Jan. 23, 1951 N. E. FUNK 2,539,068

CYLINDER ADJUSTING MECHANISM FOR MULTICOLOR PRINTING PRESSES

Filed Aug. 12, 1946 3 Sheets-Sheet 1

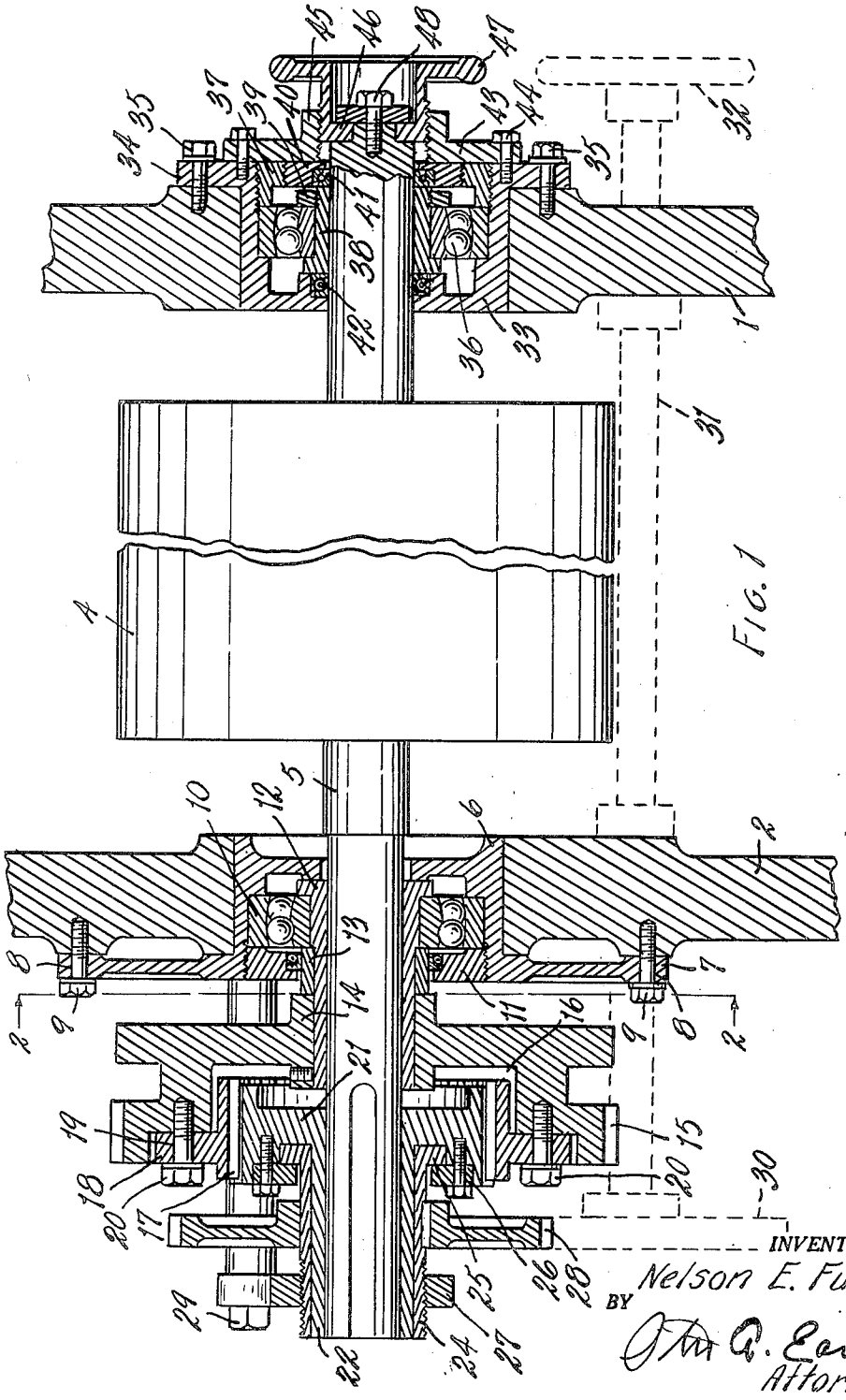

FIG. 1

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Filed Aug. 12, 1946 3 Sheets-Sheet 2

