Sept. 21, 1971 L. J. CHAMBON 3,606,835

OFFSET ROTARY PRINTING MACHINE

Filed July 10, 1969 3 Sheets-Sheet 1

Fig.1.

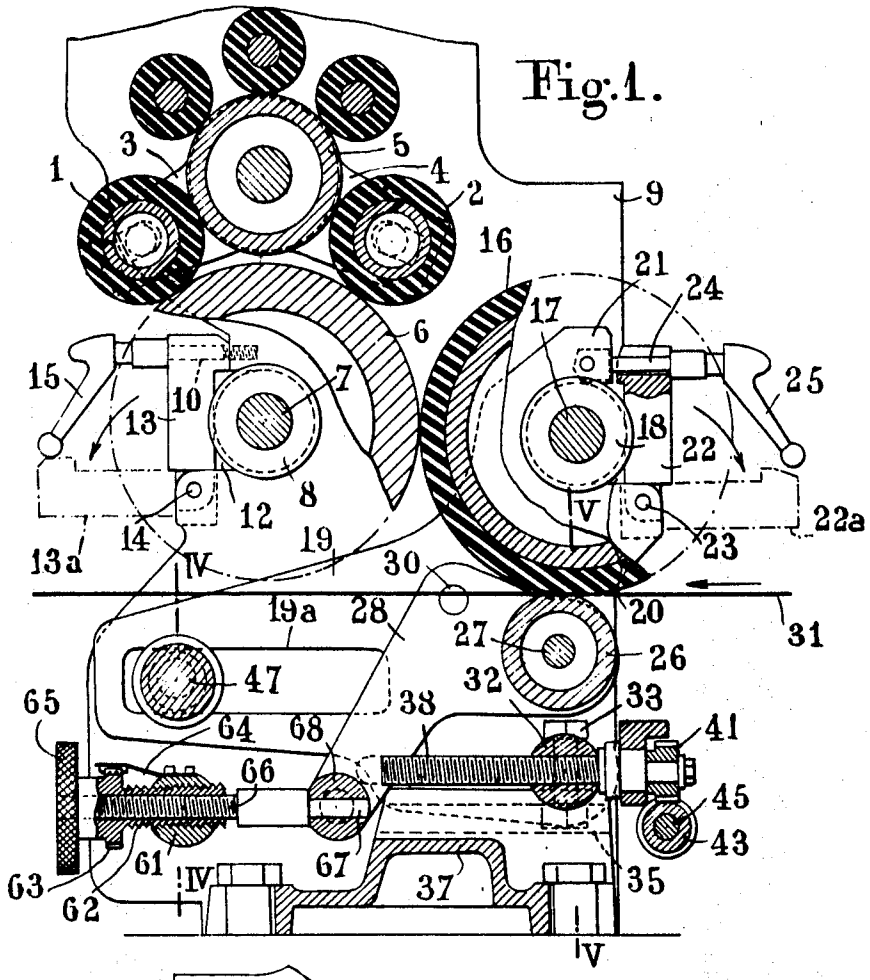
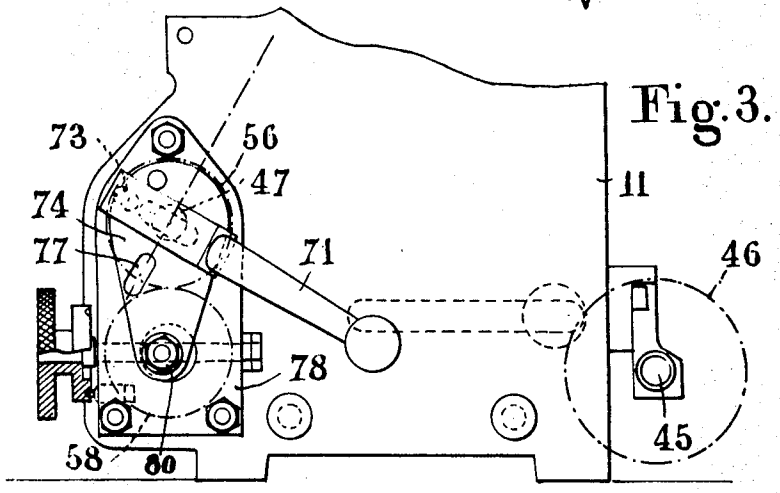


Fig.3.



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OFFSET ROTARY PRINTING MACHINE

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Fig. 2.

