Oct. 20, 1959

R. J. CRISSY

2,909,117

ROTARY OFFSET PRINTING MACHINE WITH AUXILIARY OFFSET CYLINDER

Filed May 25, 1955

6 Sheets-Sheet 1

Fig. 4A

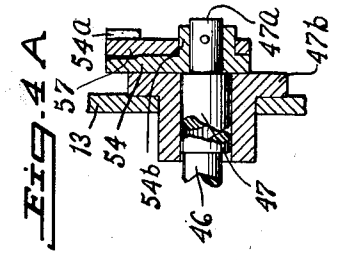


Fig. 1

INVENTOR.
Robert J. Crissy

Campbell, Brumbaugh, Free & Graves

BY

ATTORNEYS

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R. J. CRISSY

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6 Sheets-Sheet 2

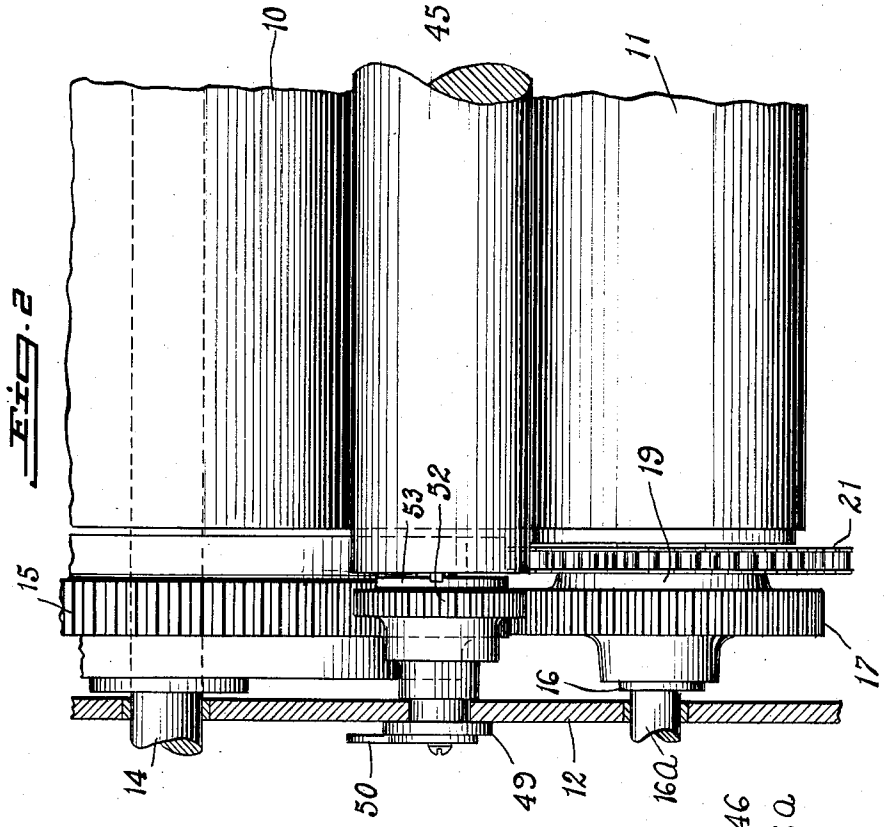


Fig. 2

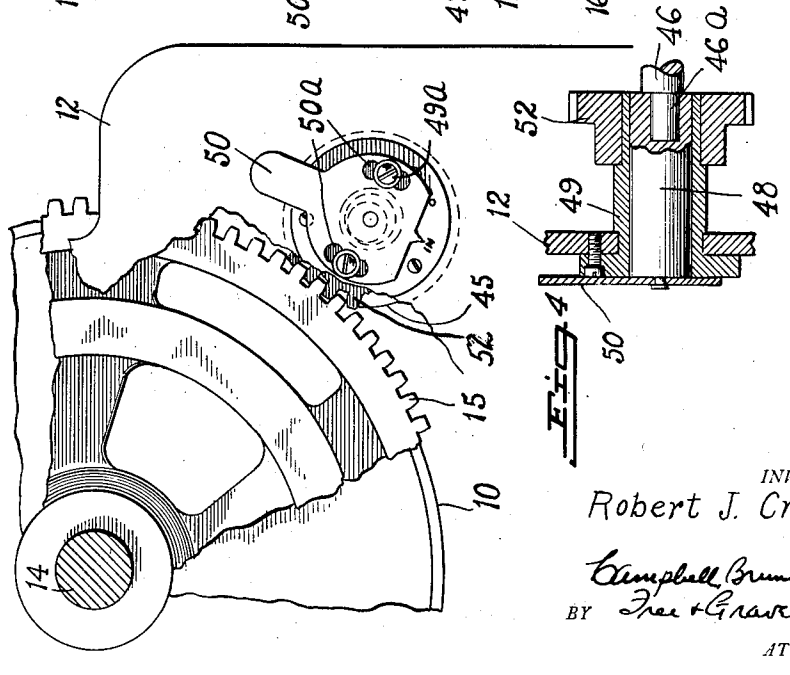


Fig. 3

Fig. 4

INVENTOR.
Robert J. Crissy
BY Campbell Brumbaugh, Free & Graves
ATTORNEYS

Oct. 20, 1959

R. J. CRISSY

2,909,117

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6 Sheets-Sheet 3

Fig. 5

Fig. 6

INVENTOR.
Robert J. Crissy

Campbell, Brumbaugh, Free & Graves
BY

ATTORNEYS

Oct. 20, 1959

R. J. CRISSY

2,909,117

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6 Sheets-Sheet 4

Fig. 10

Fig. 7

INVENTOR.
Robert J. Crissy

BY Campbell, Brumbaugh, Free & Graves

ATTORNEYS

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ROTARY OFFSET PRINTING MACHINE WITH AUXILIARY OFFSET CYLINDER

Filed May 25, 1955 6 Sheets-Sheet 5

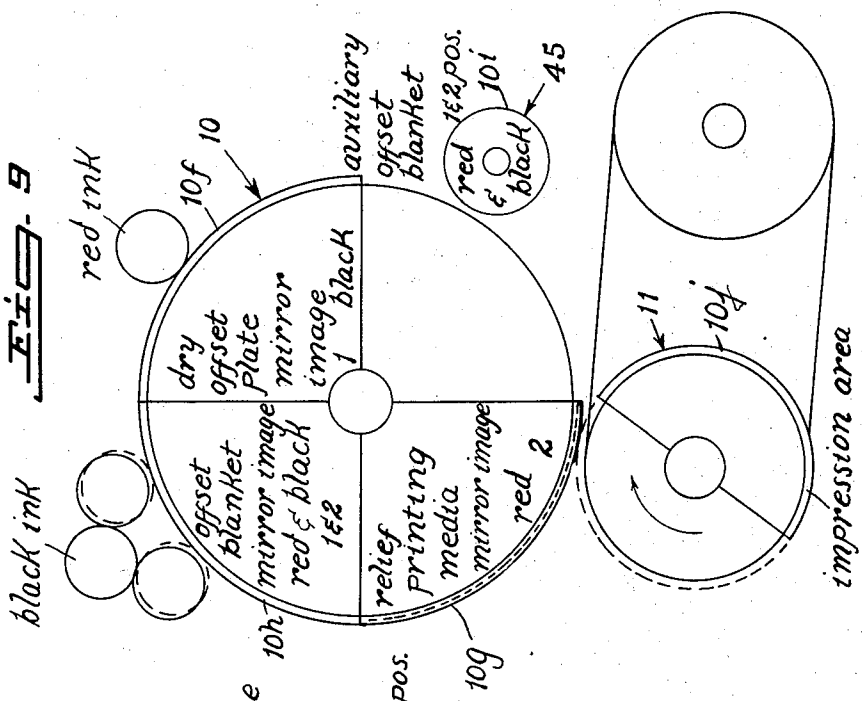


Fig. 9

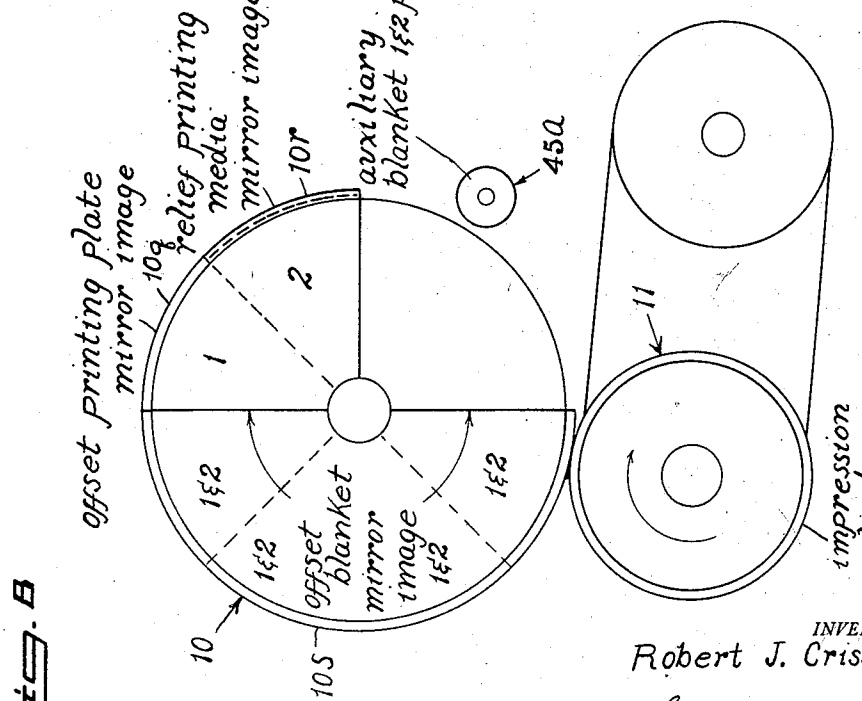


Fig. 8

INVENTOR.
Robert J. Crissy

Campbell, Brumbaugh, Free & Graves
BY

ATTORNEYS

Oct. 20, 1959 R. J. CRISSY 2,909,117

ROTARY OFFSET PRINTING MACHINE WITH AUXILIARY OFFSET CYLINDER

Filed May 25, 1955 6 Sheets-Sheet 6

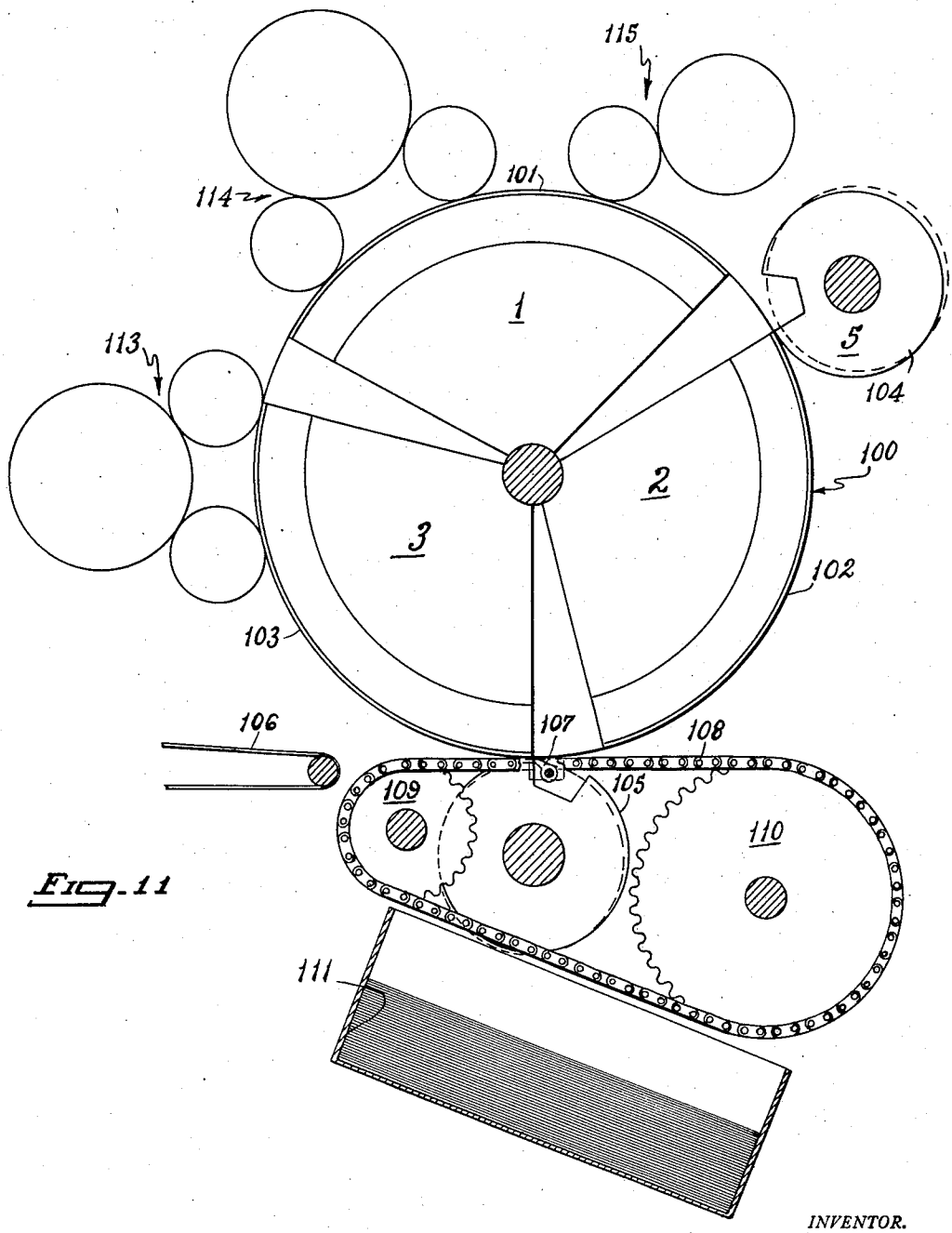


FIG. 11

INVENTOR.
Robert J. Crissy

BY Campbell, Brumbaugh, Free & Graves
ATTORNEYS

United States Patent Office

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Patented Oct. 20, 1959

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ROTARY OFFSET PRINTING MACHINE WITH AUXILIARY OFFSET CYLINDER

Robert J. Crissy, West Caldwell, N.J.

Application May 25, 1955, Serial No. 511,073

14 Claims. (Cl. 101—137)

This invention relates to a rotary printing press and to a method of printing wherein during a single machine cycle, it is possible to print on opposite sides of a sheet, to superimpose different printing matter on either or both sides of a sheet, to repeat an image from a single form or plate on the same or different sheets, and other varied effects. The superimposition of different printing matter makes it possible to print a composite image by combining different colors, by combining images of relief and offset plates and by combining information of two or more printing plates.

In the rotary printing press of the present invention a rotatable auxiliary cylinder is arranged to engage a main cylinder of the press, the main cylinder carrying one or more printing surfaces thereon, and ink impressions are transferred by the auxiliary cylinder from one portion of the periphery of the main cylinder to another portion thereof. The auxiliary cylinder may be moved into contact with predetermined portions of the periphery of the main cylinder during a machine cycle, so that only certain impressions will be received by the auxiliary cylinder from the printing plates carried by the main cylinder, or the auxiliary cylinder may be maintained in operative relationship with the main cylinder during the entire machine cycle so that all the impressions will be received from the main cylinder and one or more impressions will be transferred to the surface of the main cylinder.