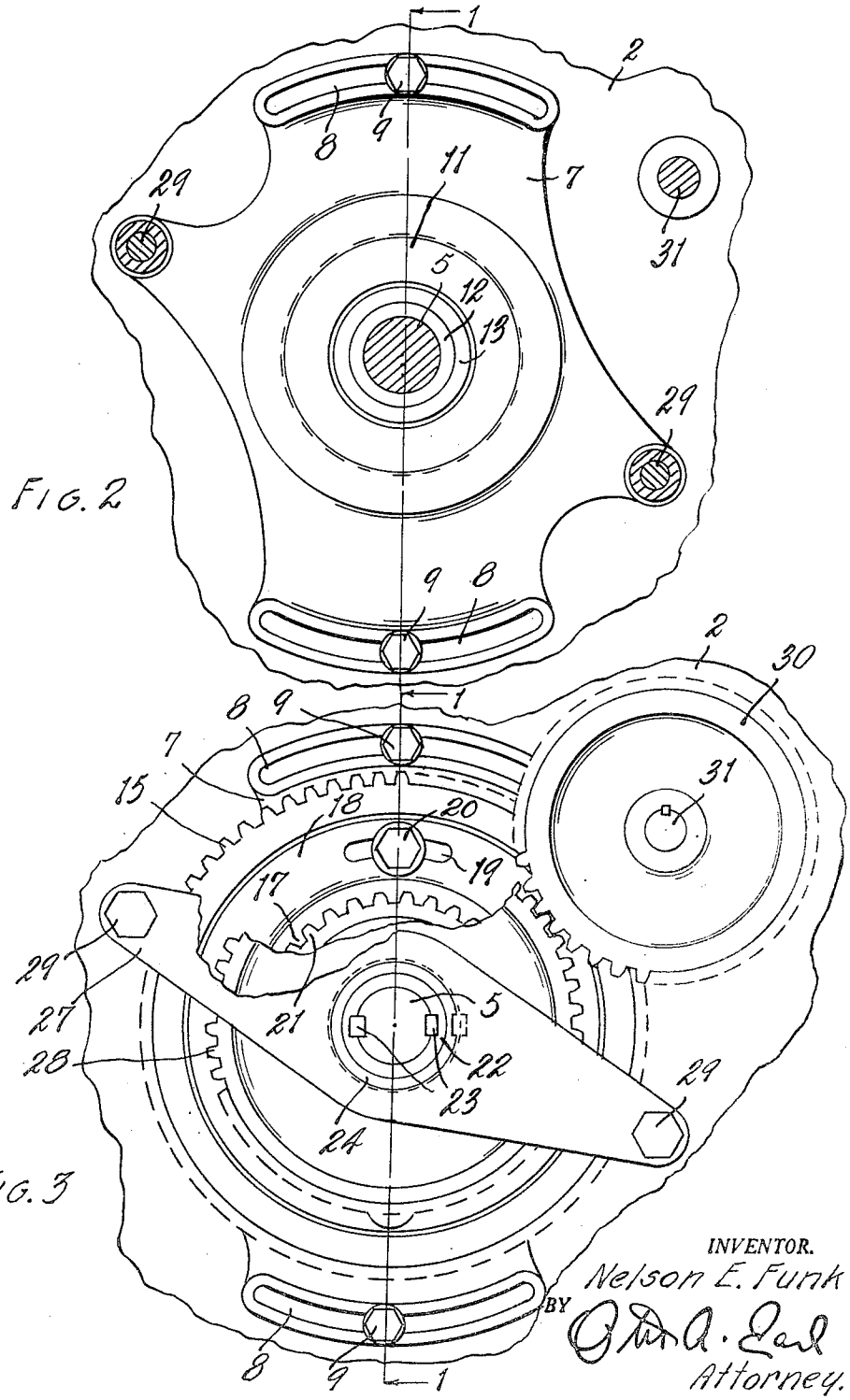


FIG. 2

FIG. 3

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CYLINDER ADJUSTING MECHANISM FOR MULTICOLOR PRINTING PRESSES

Filed Aug. 12, 1946 3 Sheets-Sheet 3

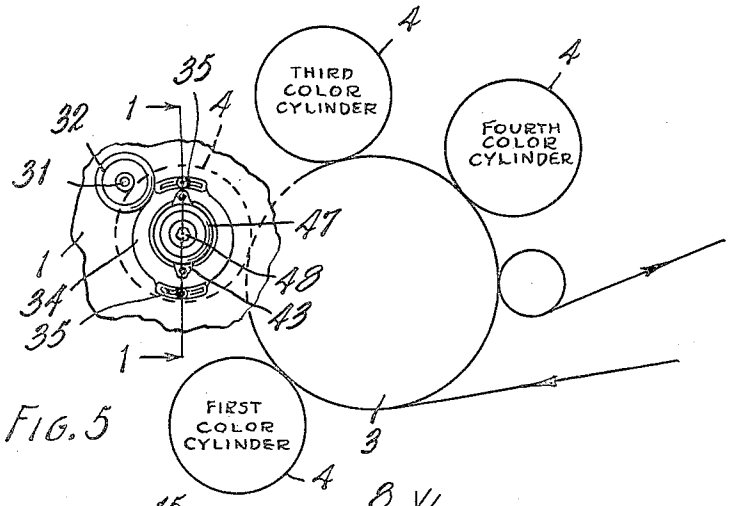


FIG. 5

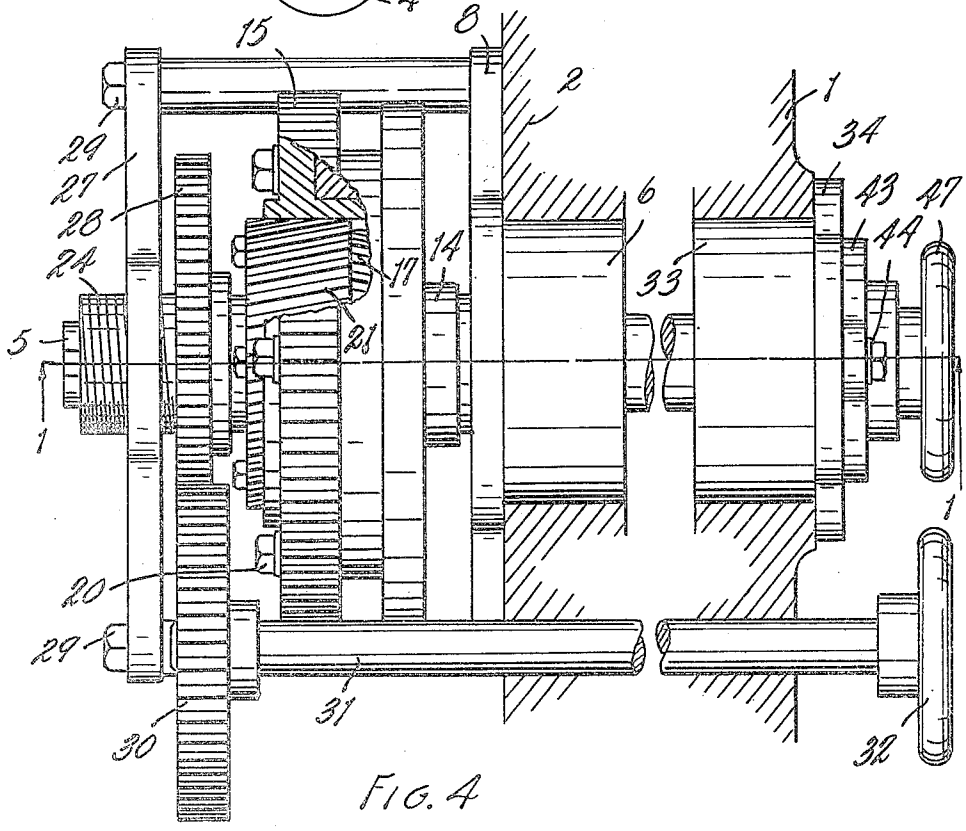


FIG. 4

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# UNITED STATES PATENT OFFICE

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## CYLINDER ADJUSTING MECHANISM FOR MULTICOLOR PRINTING PRESSES

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10 Claims. (Cl. 101—248)

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This invention relates to improvements in cylinder adjusting mechanism for multi-color printing press.

Principal objects of this invention are:

First, to provide a printing press for printing multi-color pictures in which the various colors may be brought into register while the press is operating.

Second, to provide a mounting for a color cylinder of a printing press which permits the cylinder to be displaced angularly and transversely with respect to the main impression cylinder of the press.

Third, to provide a mounting for a color cylinder of a printing press having a rough adjustment and fine adjustment for shifting the color cylinder angularly with respect to the main impression cylinder of the press.