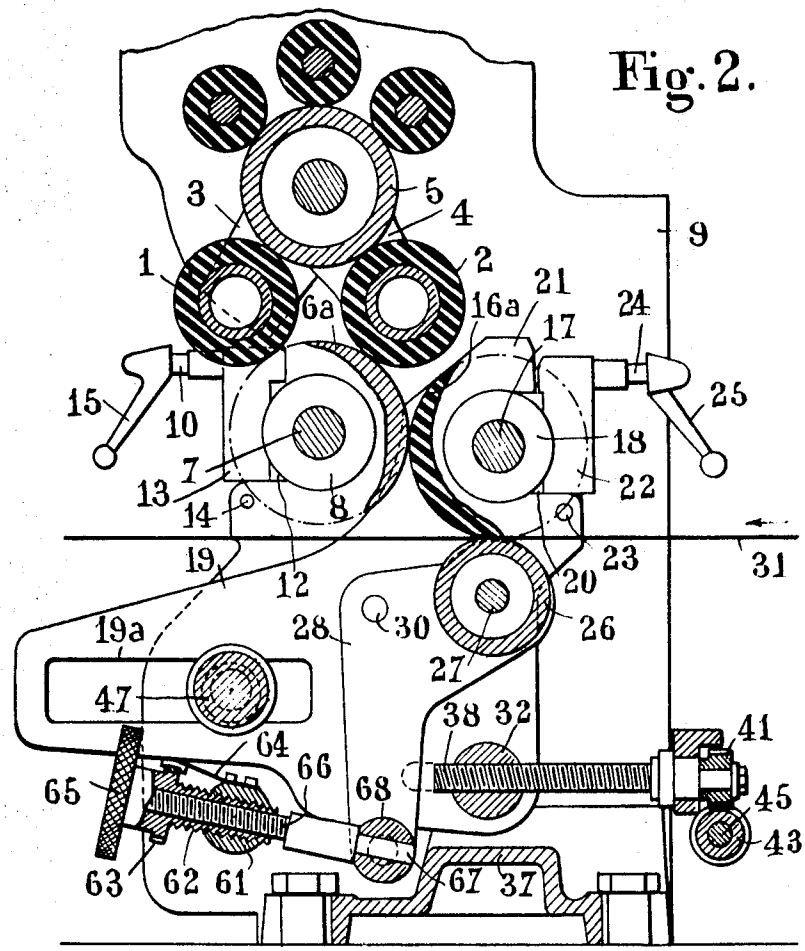
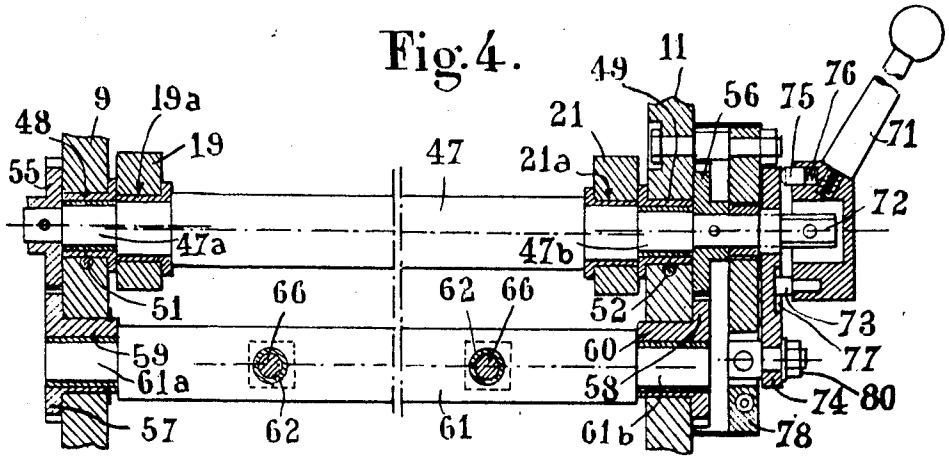


Fig. 4.



OFFSET ROTARY PRINTING MACHINE

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Fig. 5.