In another aspect of the invention one or more impressions may be transferred from the one cylinder of the press to the other cylinder thereof, permitting the press to be employed for perfection printing. In this way, superimposed images from different printing areas of the one cylinder may be transferred to the other cylinder. Thus, a sheet fed between the cylinders will receive the composite image on one side of the sheet, as well as images on the other side from the main cylinder.

The machine of the present invention is readily converted from one use to another, and consequently it makes available to the small printer a wide and varied assortment of different printing methods and effects heretofore impossible with a single printing press.

For a complete understanding of the present invention, reference may be had to a detailed description which follows and to the accompanying drawings wherein:

Fig. 1 is a side elevation of a rotary printing machine equipped with the present invention;

Fig. 2 is a fragmentary rear view of the cylinders and the drive means therefor;

Fig. 3 is a broken-away side elevation of a portion of the machine represented in Fig. 2;

Fig. 4 is a cross-sectional view of the means for supporting one end of the auxiliary cylinder;

Fig. 4A is a cross-sectional view of the means for supporting the other end of the auxiliary cylinder;

Fig. 5 is a diagrammatic view illustrating the application of the machine of the present invention to perfection printing;

Fig. 6 is a view illustrating the application of the machine of the present invention to the printing of a composite image formed by superimposing images from offset and relief printing plates;

Fig. 7 is a view illustrating the application of the present invention for printing, during each machine cycle, a composite image on one side of a sheet formed by superimposing images from offset plates and a different image on the opposite side of the sheet;

Fig. 8 is a view illustrating the application of the present invention to the superimposing of different images and different printing media onto a common form and repeating the composite image several times on one side of a sheet of paper;

Fig. 9 is a view illustrating the application of the present invention to the printing of multiple colors from different media on a common cylinder in a single machine cycle;

Fig. 10 is a view illustrating the application of the present invention to a machine for repeating the same image several times on a sheet of paper from a single form or plate; and

Fig. 11 is a view illustrating the application of the present invention to a machine wherein the main cylinder carries three removable segments.