Other objects and advantages pertaining to the details of the invention will be apparent from the following description. The invention is further pointed out in the claims.

The drawings, of which there are three sheets, illustrate a preferred form of my invention.

Fig. 1 is a fragmentary cross sectional view through a portion of the frame of a printing press showing a color printing cylinder mounted thereon.

Fig. 2 is a fragmentary cross sectional view along the plane 2—2 in Fig. 1.

Fig. 3 is a fragmentary end view, partially broken away, of the structure shown in Figs. 1 and 2.

Fig. 4 is a fragmentary plan view of the mounting mechanism shown in Fig. 1, the frame members of the press being shown in cross section.

Fig. 5 is a side elevational view, diagrammatic in character, showing the relationship between the impression cylinder and the several plate cylinders of a printing press to which my plate cylinder mounting is applied.

As is well known in the printing art, color pictures are produced by imprinting several impressions on the paper, each impression being in a different primary or neutral black color and so located or registered with respect to the other impressions that the finished picture gives the appearance of a mixture of natural colors. In order that the colors will appear natural, it is necessary that the impressions printed by the several color cylinders be accurately placed on the paper with respect to each other.

My invention provides means for mounting the plate cylinders so that they may be individually shifted both transversely of the press and angularly or rotationally with respect to the main impression cylinder. This permits the several printing plates to be installed on the plate cylinders in roughly adjusted position, at which time the press is started at slow speed. The pressman may then successively adjust the several cylinders to bring the color impressions into exact register without stopping the press.

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In the drawings, reference character 1 indicates the frame member on the forward or operator's side of the press and 2 the rear frame member. The frame members are arranged to support a main impression cylinder 3 (see Fig. 5) and four or more color plate cylinders 4 on shafts 5. The mounting for the plate cylinders is shown in detail in the other figures.

The rear frame 2 is bored to receive an eccentric bushing 6 provided with a flange 7 on the rear side of the frame. The flange defines a pair of arcuate slots 8 through which the cap screws 9 extend to adjustably clamp the bushing to the frame.

The outer portion of the bushing 6 is recessed to receive the ball bearing 10 held in place by the threaded collar 11. It will be noted that the bearing 10 is mounted eccentrically in the bushing 6 and as shown in the drawings, is closer to the upper portion of the bushing. Both the collar 11 and bushing 6 are grooved to define annular spaces in which oil seals, not shown, may be positioned on each side of the bearing 10. By loosening the screws 9 and rotating the bushing 6 the bearing 10 and shaft 5 may be moved away from the main impression cylinder to permit installation of the printing plate, which is not shown, on the color cylinder.

Mounted around the shaft is a sleeve 12 which is shouldered to engage the inner race of the bearing 10. The bearing is held in place against the shoulder by the ring 13. The outer end of the sleeve 11 carries the hub 14 of a driving gear 15 which has a pitch diameter equal to the diameter of the color plate cylinder 4. The hub is connected to the sleeve 12 by a set screw so as to rotate with the sleeve.

The rear face of the gear 15 is recessed as at 16 to receive the body of an internal gear 17. The gear 17 is formed with an annular flange 18 around the outside thereof which fits against the rear face of the gear 15 and defines a pair of arcuate slots 19 through which the cap screws 20 extend to adjustably secure the internal gear to the external gear.

Mounted on the rear end of the shaft is an external gear 21 provided with an elongated hub

section 22 which is arranged to move axially on the shaft but is secured for rotation with the shaft by the elongated keys or splines 23 (see Fig. 3). The gear 21 is meshed with the internal gear 17 and the mating teeth are helical or oblique preferably at an angle of approximately 15 degrees to the axis of the gears.

A sleeve 24 is slidably mounted around the hub 22 of the gear 21 and is provided with an annular flange 25 at its inner end which is retained against axial movement relative to the gear 21 by means of a ring 26 secured to the rear face of the gear 21. The rear end of the sleeve 24 is threaded to receive the center of a yoke member 27 and is also keyed to an adjusting gear 28 mounted on the sleeve between the yoke and the retaining ring 26.

The ends of the yoke 27 are secured by means of the spacer sleeves and cap screws 29 to the flange 7 on the bushing so that the yoke is fixed against axial movement, relative to the bushing and the frame of the press. Rotation of the sleeve 24 by the adjusting gear 28 will therefore result in axial movement of the sleeve 24 due to its threaded connection with its yoke. The adjusting gear 28 is arranged to be driven by a pinion 30 mounted on the rear end of the shaft 31 which extends through the press to the front thereof, and is provided with an operating hand wheel 32.