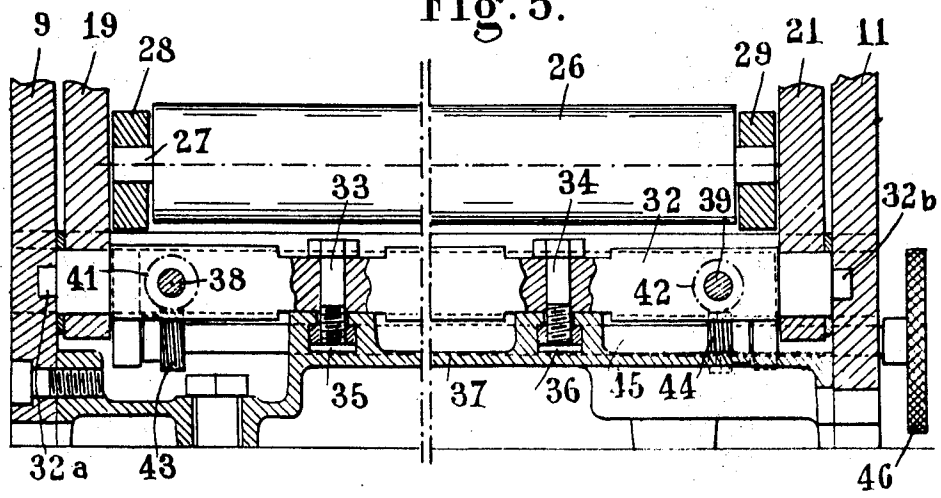
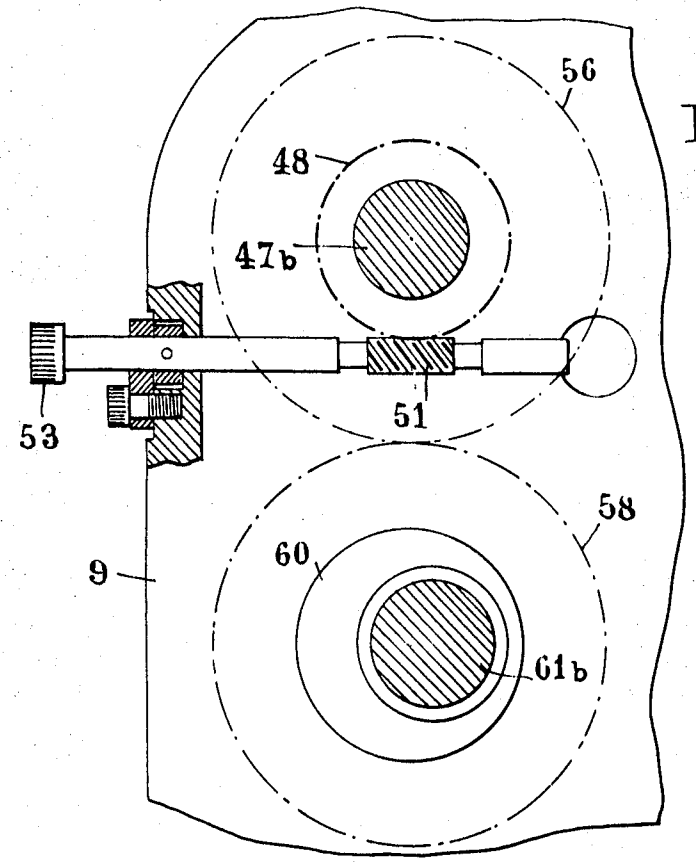


Fig. 6.



United States Patent Office 3,606,835 Patented Sept. 21, 1971

3,606,835

OFFSET ROTARY PRINTING MACHINE

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Filed July 10, 1969, Ser. No. 840,719
Int. Cl. B41f 13/34
U.S. Cl. 101—218 9 Claims

ABSTRACT OF THE DISCLOSURE

An offset rotary press wherein the printing and impression cylinders are carried by a pair of vertical flanges mounted for longitudinal and horizontal sliding movement on said frame structure, so as to bring said printing cylinder in contact with the plate cylinder by causing said pair of flanges to slide horizontally. Means are provided for converting the horizontal sliding movement of said pair of flanges into a vertical movement of said impression cylinder so to constantly bring said impression cylinder into engagement with the lower portion of said printing cylinder when said printing cylinder itself is in engagement with the plate cylinder.

The size change operation can be carried out very rapidly since putting said printing cylinder and plate cylinder in mutual contact by causing the horizontal sliding movement of said pair of flanges will automatically cause said impression cylinder to be properly set in position against said printing cylinder, irrespective of the size contemplated.

BACKGROUND OF THE INVENTION

The present invention relates in general to printing machine and has specific reference to improvements in or relating to offset rotary presses.

Rotary presses of this type are already known comprise essentially and etched, gravure offset or plate cylinder tangent to a printing, blanket or transfer cylinder covered with resilient material such as rubber, and an impression or countercylinder engaging the blanket or printing cylinder, the paper web being fed between the printing cylinder and the impression cylinder.