Referring to the drawings, the present invention is shown as applied to a rotary printing press of the general organization represented in U.S. Letters Patent No. 2,387,750, to W. W. Davidson, wherein a pair of rotatable cylinders **10**, **11** are disposed in substantially tangential relationship, the upper cylinder **10** being twice the diameter of the lower cylinder **11**. The upper cylinder **10** is supported by a transverse shaft **14** which extends between the side frames **12**, **13** of the machine. The lower cylinder **11** is supported on a transverse shaft **16**, and the shaft **16** is provided with eccentric trunnions **16***a* at both ends which support the shaft between the side frames **12**, **13** of the machine. As shown in Fig. 2, a gear **15** is carried by the shaft **14** for driving the cylinder **10**. Also, the shaft **16** carries a gear **17** adjacent the cylinder **11**, and the gear **17** is connected to the cylinder **11** by means of coupling **19**, such as an Oldham type coupling, to permit the cylinder **11** to be translated towards and away from the larger cylinder **10** without disengaging the gears **15**, **17**. The power for rotating the cylinders is transmitted from a motor (not shown) by means of a gear **18** (see Fig. 1) which drives the gear **17**.

Referring to Fig. 1, the sheets to be printed are fed one at a time across a guide plate or table **20**, and the leading edges of the sheets are delivered to grippers (not shown) supported between and transported in an orbital path by a pair of moving chains **21**. The chains **21** each form a closed loop passing around a pair of sprockets **22** and **23**, the sprockets **22** being supported by the shaft **16** and the sprockets **23** being supported by a transverse shaft **24** extending between the side frames of the machine. The grippers guide the sheets through the bite between the cylinders **10**, **11**, and the sheets are ultimately discharged and stacked, one on top of another, upon a delivery platform (not shown).

As described in the above-identified patent, the machine **10** is suitable for use in both letterpress and offset printing. When used in offset printing, the periphery of the larger cylinder **10** is provided with removable plate and platen segments while the smaller cylinder carries a blanket. During the first half revolution of the large cylinder, the image on the plate is transferred to the blanket of the smaller cylinder, and during the next half revolution, the blanket transfers the image to a sheet passing between the cylinders, the platen serving as an impression surface. The machine may be converted into a direct printing letterpress machine by re-

moving the plate and platen segments and substituting a letterpress plate for the platen segment. Thus, sheets passing between the cylinders will be printed directly from the letterpress plates with the surface of the smaller cylinder serving as an impression surface.