From the above description it should be apparent that rotation of the hand wheels 2 and the resulting axial movement of the sleeve 24 will result in the external helical gear 21 being moved axially of the shaft 5 along the keys 23 due to the engagement of the annular flange 25 with the gear or the retaining ring 26. Since the gear 21 is nonrotatably fixed relative to the shaft and since the driving gear 15 together with the internal gear 17 carried thereby are rotatable with the sleeve 12 relative to the shaft and since the gear teeth of the internal gear 17 and the gear 21 are helical, axial movement of the gear 21 as just described will result in the shaft 5 and plate cylinder 4 being displaced angularly with respect to the driving gear 15 as the helical teeth move axially with respect to each other. Since the driving gear 15 is permanently connected to the driving mechanisms of the main impression cylinder, this relative angular displacement of the shaft 5 will result in a rotation of the plate cylinder 4 without a corresponding rotation of the main impression cylinder 3, therefore, the impression printed by the color plate cylinder will be displaced longitudinally along the sheet of paper being printed relative to the impressions being printed by other color plate cylinders.

Attention is now directed to the mounting structure on the forward frame 1 as shown on the right hand side of Figs. 1 and 4. Frame member 1 is apertured to receive a bushing 33 which is provided with a flange 34 along the forward side thereof defining arcuate slots through which the cap screws 35 extend to adjustably clamp the bushing to the frame. The bushing is recessed to receive the ball bearing 36 which is eccentrically mounted in the bushing corresponding to the eccentric mounting of the bearing 10 in the bushing 6 on the rear frame of the press. The bearing 36 is held in place by the threaded ring 37.

Positioned around the forward end of the shaft 5 is a sleeve 38 which is shouldered to engage the inner race of the bearing 36 and threaded to receive the lock washer 39 for holding the bearing on the sleeve. An externally threaded washer 40 is threaded into the ring 37 and shouldered on its inner edge to form an annular space for an oil seal gasket 41 around the forward end of the shaft. A similar oil seal is provided at 42 between the inner face of the bushing 33 and the sleeve 38.

A plate 43 is secured to the front of the bushing 33 by the cap screws 44 and is provided with a central boss 45 defining a threaded aperture around the front end of the shaft 5. The shaft 5 is shouldered to rotatably receive the cylindrical hub 46 of the hand wheel 47. The outer surface of the hub is threaded in the boss 45 while the base of the hub is fixed axially with respect to the end of the shaft by the cap screw and washer indicated at 48.

The eccentric bushing 33 and the adjustable mounting is provided so that the alignment between the bearings 36 and the rear bearings 10 may be maintained as the color cylinder 4 is moved toward and away from the main impression cylinder. The threaded connection between the hand wheel 46 and the threaded boss 45 provides for axial movement of the shaft 5 relative to the main impression cylinder so that the impression printed by the color cylinder may be moved transversely of the sheet of paper passing over the impression cylinder. It will be noted that axial movement of the shaft 5, resulting from operation of the hand wheel 47 will not affect the relative angular position of the color plate cylinder since the shaft is free to move axially with respect to both the gear 21 along the key 23 and the sleeve 12.

When the structure such as has just been described is applied to one or more of several color plate cylinders of a printing press, the operator may move the plate cylinders away from the main impression cylinder by loosening the cap screws 9 and 35 and rotating the eccentric bushings 6 and 33. At this time the various color plates are installed in roughly their proper position on the plate cylinder and the bushings are rotated back to their working position to engage the plate cylinders with the impression cylinder. The cap screws 20 may be loosened and the helical gears 17 and 21 adjusted angularly with respect to the driving gear 15 to obtain an intermediate angular adjustment of the color impression with respect to the impression cylinder. The bushings and helical gears are then tightened in place and the press may be started at slow speed. Then taking the impression printed by one plate cylinder as a starting point, the operator may successively bring the impressions printed by each succeeding plate cylinder into proper register by manipulating the hand wheels 32 and 47 in the manner just described. The adjustments can be made while the press is operating from a convenient location at the front of the press and it is not necessary to stop the press several times until all color impressions are in proper register.

