parts being set so that these grippers open and close as usual. As many of these grippers are employed as required and they are mounted in their respective cylinders on suitable shafts 176 in the conventional way. The structure with regard to the cylinder 5 is the same as above set forth except that the cams are changed for a means which may be controlled which will provide for the opening and the closing of the grippers. This means consists of a crank 177 fixed to the crank shaft 176 which crank is pressed in one direction by the spring controlled tension rod 178 which has one end pivotally connected to the crank 177 and its other end passing through a guide 179 which is fixed to the cylinder 5.

The spring rod is actuated with and against an enclosing coil spring 180 which has one end resting against the pivot bearing 179 and the other against a collar 181. It is obvious from the foregoing that the crank 177 and the spring rod 178 when taken in connection with their pivots form a toggle and that when the crank is in one position it will remain so under the influence of the rod 178 and when in the other position it will remain so under this rod and as the grippers are connected to this crank through the shaft 176 it is equally obvious that the grippers will remain open or closed according to the means used to shift the crank to one position or the other. This means is found in spring pressed bolts mounted in or from the frame 14 of the machine. The opening bolt is designated 182 and the closing bolt 183. These bolts normally project in the path of movement of the crank 177 which is provided with two pin receiving grooves 184 and 185, the groove 184 being shaped so as to receive the opening pin 182 and the groove 185, in a corresponding manner, receives the closing pin 183. The means for withdrawing these pins against the tension of their respective springs 186 will now be described, it being assumed that these springs are mounted, as shown in Figure 10, or in substantially this manner. Each bolt 182 and 183 has a head 187 which is engaged by a pin 188 on a bell crank lever 189. The lower bell crank lever 189 is fulcrumed at 190 on a pin extending from a bracket 191 and the upper bell crank 189 is similarly pivoted on a suitable pin 192 extending from a suitable bracket 193. The free arms 194 of the bell crank levers 189 are engaged by a suitably bent link 195 which is pivotally connected at 196 to the arm 62 of the lever 61, above described. A suitable guide 197 directs the lower end of the link 195 so that it always and in a suitable manner cooperates with the bell crank arm 194 to which it is connected. When the link 195 is in its upper position the arms 194 are not pressed and then the bolts 182 and

183 remain in their projecting positions shown in Figure 10. When the link 195 is lowered the arms 194 are depressed and then the bell crank levers 189 function so as to withdraw both the opening pin 182 and the closing pin 183 and these pins then remain in the withdrawn position until the link 195 is raised through a subsequent action of the controlling mechanism which is exerted through the pivot 196. A pivoted arm 198 is pivoted at one end from the frame 14 of the machine and at the other to the link 195 and this functions so as to cause the link 195 to rise and fall with a substantially parallel movement.

From the foregoing it is apparent that when the tripping mechanism above described is actuated so as to shift the lever 61 its arm 62 is depressed at its extreme end and thereby lowers the link 195 and causes the pins 182 and 183 to be withdrawn and this withdrawing is timed to take place after the release of a sheet and before a new one can be gripped and also when the pins 182 and 183 are restored to the normal, projecting position, they are restored so that the first pin to be engaged by the crank 177 is the pin 183 so that these grippers may properly secure any sheet of paper fed to the apparatus. It is also apparent that these pins will be restored upon the elevating of the arm 62 of the lever 61 and this occurs through the upward thrust of the link 64 under the influence of the spring rod 75.

33 *The tripping mechanism*

The tripping mechanism is found in three forms in this machine, one for stopping the machine successively and automatically, as above described, when controlled by the paper feed, one for tripping either printing element without disturbing the operation of the other or others and one for throwing the entire machine out of operation. The two latter will now be described, beginning with the former.

The manually controlled tripping mechanism for throwing one printing couple out of action

The frame 14 of the machine, adjacent each printing couple, carries a horizontally disposed lever 199 pivoted at 200 from the frame 14. This lever has a handle 201 by which it may be manipulated and this handle passes over a segment 202 which is fixed to the frame 14 of the machine and is adapted to hold its lever 199 in its intermediate position. As will now appear, each lever is connected so as to throw the plate and blanket cylinders of its couple out of printing operation into a mid position, so that the machine may be used without operating the couple, or into the upper position of the handle 201 which is the inoperative position in

which the functioning of the apparatus is not distributed and into the position where the handle 201 is lowest and where the plate and blanket cylinders are brought together while the blanket cylinder is separated from the impression cylinder so that the blanket cylinder may get a preparatory coat of ink and be ready to function. When the machine is started and after all the couples are revolving and while the blanket cylinders are off their respective impression cylinders, the lever 199 is shifted so that the handle 201 is depressed to the lowest position for the purpose just described above and as soon as the blanket cylinder is properly prepared to function this lever is put with the handle 201 in the most elevated position and thereafter the apparatus passes from manual to automatic control.