In this conventional printing press, the cylinders, although normally in tangential relationship during the printing operation, are adapted to be separated when a sheet is not fed to the press in any machine cycle. The Oldham type coupling **19** will permit the separation of the cylinder **11** from the cylinder **10** without disengagement of the gears **15, 17**. The separation of the smaller cylinder from the larger cylinder is accomplished by the rotation of the eccentric trunnions **16***a*, which trunnions are normally spring urged for rotation in a counterclockwise direction, as viewed in Fig. 1, to effect this separation. The separation of the smaller cylinder is normally prevented, however, by the engagement of a pivotal latch **25** with a shoulder **26** of a disc member **27** carried at the extreme end of one of the trunnions **16***a*. Thus, while the latch **25** is in position to engage the shoulder **26**, the cylinder will be maintained in operative printing relationship with the larger cylinder **10**.

The release of the pivotal latch **25** to effect the separation of the cylinder is brought about as follows. During each cycle of operation, a reciprocating sheet-detecting finger **28**, driven in synchronism with the press, moves relative to the upper surface of the plate and across a slot **29** formed therein. Directly beneath the slot **29** is an upright arm **30** connected to a pivotal shaft **31**, and the latch **25** is freely pivoted on the shaft **31** so that the shaft is free to rotate independently of the latch. Although the shaft **31** is free to rotate independently of the latch, the shaft **31** carries a pin **32** which is connected by means of a tension spring **34** to a downwardly depending pin **33** of the latch. Thus, if the shaft **31** should be rotated in a counterclockwise direction by the engagement of the reciprocating finger **28** with the upper end of the arm **30**, as will be the case when the finger fails to detect a sheet, tension will be applied by means of the spring **34** to urge the pivotal latch **25** out of engagement with the shoulder **26**. The heavy spring pressure, however, which tends to rotate the small cylinder **11** on its trunnions **16***a* will cause the shoulder **26** to exert sufficient pressure upon the latch **25** to prevent its release until this pressure is relieved by the operation of a pivotal lever **37**.

The lever **37** is pivotally supported on a shaft **38** to the side frame **13** of the machine, and the lower end of the lever is connected to a tension spring **39** which ordinarily maintains the lever against a fixed stop **40**. The upper end of the lever carries a roller **41** which is engaged by the raised surface of a cam **42** during each cycle of the machine to pivot the lever **37** in a counterclockwise direction, as viewed in Fig. 1. When the lever **37** is thus actuated, the lower end will strike the surface **27***a* of the disc **27**, thereby momentarily relieving the pressure exerted by the shoulder **26** against the latch **25**. If, therefore, the reciprocating finger **28** has detected a missing sheet during the cycle and has applied pressure to the spring **34** due to engagement with the arm **30**, the latch **25** will be pivoted to inoperative position, permitting separation of the cylinders **10, 11**. Otherwise, the latch will remain in the operative position, preventing separation of the cylinders. The action of the lever **37** against the surface **27***a* is only momentary, and, therefore, the lever does not interfere with the rotation of the trunnions **16***a* to effect a separation of the cylinders. The separation of the cylinders, of course, prevents unnecessary and undesirable transfer of an inked impression from the larger cylinder to the smaller cylinder during a machine cycle in which a sheet has not been supplied.

The arm **30** is restored to its upright position when the finger moves out of engagement with the arm by the action of a spring **43** which acts on the shaft **31** through a pin **44** thereof. If a sheet is supplied during the following cycle of the machine following a cycle during which the cylinders of the printing couple were separated, the engagement of the pin **32** with a shoulder (not shown) formed on the latch **25** will restore the latch to its operative position against the shoulder **26** the next time that the disc **27** is actuated by the lever **37**. Of course, if a sheet has not been supplied during this next cycle of operation, the latch **25** will not be thus restored.

The operation of the machine as thus far described is conventional and forms no part of the present invention, except insofar as the operating parts of the present invention cooperate therewith and depend thereon. For a more complete understanding of the operation of the conventional machine, reference may be had to the above-identified patent.

Turning now to a description of the present invention, an auxiliary rotatable cylinder **45** is arranged in tangential relationship to the cylinder **10**. The cylinder **45**, as best shown in Figs. 4 and 4A, is supported on a shaft **46**, and the shaft **46** is eccentrically supported at both ends to permit the surface of the cylinder **45** to be moved into and out of operative contact with the surface of the cylinder **10** as desired.

As shown in Fig. 4A, one end of the shaft **46** is provided with an eccentric journal **47** which is rotatably supported within a bearing **47***b* of the frame **13**. The other end of the shaft **46**, as shown in Fig. 4, is formed with an eccentric trunnion **46***a* which is suported eccentrically of the axis of a rotatable bushing **48**. The bushing **48** is rotatable within a bearing **49** of the frame **12**.

A hand lever **50** is connected to the extreme end of the bushing **48** outside the frame **12** to permit the rotational adjustment of the bushing **48**. The bore in the bushing **48** in which the trunnion **46***a* is journaled is offset with respect to the axis of rotation of the bushing **48**, so that rotation of the bushing will move the corresponding end of the shaft **46** toward or away from the large cylinder **10**. This adjustment of the angle of the axis of the shaft **46** makes it possible to obtain uniformity of pressure along the entire line of contact between the cylinders **45** and **10**. As shown in Fig. 3, the adjusting lever **50** is provided with arcuate slots **50***a* which accommodate screws **49***a*, the screws being received in threaded holes in the outside face of the bearing **49**. When, therefore, the lever is adjusted to the desired position it may be locked in place by tightening the screws **49***a*.

The auxiliary cylinder **45** is driven by means of a gear **52** which meshes with the gear **15** associated with the large cylinder. The gear **52**, as best shown in Fig. 4, is rotatably supported on the bearing **49**. To permit the auxiliary cylinder **45** to be moved toward and away from the cylinder **10** without disengaging the gears **15** and **52**, the gear **52** is conected to the auxiliary cylinder by means of an Oldham type coupling **53** (see Fig. 2), similar to the coupling **19** which is employed to connect the gear **17** with the cylinder **11**.