The color plate cylinders have been illustrated as printing directly on the impression cylinder but the same advantages of register adjustment may be obtained on a press employing intermediate transfer cylinders. The adjustable feature of my mounting is equally advantageous on presses using the original electrotype plates or stereotype mats.

I have described my invention in a highly practical embodiment thereof and have not attempted to show the driving connections between the

main impression cylinder and the several color plate cylinders as it is felt that persons skilled in the art may adapt my adjustable mounting mechanisms to presses of varying designs without further description.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a printing press having a frame member with an impression cylinder and a plurality of color plate cylinders mounted thereon, means for mounting said plate cylinders comprising bushings positioned in said frame and rotatably adjustable with respect thereto, bearings eccentrically positioned in said bushings, sleeve members positioned in said bearings, shafts for said plate cylinders positioned in said sleeves and having elongated key ways in one end thereof extending beyond said sleeves, driving gears for said plate cylinders nonrotatably secured to said sleeves, internal gears adjustably secured to said driving gears, helical gears having elongated hubs slidable axially on said key ways and teeth engaged with said internal gears, second sleeve members positioned around said hubs and having sliding flange connections with said helical gears, yoke means having threaded connections with said second sleeves and being fixedly secured to said bushings, adjusting gears secured to said second sleeves, and means extending to the front of said press for rotating said adjusting gears whereby rotation of said second sleeves results in axial movement thereof and angular displacement between said shafts and said driving gears.

2. In a printing press having a frame member with an impression cylinder and a plurality of color plate cylinders mounted thereon, means for mounting said plate cylinders comprising bushings positioned in said frame and rotatably adjustable with respect thereto, bearings eccentrically positioned in said bushings, sleeve members rotatable in said bearings, shaft members for said plate cylinders positioned rotatably in said sleeves and having elongated key ways in the ends thereof, driving gears for said plate cylinders nonrotatably secured to said sleeves, internal gears secured to said driving gears and angularly adjustable with respect thereto, helical gears slidable axially on said key ways and engaged with said internal gears, second sleeve members positioned around the ends of said shafts and having sliding flange connections with said helical gears, yoke means having threaded connections with said second sleeves and fixedly secured to said bushings, adjusting gears secured to said second sleeves for rotation therewith, and means for rotating said adjusting gears whereby rotation of said second sleeves results in axial movement thereof and said helical gears and angular displacement between said shafts and said driving gears.

3. In a printing press having a frame member with an impression cylinder and a color plate cylinder mounted thereon, means for mounting said plate cylinder comprising a bushing positioned in said frame and rotatably adjustable with respect thereto, a bearing eccentrically positioned in said bushing, a sleeve member rotatable in said bearing, a shaft member for said plate cylinder positioned in said sleeve, a driving gear for said plate cylinder non-rotatably secured to said sleeve, an internal gear secured to said driving gear, a helical gear slidable axially but non-rotatably mounted on said shaft and engaged with said internal gear, a second sleeve member positioned rotatably around the end of said shaft and having a sliding flange connection with said helical gear, yoke means having a threaded connection with said second sleeve and fixedly secured to said bushing, an adjusting gear secured to said second sleeve, and means for rotating said adjusting gear whereby rotation of said second sleeve results in axial movement thereof and angular displacement between said shaft and said driving gear.

4. Mounting mechanism for the color plate cylinder of a printing press having front and rear frame members defining apertures comprising a shaft for said cylinder extending through said apertures, bushing members positioned in said apertures and having flanges adjustably secured to said frame members, sleeve members positioned around said shaft and within said bushings, bearing members positioned between said sleeves and said bushings and eccentrically located with respect to said bushings, a driving gear secured to one of said sleeves and having an internal gear adjustably secured thereto, a helical gear meshed with said internal gear and rotatable with said shaft, other sleeve means rotatably mounted on said helical gear and arranged to impart axial movement thereto, yoke means secured to one of said flanges and having a threaded connection with said other sleeve means, manually operable means for rotating said other sleeve, means to impart axial movement to said helical gear, a plate secured to the other of said bushings and having an internally threaded portion, and a hand wheel rotatably secured to the other end of said shaft and engaged with said threaded portion of said plate for imparting axial movement to said shaft.