The end of each lever 199 which is remote from the handle 201 is connected to a link 203 and these links are connected to their respective levers 204 mounted on the studs 115. Where there are more than two printing couples the subsequent ones are identical with the second printing couple herein described, as is obvious. The lever 204 had two cam lobes, one 205 which functions with the projection 118 and one 206 which functions with a projection 207 on the lever 130 so as to force this lever to have a clockwise movement. The cams are so timed and placed that when the link 203 is elevated first the lobe 205 becomes active to depress the cam 118 and throw the lever 100 or 101 and thereby shift the rod 110 to the left, as above specified, so as to cause its shoulder 123 to elevate the pin 124 and thereby withdraw a blanket cylinder from operation and thereafter the plate cylinder and inking rollers are withdrawn, as described above. If the upward movement of the rod 203 be further continued, as it is when the handle 201 is put in its lowest position, the cam lobe 206 comes into operation and forces the end 207 of the lever 130 into a clockwise movement which will cause the link 131 to be withdrawn to the right and thereby permit its rod 111 to have its upper end shifted to the right by its tension rod 113 thereby causing the pin 155 to be elevated with a making of the toggle 136 and this occurs while the pin 124 is elevated with a broken toggle 127 with the result that the blanket cylinder receives ink from the plate cylinder in the manner described above and will continue to receive it as long as the handle 201 is depressed. Once the inking has been completed the handle 201 is raised to its topmost position and thereafter the blanket cylinder is ready to function and does function to print as soon as paper is fed into the machine in the manner described above.

The complete tripping mechanism for tripping all printing elements simultaneously

Above has been set forth mechanisms by which certain tension rods 121 connect to
5 levers 100 and 101 have functioned to give a thrust to the left when viewed, as shown in Figure 1, and thereby throw the rods 110 into a functioning position so that they will cause a separation of the plate and blanket
10 cylinders of the various couples. It is obvious that if these tension rods 121 be actuated simultaneously the printing couples will be actuated simultaneously and thrown out of printing operation simultaneously.
15 This is done through a series of links, bell crank levers, rods and manual controls, as will now appear.

Beginning with the lever 100 and tracing through it appears that this lever is connected to the rod 99, as above described, and this in turn to the lever 97 pivoted at 96 and from it extends an arm 208 which is connected to a rod 209 connected to a rocking
20 lever 210 pivoted at 211 to the frame 14 of the machine and this rocking lever 210 has two other arms, one of which is pivotally connected to a rod 212 which runs through a suitable guide 213 to a handle 214 by means of which it may be pressed and so lowered
25 and another arm is connected to links 215 and 216. The link 215 runs to the rear of the machine where it is connected with manual control means at any desired point, in an obvious manner, and the link 216 runs
30 towards the front of the machine where it is connected to a bell crank lever 217 pivoted at 218 to a part of the frame 14 of the machine. One arm of the bell crank lever 217 is connected by a rod 219 which passes
35 through a suitable guide 220 where it can engage with the shoulder 119 of the lever 101.

From this it is apparent that by depressing the handle or treadle 214 the rocking lever 210 is shifted so that both the levers
40 100 and 101 are shifted so as to simultaneously shift the rods 110, as above explained, and thereby simultaneously throw out of operation the printing couples, as above set forth. It is not sufficient to throw the couples out of operation. The paper feed mechanism must also be thrown out of operation. Mechanism for doing this will also be set forth.

The bell crank lever 217 is connected to a link 221 which runs to a rocking lever 222 pivoted at the extreme front of the machine and to the frame 14 and this rocking lever has two arms, one connected to a rod 223
50 which is surmounted by a treadle or handle 224, as shown in Figure 1, and the other is connected to a tension rod 225 that runs through a guide 226. A lever 227 which has one arm 228 immediately under the extreme
55 end of the arm 62 of the lever 61 and another

arm extending downwardly at 229 to the electrical control box 230 which controls the flow of electricity to the motors which run the machine, which motors and connections are not shown, as they are the conventional
70 ones and need no description here. Another arm of the lever 227 is engaged by the rod 225 and yet a fourth arm 231 is connected to a rod 232 which extends beyond the front of the machine to control the paper feed and
75 shut off the same when the lever 227 is rocked, as above described. This lever 227 is pivoted at any suitable place as the pivot 233 to the frame of the machine and this pivot may also carry a handle 234 which has provision for lost motion and a spring 235 with which it is
80 connected to the lever 227.

From the foregoing it is apparent that whenever the handle 231, the pedal 224 or the pedal 214 is manually shifted all the
85 tripping mechanisms are simultaneously shifted and all couples simultaneously go out of printing relation.

The feeder control rod 232, carries two collars 239 spaced to admit a spring pin 240
90 between them. This spring pin 240 is carried in a lever 241 fulcrumed at 242 and having a cam face 243 arranged to engage with pintle 244 of a crank arm 245 secured to cross shaft 246 which is supported in
95 frames 3 and carries a series of fingers 247 resting normally, when press is in printing operation, below the sheet path but adapted to rise above the path of said sheet when the rod 232 is shifted to the left and engage a
100 series of flexible fingers 248 carried on a rod 249 in frames 3 for the purpose of arresting the movement of the sheet when the press is tripped.