Turning now to the mechanism for moving the auxiliary cylinder **45** into and out of contact with the periphery of the cylinder **10**, the extreme end **47***a* (see Figs. 1 and 4A) of the trunnion **47** carries a disc **54** thereon which is formed with a hub portion **54***b*, and the hub portion accommodates a lever **57** thereon. A boss **54***a* carrying an adjustable screw **55** therein is formed integrally on the disc **54**, and the end of the set screw is adapted to engage a shoulder **57***a* formed on the lever **57**. The lever **57** is attached to the outside face of the disc **54** by means of the screws **58** which engage arcuate slots **59** in the lever. The adjustment of the set screw **55** permits the lever **57** to be adjusted with precision relatively to the disc **54**, and the lever **57** and disc **54** may be locked in the adjusted relative position by tightening the screws **58**.

The cylinder **45** is normally maintained out of operative contact with the cylinder **10** by means of a tension

spring 60 connected between a pin 61 on the frame 13 and a pin 62 on the lever 57. The cylinder 45, however, may be maintained in operative engagement with the cylinder 10 by a pivotal latch 65 which engages a shoulder 57*b* formed on the lever 57.

The latch 65 is normally maintained in shoulder engaging position by a spring 67. The latch 65, however, is adapted to be released to separate the auxiliary cylinder 45 from the cylinder 10 (*a*) during cycles in which a sheet has not been fed between the cylinders 10, 11 and (*b*) at predetermined times to prevent the transfer of certain images or portions of images from the large cylinder 10 to the auxiliary cylinder.

The actual separation of the auxiliary cylinder 45 from the cylinder 10 is brought about by the actuation of the long horizontal link 68. The lower end of the latch 65 carries a pin 70 which is accommodated within a slot 71 at one end of the link 68. The link also is provided with a slot 73 which accommodates a fixed pin 72 extending from the frame 13, and a spring 74 is connected between the pin 72 and the link, urging the link in a leftward direction, as viewed in Fig. 1, to a position determined by the engagement of the end of the slot with the pin 72.

When the link is in this normal leftward position, the tension of the spring 67 will maintain the pivotal latch 65 in its operative position in engagement with the shoulder 57*b*. The pin 70 of the latch 65, however, is connected to the link 68 by a tension spring 75, and when the link 68 is shifted to the rightward position, by means to be described below, the tension of the spring 75 overcomes the effect of the spring 67 urging the latch 65 to an inoperative or release position determined by the stop 77. The frictional engagement between the shoulder 57*b* and the latch 65 caused by the spring 60, however, prevents the release of the latch, until the pressure is relieved.

The pressure is adapted to be relieved momentarily by the operation of a lever 80 which, like the lever 37 is pivoted on the shaft 38. The lower end of the lever 80 carries an adjustable screw 84 which, when the lever is actuated, strikes the surface 57*c* of the lever 57, momentarily relieving the pressure of the shoulder 57*b* against the latch 65. If, therefore, the link 68 has been shifted in a rightward direction, so that the latch is conditioned for operation, the latch will be released during this momentary separation between the latch 65 and the shoulder 57*b*, permitting the spring 60 to throw the auxiliary cylinder 45 out of operative contact with the cylinder 10. The operation of the lever 80 is, of course, only momentary so that it does not remain in contact with the surface 57*c* long enough to interfere with the throw out of the cylinder 45.

The lever 80 is maintained in an inoperative position against a fixed stop 81 by the tension of a spring 82. The lever, however, carries a roller 83 which, when engaged by the raised surfaces 85*a* and 85*b* of the cam 85, pivots the lower end of the lever, causing the screw 84 to strike the surface 57*c* of the lever 57. If, of course, the latch 65 has not been conditioned for release by the rightward movement of the link 68, the pivotal operation of the lever 80 does not effect the separation of the auxiliary cylinder 45 from the cylinder 10.

As mentioned above, the separation of the auxiliary cylinder 45 from the cylinder 10 is effected during cycles when no sheet is fed between the cylinders 10, 11. The movement of the link 68 to condition the latch 65 for release in this event is controlled by an arm 90 connected to the extreme end of the rock shaft 31. When the shaft 31 is rocked by the engagement of the sheet detector 28 with the arm 30, the arm 90 will be pivoted, so that a pin 91 on the lower end of the arm engages a shoulder 92 formed by a cut-out portion in the upper edge of the link. In this way, the pivotal movement of the arm 90 shifts the link to the right, as viewed in Fig. 1, and when the link is thus shifted the resulting increase of tension of the spring 75 will condition the latch 65 for operation. When the latch 65 is thus conditioned for release, the actual release of the latch to bring about the separation of the cylinder 45 from the cylinder 10 is, as mentioned above, effected by the operation of the lever 80.

The throw out of the auxiliary cylinder 45 is also effected when it is desired to prevent the surface of the cylinder 45 from receiving images from certain portions of the periphery of the cylinder 10. The throw out at such times is controlled by the operation of a lever 95 pivoted at 96 to the frame 13. The lower end of the lever 95 is bifurcated, and the bifurcated end engages a pin 97*a* of the link 68. The upper end of the lever 95 lies in the path of a cam roller 97 mounted to the outside face of the cam 85. When this cam engages the upper end of the lever 95, it produces a counterclockwise movement of the lever 95, thereby shifting the link 68 against the action of the spring 74 to condition the latch 65 for release. If then the lever 80 is actuated while the latch 65 is conditioned for release, the auxiliary cylinder will be separated from the surface of the cylinder 10.

It is, of course, understood that the points at which the throw out of the auxiliary cylinder is to occur during a cycle of the machine can be determined by the design of the cam 85 and by adding additional cam rollers 97. In the arrangement shown in Fig. 1, the relative positions of the raised surface 85*b* of the cam 85 and the roller 97 carried thereby are such that, as the cylinder 10 rotates in a clockwise direction, as viewed in that figure, the roller 97 will first actuate the lever 95, thereby shifting the link 68 in the direction to condition the latch for release, and while the lever 95 is thus actuated, the raised surface 85*b* of the cam will actuate the lever 80 thereby effecting the separation of the auxiliary cylinder 45 from the cylinder 10. The auxiliary cylinder will remain separated until the lever 80 is actuated by the raised surface 85*a*. Since at this time the lever 95 has not been actuated to condition the latch 65 for release, the pivotal operation of the lever 80 will merely rock the lever 57 to permit the latch 65 to move into engagement with the shoulder 57*b*.

It is evident that the separation of the auxiliary cylinder 45 may be effected at additional times during the cycle of the machine to achieve certain effects which will be described in detail below.