5. Mounting mechanism for the color plate cylinder of a printing press having front and rear frame members defining apertures comprising a shaft for said cylinder extending through said apertures, bushing members positioned in said apertures and having flanges adjustably secured to said frame members, sleeve members positioned around said shaft and within said bushings, bearing members positioned between said sleeves and said bushings and eccentrically located with respect to said bushings, a driving gear secured to one of said sleeves and having an internal gear secured thereto, a helical gear engaged with said internal gear and rotatable with said shaft, sliding means arranged to impart axial movement to said helical gear, yoke means secured to one of said flanges and having a threaded connection with said sliding means, manually operable means for rotating said sliding means in said threaded connection, a plate secured to the other of said bushings and having a threaded portion, and a hand wheel rotatably secured to the other end of said shaft and engaged with said threaded portion of said plate for imparting axial movement to said shaft.

6. Mounting mechanism for a color plate cylinder of a printing press having front and rear frame members defining apertures comprising a shaft for said cylinder extending through said apertures, bushing members positioned in said apertures and having flanges defining arcuate slots, screw means extending through said slots to secure said bushings to said frame members, sleeve members positioned around said shaft and within said bushings, bearing members positioned between said sleeves and said bushings and eccentrically located with respect to said bushings, a driving gear secured to one of said sleeves and

having a first helical gear secured thereto, a second helical gear engaged with said first helical gear and rotatable with said shaft, other sleeve means rotatably mounted on said shaft and arranged to impart axial movement to said second gear, yoke means secured to one of said flanges and having a threaded connection with said other sleeve means, manually operable means for rotating said other sleeve means, a plate secured to the other of said bushings and having a threaded portion, and a hand wheel rotatably secured to the other end of said shaft and engaged with said threaded portion of said plate for imparting axial movement to said shaft.

7. In a printing press having frame members supporting a main impression cylinder and a plurality of color plate cylinders mounted thereon, means for adjusting said plate cylinders comprising bushing members positioned in said frames, shafts for said plate cylinders and extending through said bushing members, bearings positioned eccentrically within said bushings and around said shafts, driving means mounted on one end of said shafts, means including helical gears slidable axially of said shafts for transmitting driving energy from said driving means to said shafts, manually operable means for imparting axial motion to said last mentioned means, and hand wheels secured to the other ends of said shafts and having a threaded connection with said bushings whereby rotation of said hand wheels will impart an axial movement to said shafts.

8. In a printing press having a main impression cylinder and a color plate cylinder mounted on a frame, means for adjustably mounting said plate cylinder comprising a shaft for said plate cylinder, a bushing extending through said frame and rotatably adjustable therein, a bearing eccentrically positioned in said bushing, a sleeve positioned around the end of said shaft and inside of said bearing, a plate having a threaded boss secured to said bushing and around said shaft, and a hand wheel having a hub portion with a threaded connection with said boss secured to the end of said shaft whereby rotation of said hand wheel results in axial movement of said shaft in said sleeve.

9. The combination in a printing press of a frame having front and rear sides, an impression cylinder rotatably mounted therein, a plurality of coacting plate cylinders operatively associated with said impression cylinder and provided with shafts mounted in said frame for axial adjustment and for lateral adjustment relative to said impression cylinder, means for independently adjusting said plate cylinder shafts laterally comprising bearings for the shaft and rotatably adjustable eccentric supports for said bearings, screw means for axially adjusting said shafts provided with hand wheels at the front of the frame, means for angularly adjusting each of said plate cylinders comprising driving gears on the rear ends of said shafts having internal gears connected thereto, helical gears coacting with said internal gears and rotatable with the shafts, and means for imparting axial movement to said helical gears whereby the shafts are angularly adjusted relative to their driving gears comprising manually rotatable shafts extending transversely of the frame and provided with a hand wheel at its front end and having driving connection with said helical gears for effecting their axial adjustment.

10. The combination in a printing press of a frame, an impression cylinder rotatably mounted therein, a plurality of coacting plate cylinders operatively associated with said impression cylinder and provided with shafts mounted in said frame for axial adjustment, screw means for axially adjusting said shafts provided with hand wheels at the front of the frame, means for angularly adjusting each of said plate cylinders comprising driving gears on the rear ends of said shafts having internal gears connected thereto, helical gears coacting with said internal gears and rotatable with the shafts, and means for imparting axial movement to said helical gears whereby the shafts are angularly adjusted relative to their driving gears comprising manually rotatable shafts extending transversely of the frame and provided with a hand wheel at its front end and having driving connection with said helical gears for effecting their axial adjustment.

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