Operation

In view of the foregoing, the operation of this press will be readily understood. Assuming the parts to be, as above set forth, and that in addition there are convenient
110 platforms, one of which is the platform 236 between the first and second couples and it is to be understood that a similar platform is between all other couples and another is the platform 237 at the front of the machine
115 and yet another is the platform 238 at the rear of the machine. As is well known when the machine is shut down it is necessary to cover the printing plates with a protecting substance or gum, such as gum arabic and
120 water and before the press is started this solution must be removed by a suitable solvent such as a weak acid. Both the solvent and the protecting medium are generally applied in the usual manner, as by a sponge,
125 although this may be varied as desired. The platforms 238 and 236 give ample space for an attendant to get on, and work from, and press starting and stopping mechanism controlling the drive from the motor, by means
130

of which move the cylinders a few inches in the conventional manner, is conveniently placed on the frame 14, not shown, as such forms no part of the invention of this application. This mechanism is operated enough to get the blanket and plate cylinders so that proper surfaces are exposed from time to time, as desired, for the placing or removal of the protecting medium. Once the protecting medium has been removed, the apparatus is ready to function and should function or the printing plates will be injured if not ruined. The first thing to do after getting the plate and blanket cylinders in condition for use is to start the machine and bring the dampening rollers 12 into functioning position, in the conventional way, drop the inking rollers into inking relation with the plate through the handle 160 and put impressions on the blanket cylinders preparatory to printing and by shifting the levers 199, as above described, so that the handles will pass to the lowest positions and then to the highest, as shown. The paper comes from the mechanism in the space 3 and finally reaches the stop 15 where it remains an instant. Under normal conditions this sheet will strike the stops 15 absolutely true and assuming that it does, the open grippers 174 of the cylinder 5 are shifted from the open position shown in Figure 6 to the closed position shown in Figure 5 and thereby caused to grip the paper 2 and carry the same with the cylinder 5 under the blanket cylinder 6 which by this time, through the mechanism above described is brought into printing contact with the paper so that the paper receives its impression. This presence of the paper causes the motor to assume full speed. This is done through the control box 230. At the proper time the paper is transferred from the impression cylinder 5 to the transfer cylinder 7 and in a similar manner after passing through a large angle, substantially 270 degrees, this paper is deposited on the second impression cylinder 8 and the apparatus is so timed by the relay mechanism and other connected parts, as above described, so that this paper will thereafter pass in due season under the second blanket cylinder 8 and have its second printing and from there this paper is passed out through the stacking mechanism connected to the cylinder 10, in the conventional manner. As neither the paper feeding device nor the paper stacking device form a part of the invention involved in this case no description of either is necessary as both are well known. Furthermore, any suitable devices of this character may be employed.

The printing so inaugurated will continue indefinitely as long as sheets of paper appear in due course at the stops 15. It is apparent that the oscillation of the rod 21 keeps these stops 15 in a vertical position only

long enough for the paper to be aligned and not long enough to interfere with this movement so that these stops are swung to the left in Figure 5 as the paper passes under. If no paper passes there is nothing to bring the lower end of the pendulum 17 into proper alignment with the bottom of the vertical stop 15 so that the upper end 42 of this pendulum overbalances it and makes engagement with the end 43 of the arm 44 so that the oscillation of the shaft 24 is restricted, as above described, and thereby is inaugurated the train of movements through the levers and links beginning with the link 50 and throughout the printing couples so that the blanket cylinder 6 and the first plate cylinder 11 are both shifted, one after the other, so as to be out of printing relation, the blanket cylinder being out of printing relation both with the impression cylinder 5 and the plate cylinder 11 and, of course, when this occurs, as above described, the inking rollers 13 are removed from contact with the plate cylinder, and if desired, mechanism may be supplied for removing the water rolls 12 from the plate cylinders 11. As above set forth, power is derived for shifting these cylinders from cams on the shafts 27 and 102 of the impression cylinders 5 and 8 and the control for the second or subsequent couples after the first is exerted through the latch relay connected with the disc 73. The motor control exerted through the box 230 slows the machine down. When a sheet again appears properly at the stops 15 so that the pendulums 17 are properly placed through the mechanism above described, the functioning of the apparatus is restored to normal and thereafter the press continues until its cycle of operation is completed either through the passing of the last sheet or through one or more of the manual controls, above mentioned. At the completion of this functioning the machine is shut down and the plate cylinders cleaned and protected, as above indicated. Paper is checked or released through the fingers 247 and 248.

Advantages

It is apparent that the structure above set forth provides ample facilities for cleaning and repairing and that as many couples may be employed as desired through a mere duplication of what is shown and described. Further advantages are the certainty of operation, the strength and durability of all parts and the simplicity of positive action throughout the entire functioning of the machine. The machine is easily operated at all times and easily adjusted for different conditions of service.

Having thus described my invention, what I claim is:

1. In a multi-color press, a plurality of

printing couples each having gripper means and independent, normally inoperative means for separating the couples, a normally disconnected latch relay mechanism positively controlled and simultaneously actuated by the tripping movement of one of said couple separating means for placing in operative position, at a predetermined point in the cycle, another of said separating means, and a transfer cylinder of greater number of gripper units than any cylinder in a couple.