For example, Fig. 5 shows the application of the machine of the present invention to perfection printing wherein the auxiliary cylinder 45 is one-quarter the diameter of the cylinder 10. The cylinder 10 carries segments in three of its quadrants, namely an offset blanket segment 10*a*, an offset printing plate segment 10*b* bearing a mirror image 1 and an offset printing plate segment 10*c* bearing a positive image 2. The offset blanket segment 10*a* is diametrically opposite the positive plate segment 10*c*, and the mirror image segment 10*b* is between the two. The surface 10*d* of the auxiliary cylinder serves as an offset blanket, and the cylinder 11 carries a semicylindrical offset blanket segment 10*e*.

In operation, the blanket surface 10*d* of the auxiliary cylinder 45 is moved into operative contact with the segments 10*a* and 10*b* of the large cylinder 10, and separated from the cylinder 10 during the other half cycle of the machine. Consequently, the image 1 of the segment 10*b* is transferred to the blanket 10*d* of the auxiliary cylinder, and in turn the blanket surface 10*d* of the auxiliary cylinder transfers the image to the blanket surface of the segment 10*a*. The positive image 2 of the segment 10*c* is transferred to the blanket segment 10*e* of the cylinder 11. Therefore, a sheet fed between the cylinders 10, 11 will be printed on one side from the segment 10*a*, receiving the image 1 therefrom, and on the other side from the segment 10*e*, receiving the image 2 therefrom, during a single cycle of the machine.

Fig. 6 illustrates the adaptation of the machine of the present invention for printing a composite image on one side of a sheet by superimposing images from offset and relief printing plates. In this arrangement, the segment

10*f* is an offset plate bearing a mirror image 1 and the segment 10*g* is a relief plate bearing a mirror image 2. The segment 10*h* therebetween is an offset blanket. In this case, also, the surface 10*i* of the auxiliary cylinder serves as a blanket. The segment 10*j* carried by the cylinder 11 serves as an impression surface. In this embodiment, it is not necessary to move the auxiliary cylinder toward and away from the cylinder 10, since it is desirable that the auxiliary cylinder operatively engage the segments 10*f*, 10*h* and 10*g* of the cylinder 10. During the rotation of the cylinder 10, the image 1 from the offset plate segment 10*f* and the image 2 from the relief plate 10*g* are superimposed on the blanket surface 10*i* of the auxiliary cylinder, and the composite image is transferred to the blanket segment 10*h*, which surface transfers the composite image onto a sheet fed between the cylinders 10, 11.

Fig. 7 illustrates adaptation of the machine of the present invention for printing, during each machine cycle, a composite image formed by superimposed images from offset plates on one side of a sheet and a different image on the opposite side of the sheet. Accordingly, in this arrangement the cylinder 10 is equipped with segments 10*k*, 10*l*, 10*m* and 10*n*. The segment 10*k* carries an offset printing plate bearing a positive image 1, the segment 10*l* carries an offset printing plate bearing a mirror image 2, the segment 10*m* carries a blanket surface and the segment 10*n* carries a relief printing plate bearing a mirror image 3. The surface 10*o* of the auxiliary cylinder serves as a blanket, and the surface of the segment 10*p* carried by the cylinder 11 also serves as a blanket.

In this embodiment, the auxiliary cylinder 45 is moved into contact with the segments 10*l*, 10*m* and 10*n*, and thrown out so as not to receive an image from the segment 10*k*. The images 2 from the segment 10*l* and the image 3 from the segment 10*n* will be superimposed on the blanket surface 10*o* of the auxiliary cylinder, and the superimposed composite image will be transferred to the segment 10*m*. The image 1 of the segment 10*k* will be transferred to the segment 10*p*. Consequently, a sheet fed between the cylinders 10, 11 will receive the composite image 2 and 3 from the segment 10*m* on one side and the image 1 from the segment 10*p* on the opposite side thereof.

Fig. 8 illustrates the adaptation of the machine of the present invention to the superimposing of different images and different printing media onto a common form and repeating the composite image several times on the one side of a sheet of paper. In this embodiment, the diameter of the auxiliary cylinder 45*a* is only one-eighth the diameter of the larger cylinder 10, and the auxiliary cylinder need not oscillate. The large cylinder carries segments 10*q* and 10*r*, one adjacent to the other, and each being one-eighth of the entire circumference of the cylinder 10. The segment 10*q* is an offset plate bearing a mirror image 1, and the segment 10*r* may be a relief plate bearing a mirror image 2. The large cylinder 10 also carries a segment 10*s* which occupies substantially one-half the circumference of the cylinder and carries a blanket surface.

In operation, the image 1 from the segment 10*q* and the image 2 from the segment 10*r* are super-imposed on the surface of the auxiliary cylinder 45*a*, which surface serves as a blanket, and the cylinder 45*a* repeats the composite superimposed image 1 and 2 four times over on the blanket surface segment 10*s*. The segment 10*s* then prints the repeated image on a sheet fed between the cylinders 10, 11, the surface of cylinder 11 serving as an impression surface.

Fig. 9 illustrates the adaptation of the machine of the present invention to the printing of multiple colors from different printing media on a common cylinder during a single machine cycle. This embodiment is essentially the same as that described in connection with Fig. 6, except that the images carried by the segments 10*f* and 10*g* are of different color. For example, the segment 10*f* may receive black ink and the segment 10*g* red ink, and the red and black images may be superimposed on the blanket surface 10*i* of the auxiliary cylinder 45. The blanket surface of the segment 10*i* will then transfer the composite image to the blanket surface of the segment 10*h* from which they are printed on a sheet passing between the cylinders 10, 11.

Finally, the Fig. 10 illustrates the application of the present invention to a machine for repeating the same image several times on a sheet of paper from a single form or plate carried by the segment 10*q*. This arrangement is essentially the same as the arrangement shown in Fig. 8, except that the segment 10*r* is removed. The image from the plate 10*q* is transferred to the auxiliary cylinder. The image is repeated four times on the blanket surface of the segment 10*s*, and the repeated image is printed on a sheet passing between the cylinders 10, 11, the surface of the cylinder 11 serving as an impression surface.

It is evident that all of these arrangements, as well as others, are obtainable on a machine of the type described in the above-identified Davidson patent merely by changing the segments carried by the cylinders 10, 11, substituting an auxiliary cylinder of different diameter and controlling the time at which the auxiliary cylinder is moved into operative engagement and thrown out of operative engagement with the cylinder 10.

It is, of course, evident that in addition to superimposing multiple images on an auxiliary cylinder to obtain interesting printing effects, it is also possible to superimpose multiple images on one of the press cylinders, whereby the composite image formed thereby may be printed directly on a sheet. For example, an arrangement is shown in Fig. 11 of a machine wherein the main cylinder, generally designated 100, carries three segments 101, 102 and 103 about its periphery. The circumference of the effective surface of the auxiliary cylinder 104 is equal to the circumferential length of each of the segments carried by the main cylinder. The smaller cylinder 105, which together with the cylinder 100 forms the printing press, is the same size as the auxiliary cylinder 104.

