

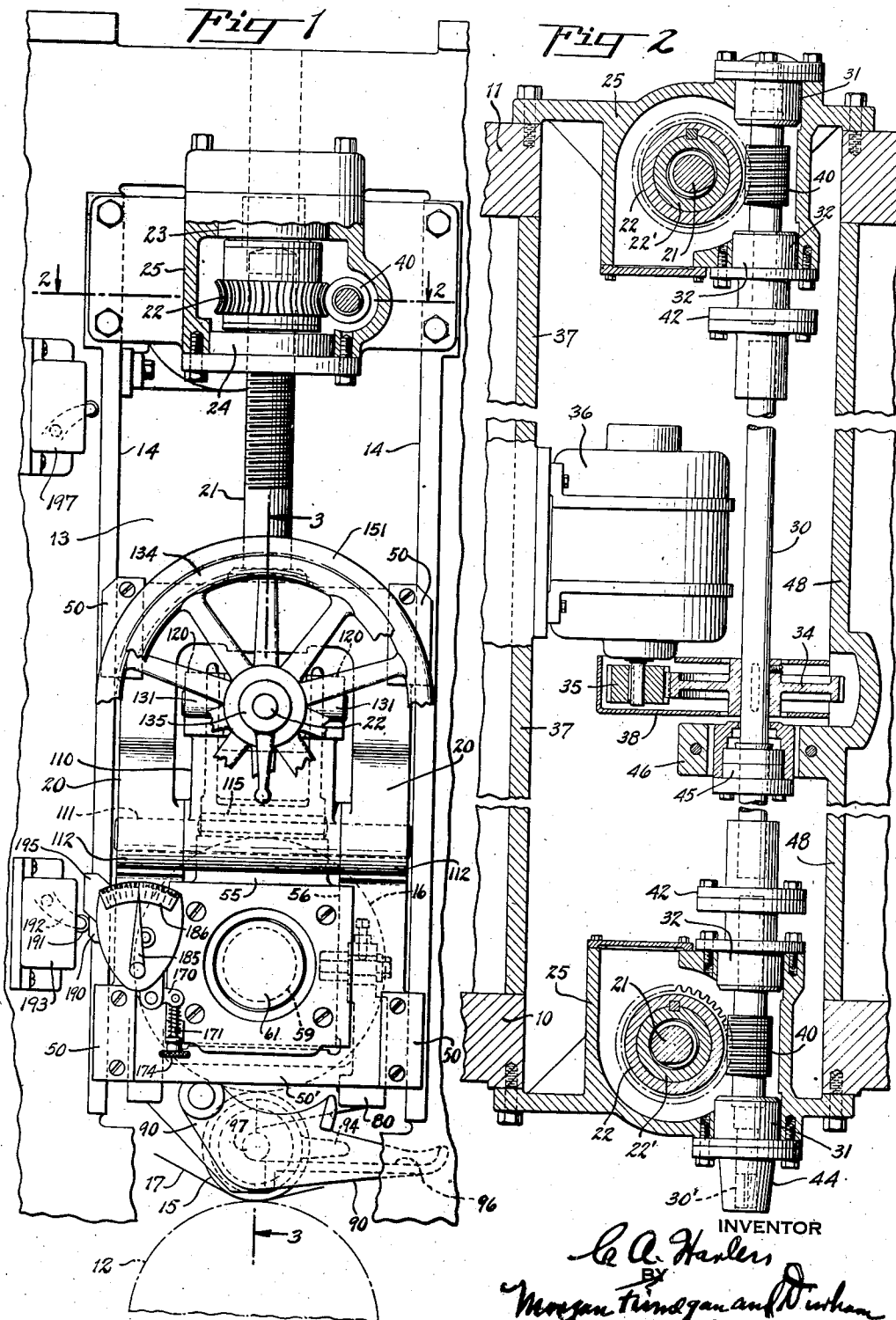
Jan. 23, 1940.