2. In a multi-color press, a plurality of printing couples each having independent, normally inoperative means for separating the couple, a normally disconnected latch relay mechanism positively controlled and simultaneously actuated by the tripping movement of one of said couple separating means for placing in operative position, at a predetermined point in the cycle, another of said separating means, and a transfer cylinder having a diameter which is a multiple of the diameter of a cylinder of a couple.

3. In a multi-color press, a plurality of printing couples each having independent normally inoperative means for separating the couple and a normally disconnected latch relay mechanism positively controlled and simultaneously actuated by the tripping movement of one of said couple separating means for placing in operative position, at a predetermined point in the cycle, another of said separating means and a transfer cylinder of sufficient diameter to enable each of the couples to be symmetrically placed.

4. In a multi-color press, a plurality of printing couples each of which is vertically disposed and each having independent normally inoperative means for separating the couple and a normally disconnected latch relay mechanism positively controlled and simultaneously actuated by the tripping movement of one of said couple separating means for placing in operative position, at a predetermined point in the cycle, another of said separating means.

5. In a multi-color press, a plurality of printing couples each of which is vertically disposed and a transfer cylinder of greater diameter than any cylinder in a couple for transferring a sheet from the grippers of one couple to the grippers of another the transfer cylinder rotating at the same peripheral speed as the cylinders of each couple.

6. In a multi-color press, a plurality of printing couples each having a plate cylinder, a blanket cylinder and an impression cylinder, all of said cylinders being of the same diameter and a transfer cylinder of larger diameter between a pair of impression cylinders.

7. In a multi-color press, a plurality of printing couples each having a plate cylinder and an impression cylinder and a trans-

fer cylinder of a multiplate diameter of the impression cylinders between a pair of impression cylinders.

8. In a multi-color press, a plurality of printing couples, each couple having plate and blanket cylinders, one immediately above the other, and an impression cylinder below each blanket cylinder and a transfer cylinder of greater diameter than the impression cylinders for transferring paper from one impression cylinder to another.

9. In a multi-color press, a plurality of printing couples, a transfer cylinder of larger diameter than the cylinders of the couples, each couple being placed symmetrically with regard to the transfer cylinder between adjacent couples, the transfer cylinder rotating at the same peripheral speed as the cylinders of each couple for the purpose of transferring a sheet from the grippers of one couple to the grippers of the following couple.

10. In a multi-color press, a plurality of printing couples, each having a plate cylinder, a blanket cylinder and an impression cylinder, a transfer cylinder between and connecting the impression cylinders of a pair of couples and fixed bearings for the impression cylinders and the transfer cylinders so that these cylinders rotate in fixed relation to each other.

11. In a multi-color press, a plurality of printing couples, each couple being composed of a plate cylinder, a blanket cylinder and an impression cylinder, a transfer cylinder of multiple diameter as compared with an impression cylinder connecting the impression cylinders of adjacent couples, means for moving the blanket cylinders in one direction and thereafter moving the plate cylinders in another direction.

12. In a multi-color press, a printing couple composed of a plate cylinder, a blanket cylinder and an impression cylinder, fixed bearings for the impression cylinder, movable bearings for the blanket cylinder so that it may move in one direction, movable bearings for the plate cylinder so that it may move at right angles to the direction of movement of the blanket cylinder and means for actuating the blanket and plate cylinders successively.

13. In a multi-color press, a plurality of printing couples, each couple having a plate cylinder, a blanket cylinder and an impression cylinder, a transfer cylinder connecting the impression cylinders of adjacent couples and in each couple, means for moving each blanket cylinder in one direction and the plate cylinder at right angles to the direction of movement of the blanket cylinder.

14. In a multi-color press, a plurality of printing couples, each couple having a plate cylinder, a blanket cylinder and an impression cylinder, a transfer cylinder connecting the impression cylinders of adjacent couples and in each couple means for successively

moving each blanket cylinder in one direction and the plate cylinder at right angles to the direction of movement of the blanket cylinder.

15 15. In a multi-color press, a printing couple composed of a plate cylinder, a blanket cylinder and an impression cylinder, movable bearings to permit the blanket cylinder to move away from the impression cylinder in
20 one direction, movable bearings for permitting the plate cylinder to move away from the blanket cylinder at right angles to the direction of movement of the blanket cylinder and means for separating these cylinders
25 or for bringing them together with a successive operation so that the blanket cylinder will move first and the plate cylinder thereafter.

20 16. In a multi-color press, a printing couple having plate, blanket and impression cylinders, bearings movable in one direction for said blanket cylinder, bearings movable in another direction for said plate cylinder, means for moving the blanket and plate cylinders successively embodying in its construction
25 rods at the ends of a rocking lever and parts adapted to engage the rods and cause the functioning of the apparatus for shifting the blanket and plate cylinders respectively,
30 and means for shifting this lever so as to produce a requisite shifting of the plate and blanket cylinders.

35 17. In a multi-color press, a plurality of printing couples, each having independent normally inoperative means for separating the couple, and means positively controlled
40 and directly actuated by the tripping movement of one of said couple separating means for simultaneously positioning a part of an adjacent couple separating means for subsequent actuation at a predetermined point in the cycle and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the
45 next.