In hitherto known rotary presses of this character, changing the size constitutes a long and tedious operation. In fact the plate cylinder and the printing cylinder must be removed and replaced by corresponding cylinders having the desired new size; then the new cylinders must be set in proper mutual contact, adjusted for pressure and the impression cylinder is adjusted accordingly.

SUMMARY OF THE INVENTION

It is the essential object of the present invention to provide an arrangement whereby this size-change operation can be performed rapidly and conveniently by resorting to a particularly simple combination of means.

To this end, the offset rotary press according to the present invention, which comprises a plate cylinder rotatably mounted in bearings mounted in fixed positions on the frame structure of the machine, a printing or blanket cylinder tangent of said plate cylinder and slightly offset downwards with respect thereto, and an impression cylinder underlying said printing cylinder, is characterized in that said printing and impression cylinders are carried by a pair of vertical flanges mounted for longitudinal horizontal sliding movement on said frame structure, so as to bring said printing cylinder in contact with the plate cylinder by causing said pair of flanges to slide horizontally, and that means are provided for converting the horizontal sliding movement of said pair of flanges into a vertical movement of said impression cylinder so to constantly bring said impression cylinder into engagement with the lower portion of said printing cylinder when said printing cylinder itself is in engagement with the plate cylinder.

The rotary press according to this invention is advantageous in that the size change operation can be carried out very rapidly since putting said printing and plate cylinder in mutual contact by causing the horizontal sliding movement of said pair of flanges will automatically cause said impression cylinder to be properly set in position against said printing cylinder, irrespective of the size contemplated.

On the other hand, the bearings supporting the shaft of said plate cylinder and the bearings supporting the shaft of the printing cylinder are mounted in corresponding recesses provided in the frame structure and in said sliding flanges, quick-release locking means being provided for retaining said cylinder shaft bearings in said recesses, in order to permit a very easy removal of said bearings from said recesses.

Finally, since the plate and printing cylinders are disposed side by side in the horizontal direction, the machine has reduced vertical dimensions and these cylinders can easily be removed from one or the other side of the frame structure of the machine.

BRIEF DESCRIPTION OF THE DRAWINGS

A typical form of embodiment of the present invention will now be described by way of example with reference to the attached drawing, in which:

FIG. 1 is a vertical longitudinal section taken across an offset rotary press set for the largest size;

FIG. 2 is a view similar to FIG. 1 but showing the press set for printing on the smallest size;

FIG. 3 is a fragmentary elevational view of the press;

FIG. 4 is a fragmentary cross-sectional view taken along the line IV—IV of FIG. 1;

FIG. 5 is a fragmentary cross-sectional view taken along the line V—V of FIG. 1; and

FIG. 6 is a fragmentary longitudinal section showing on a larger scale a parallelism adjustment device.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The offset rotary press according to this invention comprises conventional inking and wetting means shown only partially in the drawing. These means comprise notably a pair of inking rollers **1**, **2** covered with soft material and rotatably mounted to pivoted arms **3**, **4** and tangent to a central cylinder **5** constituting the inking bed.

The inking rollers **1** and **2** are tangent to an etched or plate cylinder **6** rigid with a transverse shaft **7** rotatably mounted in bearings **8** carried by the pair of vertical lateral flanges or uprights **9** and **11** constituting the fixed frame structure of the machine. These bearings **8** are mounted in correspondingly shaped recesses **12** in which they are locked in position by lock members **13** pivoted by means of pins **14** on said flanges or uprights **9** and **11**. Each lock member **13** is held in its vertical locking position by means of a screw **10** engaged in a tapped hole in the corresponding upright or flange and adapted to be actuated by means of a locking handle **15**.

The plate cylinder **6** corresponding to the major size, as shown in FIG. 1, and the plate cylinder **6***a* corresponding to the minor size, as shown in FIG. 2, are thus adapted to be locked in printing position by lock members **13** when these members are disposed vertically as shown in thick lines in the drawing.

When it is desired to remove the plate or gravure cylinder **6** or **6***a* for changing the size, the screws **10** are unscrewed by rotating the handles **15** so that the lock members **13** are released and can be pivoted to their horizontal position **13***a* shown in dot and dash lines, after the inking roller **1** has been moved upwards. Then the plate cylin-

der 6 is removed from the machine and can easily be replaced by another cylinder of different size. The various component elements are restored to their printing position by reversing the above-described sequence of steps.