C. A. HARLESS

2,188,148

ROTARY PRINTING PRESS

Original Filed April 19, 1935 6 Sheets-Sheet 1



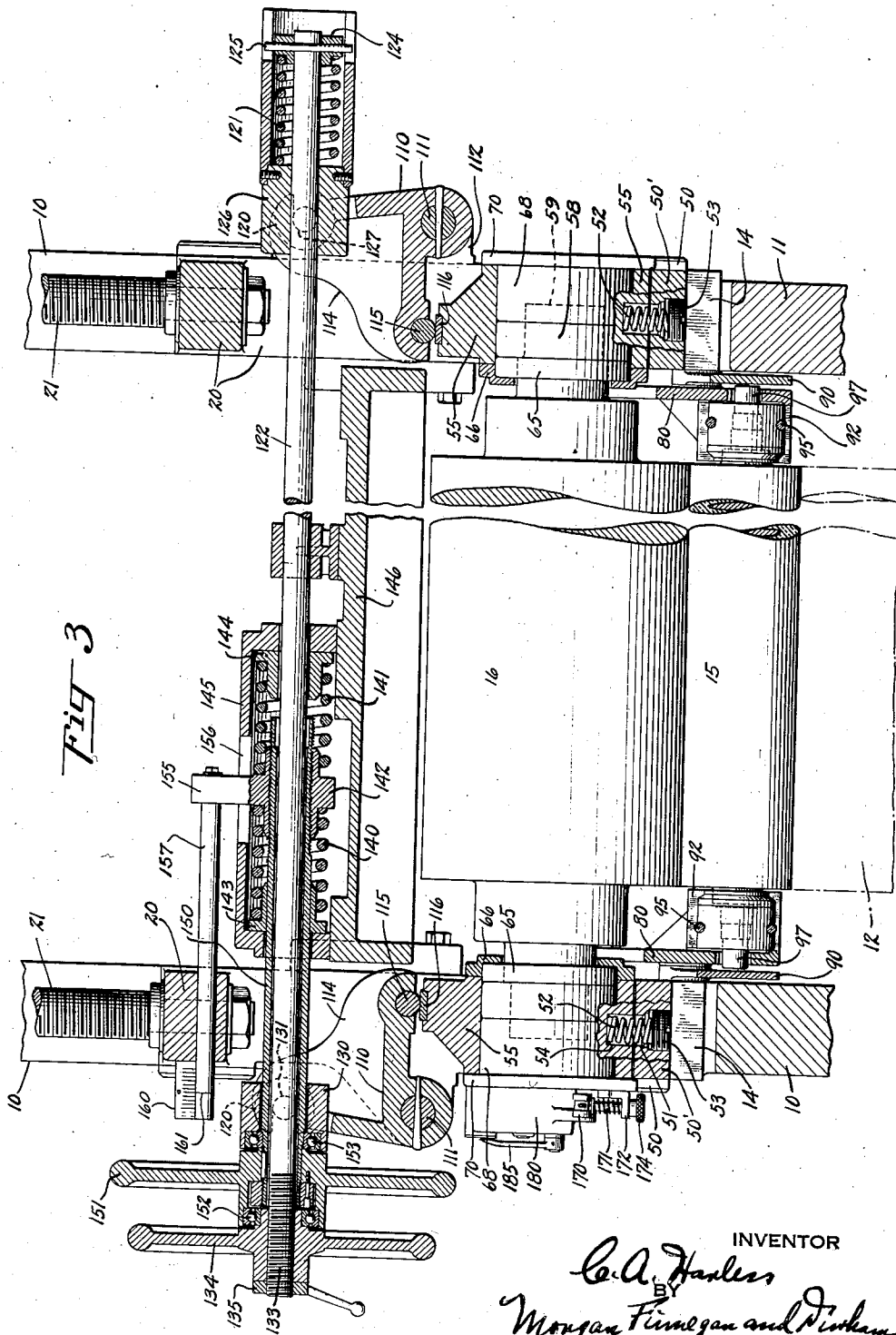
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2,188,148