50 18. In a multi-color press, a plurality of printing couples each having independent normally inoperative means for separating the couple, and means positively controlled and directly and simultaneously actuated by the tripping movement of one of said couple separating means for simultaneously positioning a part of an adjacent couple separating means for subsequent actuation at a predetermined point in the cycle operable
55 through continued movement of the press, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

60 19. In a multi-color press, a plurality of printing couples, normally inoperative means for throwing off impression for the first couple, independent normally inoperative means for throwing off impression for another couple, timing means positively controlled and directly actuated by the tripping

movement of said first impression throw-off means for simultaneously positioning a part of said other impression throw-off means in operative position to be directly actuated in predetermined sequence by an element carried by said second couple actuated through continued movement of the press, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

20. In a multi-color press, a plurality of printing couples, each comprising a pair of rotary printing members, normally inoperative means for throwing off impression for the first couple, independent normally inoperative means for throwing off impression for another couple, and timing means comprising a latch relay mechanism positively controlled and directly actuated by the tripping movement of said first impression throw-off means for simultaneously positioning a part of said other impression throw-off means in operative position to be directly actuated in predetermined sequence by an element carried by one of the printing members of said second couple actuated through continued movement of the press, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

21. In a multi-color press, a plurality of printing couples, each comprising a pair of rotary printing members, normally inoperative means for throwing off impression for the first couple at a predetermined point in the cycle, independent normally inoperative means for throwing off impression for another couple, timing means comprising a latch relay mechanism positively controlled and directly actuated by the tripping movement of said first impression throw-off means for simultaneously positioning a part of said other impression throw-off means in operative position to be directly actuated in predetermined sequence in its cycle by an element carried by one of the printing members of said second couple actuated through continued movement of the press, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

22. In a multi-color press, a plurality of printing couples, independent normally inoperative means for throwing off impression in each couple, means for actuating said throw-off means in one couple, a normally disconnected timing mechanism positively controlled and simultaneously operated by the tripping movement of said last mentioned means for simultaneously positioning a part of the impression throw-off means of the next couple, means carried by said next couple for thereafter actuating its throw-off means, all of said throw-offs being normally disconnected

ed but sequentially operable through the continued movement of the press, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

23. In a multi-color press, a plurality of printing couples, independent normally inoperative means for throwing off impression in each couple means for actuating said throw-off means in one couple, a normally disconnected timing mechanism comprising a latch relay mechanism positively controlled and simultaneously operated by the tripping movement of said last mentioned means for simultaneously positioning a part of the impression throw-off means of the next couple, means carried by said next couple for thereafter actuating its throw-off means, all of said throw-offs being normally disconnected but sequentially operable at variably predetermined points in each cycle through the continued movement of the press, and the transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

24. In a multi-color offset press comprising two printing units each composed of a form cylinder, a blanket cylinder and an impression cylinder, separate normally inoperative means for separating the blanket cylinder from both form and impression cylinders in each unit, a timing mechanism, positively controlled and simultaneously actuated by the direct movement of the separating means in the first unit to simultaneously place a part of the then normally inoperative separating means in the second unit in operative position, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

25. In a multi-color offset press comprising two printing units each composed of a form cylinder, a blanket cylinder and an impression cylinder, separate normally inoperative means for separating the blanket cylinder from both form and impression cylinders in each unit, a timing mechanism positively controlled and simultaneously actuated by the direct movement of the separating means in the first unit to simultaneously place a part of the then normally inoperative separating means in the second unit in operative position for subsequent actuation through the continued rotation of an element carried by the impression cylinder of the second unit of the press and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

26. In a multi-color offset press comprising two printing units each composed of a form cylinder, a blanket cylinder and an impression cylinder, separate normally inoperative means for separating the blanket cylinder from both form and impression cylinders in each unit, a timing mechanism positively con-

trolled and simultaneously actuated by the direct movement of the separating means in the second unit in operative position for subsequent actuation at a predetermined point through the continued rotation of an element carried by the impression cylinder of the second unit of the press, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

27. In a multi-color press, a plurality of printing couples, separate normally inoperative means for throwing off the impression for each couple, and a normally inoperative timing mechanism comprising a latch relay device controlled and actuated simultaneously by a direct connection with the first of said throw-off means to directly and simultaneously place a part of another then normally inoperative throw-off means in operative position, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

28. In a multi-color press, a plurality of printing couples, separate normally inoperative means for throwing off the impression for each couple, a normally inoperative timing mechanism comprising a latch relay device controlled and actuated simultaneously by a direct connection with the first of said throw-off means to directly and simultaneously place a part of another then normally inoperative throw-off means in operative position for subsequent actuation by the continued movement of the press, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

29. In a multi-color press, a plurality of printing couples, separate normally inoperative means for throwing off the impression for each couple, and a normally inoperative timing mechanism comprising a latch relay device controlled and actuated simultaneously by a direct connection with the first of said throw-off means to directly and simultaneously place a part of another then normally inoperative throw-off means in operative position for subsequent actuation at a predetermined point by the continued movement of the press, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

30. In a multi-color press, a plurality of printing couples, inking mechanisms therefor with separate means for throwing off same, independent normally inoperative means for separating each couple, normally disconnected means controlled and simultaneously positioned by the tripping movement of each separating means for subsequently actuating the inker throw-off means in each couple, and a transfer cylinder of greater diameter than

any cylinder in a couple for transferring paper from one couple to the next.