Adjacent the plate cylinder 6 is the printing, transfer or blanket cylinder 16. This cylinder 16 is tangent to the plate cylinder 6 and both are slightly offset in the vertical direction. The printing cylinder 16 has the same diameter as the plate cylinder 6 and therefore its diameter must be changed when the size is to be changed. In FIG. 2 it will be seen that the printing cylinder 16*a* tangent to the plate cylinder 6*a* corresponding to the minimum size actually has a smaller diameter than cylinder 16 illustrated in FIG. 1 and corresponding to the maximum size.

The plate cylinder 16 or 16*a* is rigid with a transverse shaft 17 rotatably mounted in bearings 18 locked in recesses 20 formed in a pair of vertical flanges 19 and 21 mounted for longitudinal sliding movement inside the aforesaid pair of fixed flanges or uprights 9 and 11 constituting the fixed frame structure of the machine.

Their sliding movements are controlled by means to be described in detail presently. Each bearing 18 of shaft 17 of printing cylinder 16 is retained in its recess 20 by a locking device similar to those associated with the plate cylinder 6. Each bearing locking device comprises a locking member 22 pivoted about a horizontal pin 23 carried by the flange 19 or 21, and a locking bolt 24 adapted to be actuated by means of handle 25. When the locking member 22 is locked in its vertical position (shown in thick lines in FIGS. 1 and 2) the corresponding bearing 18 is held in its recess 20 and the printing cylinder 16 is held in its proper position during the printing operation.

When it is desired to remove the printing cylinder 16 for substituting another printing cylinder therefore, it is only necessary to release the locking member 22 by actuating the handle 25 and cause said locking member 22 to pivot to its horizontal position 22*a* shown in dash and dot lines, whereafter each bearing 18 can be pulled out from its recess 20 by sliding along the lower edge thereof and then along the locking member in the horizontal position 22*a* shown in dash and dot lines.

Beneath the printing cylinder 16 and in rolling contact therewith is an impression or counterpart cylinder 26 rigid with a transverse shaft 27 having its ends rotatably mounted on first arms of a pair of parallel bell-crank levers 28 and 29 fulcrumed on flanges 19 and 21 respectively by means of pivot pins 30. The paper web 31 to be printed travels from right to left as seen in FIGS. 1 and 2, between the upper printing cylinder 16 and the lower impression cylinder 26.

Now the mechanism for causing the sliding movement of flanges 19 and 21 in relation to the fixed uprights 9 and 11 of the frame structure will be described in detail with reference notably to FIG. 5. The movable flanges 19 and 21 are interconnected by a transverse distance-piece forming bar 32 underlying the impression cylinder 26 and extending through said flanges 19 and 21; the ends 32*a* and 32*b* of this bar are slidably mounted in horizontal elongated apertures formed in said fixed uprights 9 and 11, respectively. The central portion of bar 32 receives therethrough a pair of parallel radial tightening bolts 33 and 34 having their nuts housed in longitudial grooves 35 and 36 formed in the central portion of the bed 37 of the machine. The bolts 33 and 34 are tightened to lock the distance-piece forming bar 32 and therefore the movable flanges 19 and 21 in the desired position after a mounting or size-changing operation.

The transverse bar 32 also receives therethrough a pair of spaced horizontal screw-threaded rods 38 and 39 engaging diametral tapped holes formed in this bar 32. The outer ends of these screw-threaded rods are rigid with toothed wheels 41 and 42, respectively, meshing with relevant worms screws 43 and 44, respectievly, rigid with a transverse shaft 45 carrying at its control end a size-adjusting handwheel 46.

In their portions adjacent the paper web output end the flanges 19 and 21 have a pair of parallel elongated apertures 19*a* and 21*a* formed therethrough for receiving the cylindrical journals of a transverse shaft 47 carrying beyond its end eccentric trunnions 47*a* and 47*b* respectively. These trunnions are fitted in turn in eccentric bores formed in corresponding sockets 48 and 49 mounted in recesses provided to this end in the fixed uprights or flanges 9 and 11. These sockets 48 and 49 are adapted to be rotatably driven for correcting the parallelism, as will be explained presently, by means of longitudinal worms 51 and 52 meshing with corresponding teeth formed on the outer surface of said sockets, said worms being adapted to be rotated by means of milled knobs such as the milled knob 53 (FIG. 6) controlling the rotation of worm 51.