As usual, the paper sheets are fed from a conveyor 106 to grippers 107 carried by continuous chains 108 which encircle the sprockets 109 and 110. The grippers 107 receive the leading edges of sheets fed from the conveyor 106, carry the sheets between the cylinders 100 and 105 and ultimately release the sheets in a paper hopper 111, much in the same manner as in the operation of the Davidson machine.

In this arrangement a sheet may be fed during each cycle of operation of the machine, the sheet being in contact with the segment 103 and the surface of the cylinder 105. It is evident, therefore, that the surface of the cylinder 105, may, if desired, receive images from either or both of the segments 101 and 102, if the press is to be used for perfection printing. Thus, superimposed images mabe received by the image receiving surface of the cylinder 105 and a composite image printed therefrom onto a sheet of paper. Obviously if the press is not used for perfection printing, the surface of the cylinder 105 may serve merely as an impression surface.

Also, the auxiliary cylinder 104 may be moved into operative contact with any or all of the segments 101, 102 and 103 to receive images from certain of the segments and to transfer them to the surfaces of other of the segments. Thus, this arrangement makes it possible to transfer superposed images to the surface of the cylinder 105 from two or more segments of the larger cylinder 100, so that the cylinder 105 may print a composite image thereof on one side of a sheet. Also, superposed images from two or more segments of the cylinders 100 may be transferred to the surface of the auxiliary cylinder 104 and a composite image transferred to an

image receiving segment of the cylinder **100**, so that the composite image may be printed thereby on the other side of a sheet. Obviously, a greater number of segments may be carried by the larger cylinder **100**, so that composite images may be printed on both sides of the sheet.

It will be observed that this embodiment provides for two separate inking mechanisms **113** and **114** and a dampening unit **115**. This arrangement will, therefore, permit printing in two colors during a single cycle of operation from offset and/or relief printing media. Thus, it is evident that the invention is applicable to machines of a wide variety, regardless of the number of segments carried by the larger cylinder **100** of the printing press.

The various arrangements above described are, of course, not intended to be exhaustive of the number of different printing effects which can be achieved on this machine by means of the present invention.

The invention has been shown by way of example only, and various modifications and variations may be made therein without departing from the spirit of the invention. It is to be understood, therefore, that the invention is not to be limited to any specified form or embodiment, except insofar as such limitations are set forth in the claims.

I claim:

1. In a rotary printing press, two cylinders in substantially tangential relationship comprising the printing press, an auxiliary cylinder in substantially tangential relationship with respect to one of the cylinders of the press, said auxiliary cylinder receiving images from areas of the cylinder and transferring the images to other areas of the cylinder, means for feeding sheets to the printing press, first means for effecting the separation of the cylinders comprising the press, and second means for effecting the separation of the auxiliary cylinder and the cylinder of the press which it engages, sheet detecting means, means controlled by the sheet detecting means for conditioning both said first and second means for operation, means for triggering the operation of said first means at a predetermined time in the machine cycle, whereby the cylinders comprising the press will be separated if said first and second means have been previously conditioned for operation, and means for triggering independently the operation of said second means at a predetermined time in the machine cycle, whereby the auxiliary cylinder and the cylinder of the press will be separated if said first and second means have been previously conditioned for operation, and means for imparting a predetermined series of movements to the auxiliary cylinder during each printing cycle to move the auxiliary cylinder into contact with predetermined areas of said cylinder and to move the auxiliary cylinder out of contact with predetermined areas of said cylinder.

2. In a rotary printing press, two cylinders in substantially tangential relationship comprising the printing press, an auxiliary cylinder in substantially tangential relationship with one of the cylinders of the press, said auxiliary cylinder receiving images from and transferring images to areas of the press cylinder, rotatable eccentric supports for the auxiliary cylinder, the rotation of the supports moving the auxiliary cylinder toward and away from the press cylinder, means urging the rotation of the supports to move the auxiliary cylinder away from the press cylinder, a latch for preventing the rotation of the supports to prevent the movement of the auxiliary cylinder away from the press cylinder, means operable at predetermined times during a machine cycle, sheet detecting means, means for conditioning the latch for release, said means being controlled by the failure of the sheet detecting means to detect the feeding of a sheet during a machine cycle and by means operable at predetermined times during a machine cycle, means for effecting the release of the latch at predetermined times during the machine cycle after the latch has been previously conditioned for release, thereby separating the auxiliary cylinder from the press cylinder, and, in addition, for effecting the release of the latch if a sheet is not delivered to the printing press during a given cycle of operation.

3. In a rotary printing press, two cylinders in substantially tangential relationship comprising the printing press, an auxiliary cylinder in substantially tagential relationship with one of the cylinders of the press, said auxiliary cylinder receiving images from certain areas of the press cylinder and transferring the images to certain other areas of the press cylinder, rotatable eccentric supports for the auxiliary cylinder, the rotation of said supports moving the auxiliary cylinder toward and away from the press cylinder, means urging the rotation of the supports to move the auxiliary cylinder away from the press cylinder, a shoulder associated with the rotatable eccentric supports, a latch normally engaging the shoulder to maintain the auxiliary cylinder in operative engagement with the press cylinder, a movable link to condition the latch for release, a yielding connection between the link and the latch, whereby the movement of the link urges the latch to release position, the pressure between the shoulder and the latch preventing the release of the latch, a cam operated lever for moving the the link to condition the latch for release, sheet detecting means, means controlled by the failure of the sheet detecting means to sense the feeding of a sheet during a machine cycle to move the link to condition the latch for release, and a cam operated lever for reducing the pressure between the latch and the shoulder to effect the release of the latch when the link has been moved to condition the latch for release.

4. A rotary printing press comprising a pair of cylinders forming a printing couple between which sheets are periodically fed, the diameter of one of the cylinders being a multiple of the diameter of the other, the larger cylinder carrying a plurality of segments, including at least two segments having image transferring surfaces and a segment having an image receiving surface, an auxiliary cylinder remote from the path of travel of the sheets fed between the printing couple and having a surface which is both image receiving and image transferring, the diameter of the larger cylinder of the printing couple being a multiple of the diameter of the auxiliary cylinder, and means for imparting predetermined relative movement between the axes of the auxiliary cylinder and the larger cylinder during each cycle of operation of the larger cylinder to move the surface carried by the auxiliary cylinder into contact with one of the image transferring surfaces to receive an image thereon and one of the image receiving surfaces to transfer the image thereto, and out of contact with the other image transferring surface of the larger cylinder.