31. In a multi-color press, a plurality of printing couples, inking mechanisms therefor with separate means for throwing off same, independent normally inoperative means for separating each couple, means directly positioned and positively controlled by the tripping movement of each separating means for actuating the inker throw-off means in each couple in each cycle through the continued movement of the press, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

32. In a multi-color press, a plurality of printing couples, inking mechanisms therefor with separate means for throwing off same, independent normally inoperative means for separating each couple, means directly positioned and positively controlled by the tripping movement of each separating means for actuating at variably predetermined points the inker throw-off means in each couple, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

33. In a multi-color press, a plurality of printing couples, inking mechanisms therefor with means for throwing off same, means for throwing off impression for the first couple, normally inoperative means for throwing off impression for another couple placed in operative position by said first impression throw-off means, means controlled and placed in operative position by said impression throw-off means in each couple for operating its inker throw off, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

34. In a multi-color press, a plurality of printing couples, inking mechanisms therefor with means for throwing off same, means for throwing off impression for the first couple, normally inoperative means for throwing off impression for another couple placed in operative position by said first impression throw-off means, means controlled and placed in operative position by said impression throw-off means in each couple for operating its inker throw-off at a predetermined point in the cycle after the impression is thrown off, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

35. In a multi-color press, a plurality of printing couples, inking mechanisms therefor with means for throwing off same, means for throwing off impression for the first couple, normally inoperative means for throwing off impression for another couple placed in operative position by said first impression throw-off means, means controlled and placed in operative position by said impression throw-off

means in each couple for operating its inker throw-off at a predetermined point in the cycle after the impression is thrown off actuated through the continued movement of the press, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

36. In a multi-color press, a plurality of printing couples, inking mechanisms therefor, separate normally inoperative means for throwing off same for each couple, means for throwing off impression for each couple having a connection with the inker throw-off to set the latter for operation, means controlled and actuated by the impression throw-off of each couple to set its inker throw-off means and the impression throw-off for the next couple in operative position operable through the continued movement of the press to sequentially actuate said inker throw-off means and said impression throw-off, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

37. In a multi-color press, a plurality of printing couples, inking mechanisms therefor, separate normally inoperative means for throwing off same for each couple, means for throwing off impression for each couple having a connection with the inker throw-off to set the latter for operation, means controlled and directly actuated by the impression throw-off of each couple to set its inker throw-off means and the impression throw-off for the next couple in operative position operable through the continued movement of the press to sequentially actuate said inker throw-off means and said impression throw-off at a predetermined point in the cycle, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

38. In a multi-color press, a plurality of printing couples, means for throwing off impression for each couple, inking mechanisms therefor, separate normally inoperative means for throwing off same for each couple normally inoperative but placed in operative position by its impression throw-off means when actuated thereafter to be sequentially actuated by the continued movement of the press, a timing mechanism comprising a latch relay device controlled and actuated by one of said throw-off means to position the impression throw-off means and inker throw-off in another couple for actuation by the continued movement of the press, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

39. In a multi-color press, a plurality of printing couples, means for throwing off impression for each couple, inking mechanisms therefor, separate normally inoperative means for throwing off same for each

couple normally inoperative but placed in operative position by its impression throw-off means when actuated thereafter to be sequentially actuated by the continued movement of the press, a timing mechanism comprising a latch relay device controlled and actuated by one of said throw-off means to position the impression throw-off means and inker throw-off in another couple for actuation at predetermined points by the continued movement of the press, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

40. In a multi-color press, a plurality of printing couples, manually inaugurated means for restoring the impression for the first couple, a timing mechanism positively controlled and simultaneously actuated by the impression restoring means for one couple for automatically positioning in sequence the impression restoring means in another couple by the movement of the press, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

41. In a multi-color press, a plurality of printing couples, manually inaugurated means for restoring the impression for the first couple, a timing mechanism positively controlled and simultaneously actuated by the impression restoring means for one couple for automatically positioning the impression restoring means in another couple for predeterminedly subsequent actuation by the continued movement of the press, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

42. In a multi-color press, a plurality of printing couples each comprising a pair of rotary members, independent normally inoperative means for throwing off and throwing on the impression for each couple, means for positioning the impression throw-on means for the first couple, a timing mechanism positively controlled and simultaneously actuated by the tripping movement of the impression throw-on means for the first couple for automatically positioning the impression throw-on means in the next printing couple, means operable through the continued movement of the press to actuate said several impression throw-on means in predetermined sequence, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

43. In a multi-color press, a plurality of printing couples each comprising a pair of rotary members, independent normally inoperative means for throwing off and throwing on the impression for each couple, means for positioning the impression throw-on means for the first couple, a timing mechanism positively controlled and simultaneously

actuated by the tripping movement of the impression throw-on means for the first couple for automatically and simultaneously positioning the impression throw-on means in the next printing couple, means operable through the continued movement of the press to actuate said several impression throw-on means in predetermined sequence, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