The shaft 47 controlling the force with which the printing cylinder 16 is pressed against the plate cylinder 6, as will be seen presently, has its ends rigid with pinions 55 and 56, respectively meshing with pinions 57 and 58 of same diameter but having socket extensions 59 and 60 rotatably mounted in recesses provided to this end in the fixed uprights or flanges 9 and 11, respectively. These sockets are formed with eccentric cylindrical bores engaged by the end trunnions 61*a* and 61*b* respectively of a transverse shaft 61 disposed beneath the aforesaid shaft 47 and controlling the shifting of the impression cylinder 26.

The device controlling the adjustment of the pressure exerted by the impression cylinder 26 comprises two identical mechanisms of which only one will be described in detail, this mechanism being illustrated in FIGS. 1 and 2. The transverse shaft 61 comprises a diametral tapped hole engaged by an externally screw-threaded socket 62 rigid with a lock pinion 63 receiving between its teeth a locking finger carried by one end of a spring blade 64 secured at its opposite end to the shaft 61. The outer end of socket 62 is rigid with a milled handwheel or knob 65 for controlling the impression cylinder pressure adjustment. Screwed in the axial tapped bore of socket 62 is a screw-threaded rod 66 of which the plain inner end 67 engages a diametral hole formed in a transverse distance-piece 68 rotatably mounted on the lower ends of the other arms of bell-crank levers 28 and 29. The assembly comprising the socket 62 and screw-threaded rod 66 constitutes a differential screw to increase the precision of the desired adjustment.

The shaft 47 controlling the setting and removal of the pressure exerted between cylinders 6 and 16 has its front end rigid with a control handle 71 pivoted to a transverse pin 72. This handle 71 carries a locking pin 73 urged against the fixed bearing plate 74 by the action of a diametrally opposite pin 75 mounted in a recess of handle 71 and pressed against said bearing plate 74 by a coil compression spring 76 disposed in said recess. The bearing plate 74 has formed therein a recess 77 engageable by the locking pin 73 for holding the shaft 47 against movement in its pressure setting position. The position of said bearing plate 74 is adjustable in relation to a supporting plate 78 secured to the upright 11 in order to ensure the correlative adjustment of the value of the pressure produced between the printing cylinder 16 and the impression cylinder 6. The bearing plate 74 is secured to the support plate 78 by a threaded fastener 80. The position of the bearing plate 74 is adjustable in relation to the supporting plate 78 by rotating the fastener 80 in a direction to increase or decrease the distance between the bearing plate 74 and the supporting plate 78, as desired. This in turn increases or decreases the force exerted by the bearing plate 74 on the locking pin 73 to insure the correlative adjustment of the value of the pressure produced between the printing cylinder 16 and the impression cylinder 6.

The size-changing operation will now be described by assuming that it is desired to change from a large-size printing process, utilizing the plate cylinder 6 and print-

ing cylinder **18** of FIG. 1, to a small-size printing process, utilizing in lieu thereof the plate cylinder **6***a* and impression cylinder **16***a*, shown in FIG. 2.

With the rotary press set in the position illustrated in FIG. 1, firstly the pressure between cylinders **6** and **16** is relieved by unlocking the handle **71**, i.e. by rotating this handle **71** about the pivot pin **72** for removing the locking pin **73** from recess **77**. Then the same handle **71** is actuated to rotate the shaft **47** eccentrically mounted in sockets **48** and **49**, and thus raise this shaft **47** and consequently move the printing cylinder **16** away from the plate cylinder **6** while simultaneously relieving the pressure exerted by the impression cylinder **26**, the necessary movement being obtained via pinions **56**, **58** and **55**, **57**, and eccentric sockets **59** and **60**. The raising of the shaft **47** causes flanges **19** and **21** to pivot about the bar **32** with the resulting movement of the printing cylinder **16** away from the plate cylinder **6**. The activation of the handle **71** rotating shaft **47** simultaneously causes a rotation of pinions **55** and **56**, and consequently a rotation of pinions **57** and **58** with which they are in mesh. The rotation of the pinions **57** and **58** rotates in turn the shaft **61** which is eccentrically mounted in sockets **59** and **60**. This lowers the shaft **61** and displaces the screw threaded rod **66** angularly upward with the resultant raising of the lower distance-piece shaft **68**. This movement causes the levers **28** and **29** to rotate about the pivot pins **30** and to move the impression cylinder **26** away from the printing cylinder **16** thereby relieving the pressure exerted by the impression cylinder **26**.