5. A rotary printing press comprising a pair of cylinders forming a printing couple between which sheets are periodically fed, the diameter of one of the cylinders being a multiple of the diameter of the other, the larger cylinder carrying a plurality of segments including image transferring and image receiving surfaces, an auxiliary cylinder having a surface which is both image receiving and image transferring, the diameter of the smaller cylinder of the printing couple being a multiple of the diameter of the auxiliary cylinder, and means for imparting a predetermined controlled movement to the axis of the auxiliary cylinder during each cycle of operation of the larger cylinder of the printing couple to move the surface carried by the auxiliary cylinder into contact with one of the image transferring surfaces to receive an image thereon and one of the image receiving surfaces to transfer the image thereto, and out of contact with still another image transferring surface of the larger cylinder.

6. A rotary printing press comprising a pair of cylinders forming a printing couple between which sheets are periodically fed, the diameter of one of the cylinders being a multiple of the diameter of the other, the larger

cylinder carrying a plurality of segments, at least two of said segments having image transferring surfaces, and at least one of said segments having an image receiving surface, an auxiliary cylinder having a surface which is both image receiving and image transferring, the circumference of the surface of the auxiliary cylinder being equal to the circumferential length of the segments of the larger cylinder having image transferring surfaces, and means for imparting a predetermined controlled movement to the axis of the auxiliary cylinder during each cycle of operation of the larger cylinder of the printing couple to move the surface of the auxiliary cylinder into contact with both image transferring surfaces to superpose both images on the surface of the auxiliary cylinder and to transfer a composite of the two superposed images to the image receiving segment of the larger cylinder.

7. A rotary printing press as set forth in claim 6 including means for inking the two image transferring surfaces of the larger cylinder with different colored ink, whereby the composite image is multi-colored.

8. A rotary printing press comprising a pair of cylinders forming a printing couple between which sheets are periodically fed, the diameter of one of the cylinders being a multiple of the diameter of the other, the larger cylinder carrying a plurality of segments including an image transferring surface and an image receiving surface, an auxiliary cylinder having a surface which is both image receiving and image transferring, the diameter of the larger cylinder of the printing couple being a multiple of the diameter of the auxiliary cylinder, and means for imparting a predetermined controlled movement to the axis of the auxiliary cylinder during each cycle of operation of the larger cylinder of the printing couple to move the surface carried by the auxiliary cylinder into contact with one of the image transferring surfaces to receive an image thereon and with the image receiving surface of the larger cylinder to transfer the same image at least twice thereto, and out of contact with the other image transferring surface of the larger cylinder.

9. A rotary printing press comprising a pair of cylinders forming a printing couple between which sheets are periodically fed, one of the cylinders being larger than the other, the larger cylinder carrying a plurality of segments including image transferring and image receiving surfaces, an auxiliary cylinder remote from the path of travel of the sheet and having a surface which is both image receiving and image transferring, the cylinders forming the printing couple and auxiliary cylinder all being of different diameter, the diameter of the larger cylinder of the printing couple being a multiple of the diameter of the smaller cylinder thereof, and the diameter of the smaller cylinder of the printing couple being a multiple of the diameter of the auxiliary cylinder, and means for imparting a predetermined controlled movement to the axis of the auxiliary cylinder during each cycle of operation of the larger cylinder of the printing couple to move the surface carried by the auxiliary cylinder into contact with one of the image transferring surfaces of the larger cylinder to receive an image thereon and one of the image receiving surfaces to transfer an image thereto, and out of contact with still another image transferring surface of the larger cylinder.

10. A rotary printing press comprising a pair of cylinders forming a printing couple between which sheets are periodically fed, the diameter of the two cylinders being in the ratio of 2:1, the surface of the larger cylinder carrying a plurality of segments including image transferring and image receiving surfaces, an auxiliary cylinder having a surface which is both image receiving and image transferring, the ratio of the diameters of the larger cylinder of the printing couple and the auxiliary cylinder being at least 4:1, and means for imparting a predetermined controlled movement to the axis of the auxiliary cylinder during each cycle of operation of the larger cylinder of the printing couple to move the surface of the auxiliary cylinder into contact with one of the image transferring surfaces to receive an image thereon and one of the image receiving surfaces to transfer an image thereto.

11. A rotary printing press as set forth in claim 10 wherein the smaller cylinder of the printing couple carries a surface which is image receiving, the image from the image transferring surface of the larger cylinder of the printing couple which is not transferred to the surface of the auxiliary cylinder being transferred to the surface of the smaller cylinder of the printing couple between the feed of sheets therebetween.

12. A rotary printing press as set forth in claim 10 wherein the larger cylinder has two image transferring segments and the images of both image transferring segments of the larger cylinder are transferred in superposed relationship on the surface of the auxiliary cylinder and the superposed images transferred from the auxiliary cylinder to an image receiving segment of the larger cylinder to print a composite of the superposed images.

13. A rotary printing press comprising a pair of cylinders forming a printing couple between which sheets are periodically fed, the diameter of one of the cylinders being a multiple of the diameter of the other, the larger cylinder carrying a plurality of segments, which segments include at least two segments having image transferring surfaces and a segment having an image receiving surface, an auxiliary cylinder remote from the path of travel of the sheets fed between the printing couple and having a surface which is both image receiving and image transferring, the diameter of the larger cylinder of the printing couple being a multiple of the diameter of the auxiliary cylinder, means for imparting a predetermined controlled movement to the axis of the auxiliary cylinder during each cycle of operation of the larger cylinder of the printing couple to move the surface carried by the auxiliary cylinder into contact with one of the image transferring surfaces to receive an image thereon and with one of the image receiving surfaces to transfer an image thereto, and out of contact with the other image transferring surface of the larger cylinder, means for conditioning the cylinders forming the printing couple for separation, means for conditioning the auxiliary cylinder for separation from the larger cylinder of the printing couple whenever the cylinders forming the printing couple are conditioned for separation and independently thereof at other times as well, and means for separately triggering the separation of the larger cylinder and the smaller cylinder, on the one hand, and the auxiliary cylinder from the larger cylinder, on the other hand.

14. In a rotary printing press, first and second cylinders forming a printing couple between which sheets are periodically fed, the circumference of said first cylinder having a plurality of different areas, said areas including a printing surface and an image receiving surface, an auxiliary cylinder having an image receiving surface, and means for imparting a predetermined series of movements to the auxiliary cylinder during each complete revolution of said first cylinder to move the auxiliary cylinder into contact with the larger cylinder to receive the image from the printing surface and to repeat the image at least twice on the image receiving surface.

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