44. In a multi-color press, a plurality of printing couples each comprising a pair of rotary members, independent normally inoperative means for throwing off and throwing on the impression for each couple, means for positioning the impression throw-on means for the first couple, a timing mechanism comprising a latch relay device positively controlled and simultaneously actuated by the tripping movement of the impression throw-on means for the first couple for automatically and simultaneously positioning the impression throw-on means in the next printing couple, automatic means operable through the continued movement of the press to actuate said several impression throw-on means in predetermined sequence, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

45. In a multi-color press, a plurality of printing couples, separate normally inoperative means for throwing off and throwing on the impression for each couple, a timing mechanism comprising a latch relay device controlled and simultaneously actuated by said throw-on means for one couple to automatically and simultaneously position the impression throw-on means for the next couple, both said impression throw-off and throw-on means being thereafter actuated in either direction in predetermined sequence in their respective cycles by a movable element in each couple operated through the continued movement of the press, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

46. A two color press comprising two printing couples each having a pair of rotary printing members, independent means for throwing off and throwing on the impression for each couple normally inoperative and disconnected from each other, a timing mechanism positively controlled and simultaneously actuated by the movements of said throw-off or throw-on means for one couple in either direction to automatically position the throw-off and throw-on means for the next couple, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

47. A two color press comprising two print-

ing couples each having a pair of rotary printing members, independent means for throwing off and throwing on the impression for each couple normally inoperative and disconnected from each other, a timing mechanism positively controlled and simultaneously actuated by the movements of said throw-off or throw-on means for one couple in either direction to automatically position the throw-off and throw-on means for the next couple, both said normally disconnected means being automatically actuated in either direction after being positioned through the continued movement of the press, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

48. A two color press comprising two printing couples each having a pair of rotary printing members, independent means for throwing off and throwing on the impression for each couple normally inoperative and disconnected from each other, a timing mechanism positively controlled and simultaneously actuated by the movements of said throw-off or throw-on means for one couple in either direction to automatically position the throw-off and throw-on means for the next couple, both said normally disconnected means being automatically actuated in either direction in predetermined sequence in their respective cycles after being positioned through the continued movement of the press, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

49. A two color planographic offset press comprising two printing couples each composed of a form cylinder, a blanket cylinder and an impression cylinder, inking mechanisms for the form cylinders with means for throwing off same, separate normally inoperative means for separating the blanket cylinder from both form and impression cylinders in each unit, a timing mechanism controlled and actuated by the separating means of the first unit to place in operative position the separating means of the second unit, means for operating the inker throw-off in each unit after its separating means has been actuated, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

50. A two color planographic offset press comprising two printing couples each composed of a form cylinder, a blanket cylinder and an impression cylinder, inking mechanisms for the form cylinders with means for throwing off same, separate normally inoperative means for separating the blanket cylinder from both form and impression cylinders in each couple, a timing mechanism controlled and actuated by the separating

means of the first couple to place in operative position the separating means of the second couple, means for operating the inker throw-off in each couple at a predetermined point in the cycle after its separating means has been actuated, and a transfer cylinder of greater diameter than any cylinder in a couple for transferring paper from one couple to the next.

51. In a multi-color press, a plurality of printing couples means for throwing all couples simultaneously out of operation and means always connected to the preceding means for throwing one or more couples out of operation.

52. In a multi-color press, a plurality of printing couples and manually controlled means for simultaneously throwing all couples out of operation and additional means always connected to the preceding means, manually controlled, for throwing one or more couples out of operation.

53. In a multi-color press, a plurality of printing couples each pair of couples being connected by a transfer cylinder and each couple having independent, normally inoperative means for separating the couple and a normally disconnected positively driven timing mechanism positively controlled and attached to the transfer cylinder and simultaneously actuated by the tripping movement of one of said couple separating means for placing in operative position, at a predetermined point in the cycle, another of said separating means and means for preventing paper from being fed to the first couple when the machine is tripped.

54. In a multi-color press, a plurality of printing couples, a transfer cylinder connecting each adjacent couple, grippers on the impression and transfer cylinders and mechanical means including independent pins for rendering the grippers inoperative on the first impression cylinder.

55. In a multi-color press, a plurality of printing couples, a transfer cylinder connecting each adjacent couple, grippers on the impression and transfer cylinders and manually controlled mechanical means including independent pins for rendering said grippers inoperative on the first impression cylinder.

56. In a multi-color press, a plurality of printing couples, a transfer cylinder connecting each adjacent couple, grippers on the impression and transfer cylinders and automatically controlled, mechanical means for including independent pins rendering said grippers inoperative on the first impression cylinder.

57. In a multi-color press, a plurality of printing couples, a transfer cylinder connecting each adjacent couple, grippers on the impression and transfer cylinders and manually controlled means for rendering said grippers inoperative on the first impression cylinder.

inder and automatically controlled means for rendering said grippers inoperative on the first impression cylinder.