The plate cylinder **6** is subsequently removed and replaced by the cylinder **6***a* in the manner already explained hereinabove. The same procedure is followed for replacing the printing cylinder **16** with the smaller cylinder **16***a*. Due to the reduction in the diameters of cylinders **6***a* and **16***a*, these are somewhat spaced from each other, as the movable flanges **19** and **21** are still in the initial position shown in FIG. 1.

Then the pressure exerted by the new printing cylinder **16***a* is reset by actuating the handle **71**.

The position of this printing cylinder **16***a* with respect to plate cylinder **6***a* is subsequently set by moving the flanges **19** and **21** to the left as seen in FIGS. 1 and 2. To this end, the bolts **33** and **34** provided for locking the transverse distance-piece forming bar **32** to the bed **37** are firstly released; then the size control handwheel **46** is rotated for causing the rotation in the proper direction of the longitudinal screw-threaded rods **38** and **39** by means of the transverse shafts **45**, worms screws **43**, **44**, and worms wheels **41**, **42**. The simultaneous rotation of screw-threaded rods **38** and **39** is attended by a movement of translation of the distance-piece forming bar **32**, its ends **32***a* and **32***b* sliding in the elongated holes formed in the fixed uprights **9** and **11**.

The flanges **19** and **21** slide on the journals of the upper transverse shaft **47** fitted in the elongated apertures **19***a* and **21***a*. Therefore the small-diameter printing cylinder **16***a* is moved towards the plate cylinder **6***a* until it engages same, the end position corresponding to the previously obtained pressure setting.

During the movement of the pair of movable flanges **19** and **21** and printing cylinder **16***a* to the left the pivot pins **30** of bell-crank levers **28** and **29** supporting the impression cylinnder **26** are also moved to the left while the distance-piece forming shaft **68** interconnecting the lower ends of levers **28** and **29** is held against motion by the ends **67** of screw-threaded rods **66**. Under these conditions, the movement of translation of pivot pins **30** to the left causes a pivotal movement of levers **18** and **29** in the counterclockwise direction about their pivot pins **30**, whereby the impression cylinder **26** is raised.

The ratio of the pivotal movement of levers **28** and **29** to the movement of translation of pivot pins **30** is so selected that whatever the size contemplated the impression cylinder **26** will in all cases contact the printing

cylinder **16** or **16***a* once the latter has been brought into contact with the plate cylinder **6** or **6***a* at the end of the sliding movement of flanges **19** and **21**.

When changing from a size corresponding to a cylinder having a diameter D to that corresponding to a cylinder having a diameter *d*, the printing cylinder must be moved by a distance *D—d* and the impression cylinnder **26** must be raised by a distance

$$D-d/2$$

Therefore, the ratio between the two arms of levers **28**, **29** must be substantially 2, as illustrated in the drawing.

The leftward movement of translation of the pivot pins **30** of levers **28** and **29** is attended by a slight downward movement of their lower distance-piece forming shaft **68** which is permitted by the fact that the device provided for adjusting the pressure of the impression cylinder **26**, which comprise the elements **62** to **67**, is rigid with the transverse shaft **61** trunnioned freely in the eccentric sockets **59** and **60**.

The necessary parallel relationship between printing cylinder **16** or **16***a* and plate or gravure cylinder **6** or **6***a* is obtained by means of the screws **51** and **52** causing the rotation of the eccentric sockets **48** and **49** in which the journal ends of transverse shaft **47** are rotatably mounted. Thus, one of the movable flanges **19** or **21** can be slightly raised or lowered in relation to the other for obtaining this parallelism.

The adjustment of the position and pressure of impression cylinder **26** is obtained by rotating the milled handwheels or knobs **65** in order to move the lower distance-piece shaft **68** as necessary.

Upon completion of the size-changing operations or, in other words, when the printing cylinder **16***a* has been brought into contact with the plate cylinder **6***a*, a pressure adjusting operation may be carried out if necessary.

Of course, the specific and single form of embodiment illustrated and described herein should not be construed as limiting the scope of the present invention since this form of embodiment is given by way of illustration only and many modifications and variations may be brought thereto without departing from the spirit and scope of the invention as set forth in the appended claims.