58. In a multi-color press, a plurality of printing couples each having independent, normally inoperative means for separating the couples, a normally disconnected latch relay mechanism positively controlled and simultaneously actuated by the tripping movement of one of said couple separating means for placing in operative position, at a predetermined point in the cycle, another of said separating means, a transfer cylinder connecting the couples and means rigidly connected to said transfer cylinder for driving the latch relay mechanism.

59. In a multi-color press, a plurality of printing couples provided with automatic tripping mechanisms, a transfer cylinder connecting said couples, a latch mechanism connected to said transfer cylinder and to the tripping mechanism of the adjacent couples.

60. In a multi-color press, a plurality of printing couples, tripping mechanism connected with each couple, a transfer cylinder for connecting adjacent couples, a relay mechanism connected to the transfer cylinder and to the adjacent tripping mechanism of each couple.

61. In a multi-color press, a printing couple having plate, blanket and impression cylinders, manually controlled means for separating the blanket cylinder from the impression cylinder and from the plate cylinder by shifting the blanket and plate cylinders and thereafter bringing the blanket and plate cylinders together while away from the impression cylinder, whereby the blanket cylinder may receive a printing impression which will be available for printing upon the starting of the machine.

62. In a multi-color press, stops for receiving the edge of a paper ready for printing, pendulums cooperating with said stops, means for withdrawing the stops from the paper and means for gripping the paper, means for printing the paper with one or more colors through a successive and continuous action of the paper as it passes through the press, each pendulum being so made and proportioned that its stop will overbalance its bottom and tilt the top rearwardly whenever the paper does not arrive on time at the stops and means for rendering the printing mechanism of the press inoperative whenever the pendulum is tilted for the want of paper at the stops.

63. In a multi-color press, a plurality of printing couples and a sheet transfer cylinder between the couples, means for throwing the couples out of operation when a paper is not fed, said means including an articulated lever with two parts, one of which is constantly driven by a cam and the other of which may be connected to the constantly

driven part through the action of a block and a hook and paper controlled means for operating said hook, whereby the parts of the lever are locked and not locked according to the action of the hook.

64. In a multi-color press, a plurality of printing couples each having independent, normally inoperative means for separating the couple and a normally disconnected timing mechanism positively controlled and simultaneously actuated by the tripping movement of one of said couples at a predetermined point in the cycle, a transfer cylinder connecting adjacent couples and means for opening and closing grippers of the impression cylinder of one couple operating in connection with the couple separating mechanism so that when this couple is separated the grippers are rendered inoperative.

65. In a multi-color press, a series of printing couples and a transfer cylinder between each pair of couples, three controls for determining the printing action of said couples one of said controls being automatic and sequential in its operation so as to throw out the couples or throw in the couples successively and automatically, another of said controls being a manual control for throwing one or more of said couples entirely out of action and the third control being a manual control for throwing all of said couples out of action simultaneously.

66. In a multi-color press, a plurality of printing couples and manually controlled means for instantaneously setting the tripping elements for all couples so that they may be thrown out of operation simultaneously.

67. In a multi-color press, a plurality of printing couples, an automatic means for tripping each couple and manually controlled means for instantaneously setting the tripping elements for all couples so that they may be thrown out of operation simultaneously and additional means, manually controlled, for throwing one or more couples out of operation independently of each other and rendering inoperative this automatic tripping mechanism.

68. In a printing press, a series of registering pendulums, a shaft carrying said pendulums, means for shifting the said shaft and thereby shifting the alignment of the pendulums, a tripping mechanism and means for mounting the same carried in such a relation to said shaft that the shifting of this shaft shifts the tripping control to correspond.

69. A printing press having means for printing a sheet of paper, means for feeding a sheet of paper true to the press, means for stopping the printing action of the press when the feed is not true and means for preventing the movement of paper into the press for printing, spring fingers for preventing the movement of paper towards the press for

printing when the press is rendered inoperative and means for actuating said fingers to stop the movement of paper whenever the printing mechanism is rendered inoperative.

- 5 70. In a multi-color press, a plurality of printing couples, each having single gripper units, a transfer cylinder with a multiple number of gripper units, each of said couples being provided with means for separating
10 the elements of the same or bringing them together and a timing mechanism, independent of but connected to the means for separating or assembling the couple elements and means
15 for driving the timing mechanism in synchronism with the transfer cylinder gripper action.

71. In a multi-color press, a plurality of printing couples, each having an impression cylinder, a transfer cylinder with a diameter
20 greater than that of any impression cylinder, each of said couples being provided with means for separating the elements of the same or bringing them together and a timing mechanism, independent of but connected
25 to the means for separating or assembling the couple elements and means for driving the timing mechanism in synchronism with the impression cylinders of the couples.

72. In a multi-color press, a printing couple having plate, blanket and impression cylinders, and manually controlled means for
30 separating all three cylinders by the tripping of the blanket and plate cylinders, and means for bringing in printing relation the plate and blanket cylinders prior to establishing
35 printing relation to the blanket and impression cylinders, whereby the blanket cylinders may be given an impression without transferring this to the impression cylinder.
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In testimony whereof, I have hereunto set my hand this 28th day of March, 1927.

CHRISTEN R. KADDELAND.