What I claim is:

1. An offset rotary press comprising a frame structure, a first pair of bearings mounted in said frame structure, a horizontal plate cylinder rotatably mounted in said first bearings, a pair of vertical flanges slidably mounted for longitudinal and horizontal movement on said frame structure of the machine, a second pair of bearings mounted on said pair of vertical sliding flanges respectively, a horizontal printing cylinder rotatably mounted in said second pair of bearings and tangent to said plate cylinder, a support pivotally mounted in said pair of vertical sliding flanges beneath said plate cylinder and printing cylinder, an impression cylinder rotatably mounted on said support beneath said printing cylinder, and means for transforming the horizontal sliding movement of said pair of vertical flanges into a pivotal movement of said support and therefore into a vertical movement of said impression cylinder, whereby, irrespective of the printing cylinder size, said impression cylinder is constantly held in contact with the lower portion of said printing cylinder when said printing cylinder itself engages said plate cylinder.

2. An offset rotary press as set forth in claim **1**, which comprises first recesses provided in said frame structure and adapted to receive said first pair of bearings, other recesses formed in said vertical sliding flanges and adapted to receive said second bearings, and quick-release locking means for holding said first and second bearings in said first and second recesses respectively.

3. An offset rotary press as set forth in claim **1**, which comprises a horizontal distance-piece forming member interconnecting said pair of vertical sliding flanges, said member being disposed beneath said impression cylinder and extending through said pair of flanges, horizontal

longitudinal elongated apertures formed in said frame structure and slidably engaged by the end of said distance-piece forming member, a bed forming an integral part of said frame structure of the machine, at least one locking bolt extending diametrally through said distance-piece forming member and held against motion in said bed, at least one horizontal diametral tapped hole formed in said distance-piece forming member, a horizontal screw-threaded rod screwed in said tapped hole and bearing against said frame structure, and a device for controlling the rotation of said horizontal screw-threaded rod for causing the sliding movement of said vertical sliding flanges and thus controlling the printing size as well as the pressure between the plate cylinder and the printing cylinder.

4. An offset rotary press as set forth in claim **1**, which comprises a horizontal elongated aperture formed in each vertical sliding flange beneath said plate cylinder, a first pressure-setting transverse shaft extending through said pair of apertures and engaging the edges of said apertures, and a first pair of socket mounted in said frame structure of the machine and having mounted in eccentric relationship therein said first pressure-setting transverse shaft.

5. An offset rotary press as set forth in claim **4**, which comprises a third pair of recesses formed in said frame structure and aligned with each other in the transverse direction, in which the sockets of said first pair are mounted in eccentric relationship, teeth formed on the outer surface of each socket of said first pair, a pair of worms rotatably mounted in said frame structure and meshing with the teeth of said first sockets respectively, and a pair of external control knobs rigid with a pair of worms respectively for adjusting the vertical position of the axes of said first pair of sockets in which the ends of said first pressure-setting transverse shaft are fitted.

6. An offset rotary press as set forth in claim **4**, which comprises a diametral pin carried by one end of said first pressure-setting transverse shaft, a control handle pivotally mounted to said diametral pin, a locking pin carried by said control handle, a fixed support carried by said frame structure, a bearing plate adjustably mounted on said fixed support, a recess formed in said bearing plate and a spring carried by said control handle for constantly urging said locking pin toward said bearing plate so that said locking pin may engage said bearing plate recess.

7. An offset rotary press as set forth in claim **4**, which

comprises a pair of transverse shafts carried by said vertical sliding flanges respectively, a pair of parallel bell-crank levers fulcrumed about said pair of transverse shafts respectively, each lever comprising a first arm and a second arm, said impression cylinder being rotatably mounted between the ends of said first arms of said pair of bell-crank levers, and a stop-forming device for holding against movement said other arms of said bell-crank levers carrying said impression cylinder.

8. An offset rotary press as set forth in claim **7**, wherein the ratio between the two arms of each bell-crank lever is substantially 2.

9. An offset rotary press as set forth in claim **7**, wherein the stop-forming device for said other arms of said pair of bell-crank levers comprises a second transverse shaft, a fourth pair of recesses formed in said frame structure and aligned in the transverse direction, a second pair of sockets rotatably mounted in said fourth pair of recesses of said frame structure respectively and comprising eccentric bores receiving the ends of said other transverse shaft, a first pair of pinions rigid with said second pair of sockets respectively, a second pair of pinions rigid with two end portions respectively of said first transversal pressure setting shaft and in meshing engagement with the pinions of said first pair of pinions respectively, at least one diametral tapped hole formed in said other transverse shaft, a screw-threaded rod engaging said diametral tapped hole, an external control knob rigid with said screw-threaded rod, and a transverse distance-piece forming member interconnecting the other arms of said pair of bell-crank levers which support said impression cylinder, said distance-piece forming member being held in abutment against the endmost portion of said screw-threaded rod.

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