ROTARY PRINTING PRESS

Original Filed April 19, 1935 6 Sheets-Sheet 2



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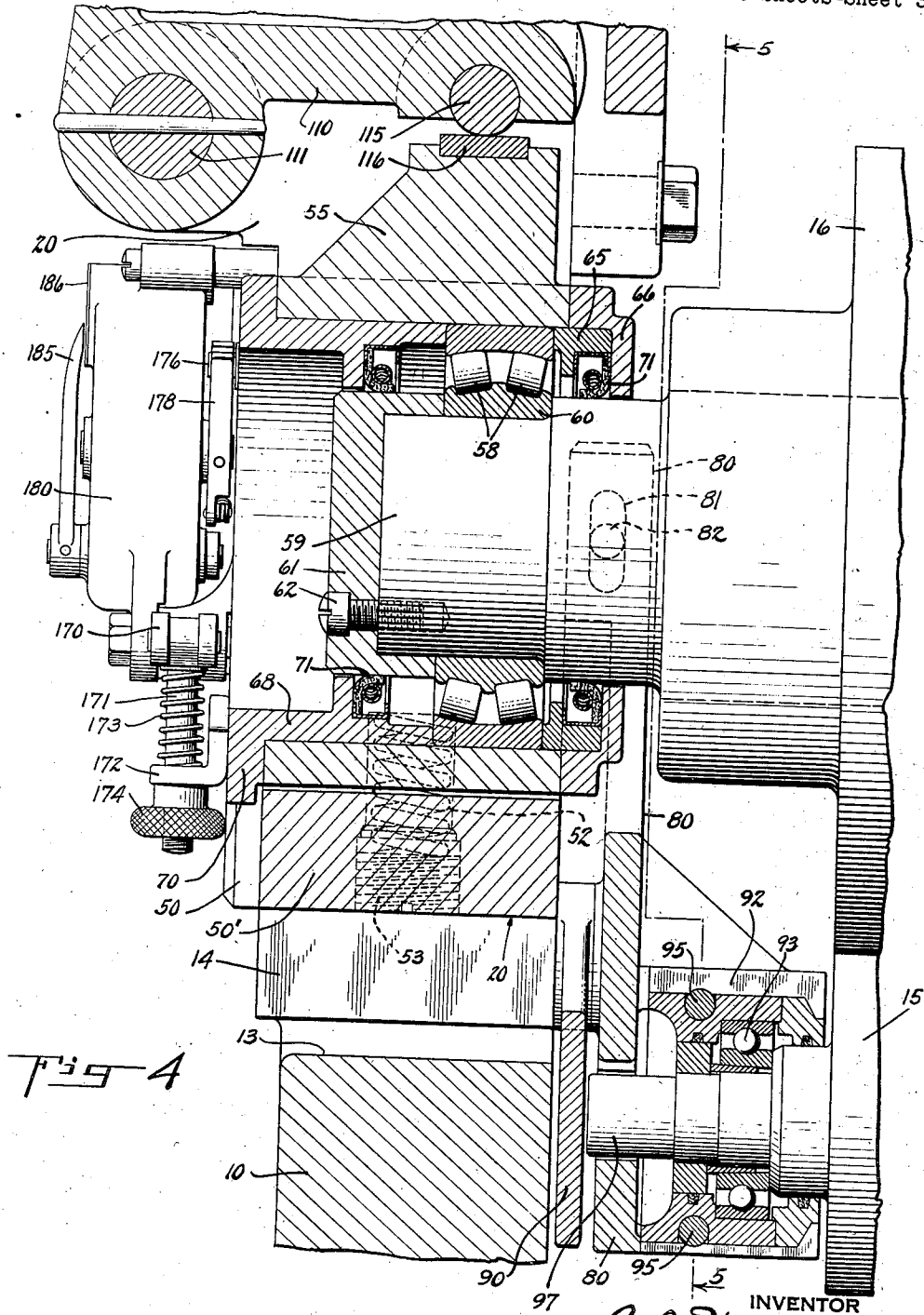
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2,188,148

ROTARY PRINTING PRESS

Original Filed April 19, 1935

6 Sheets-Sheet 3



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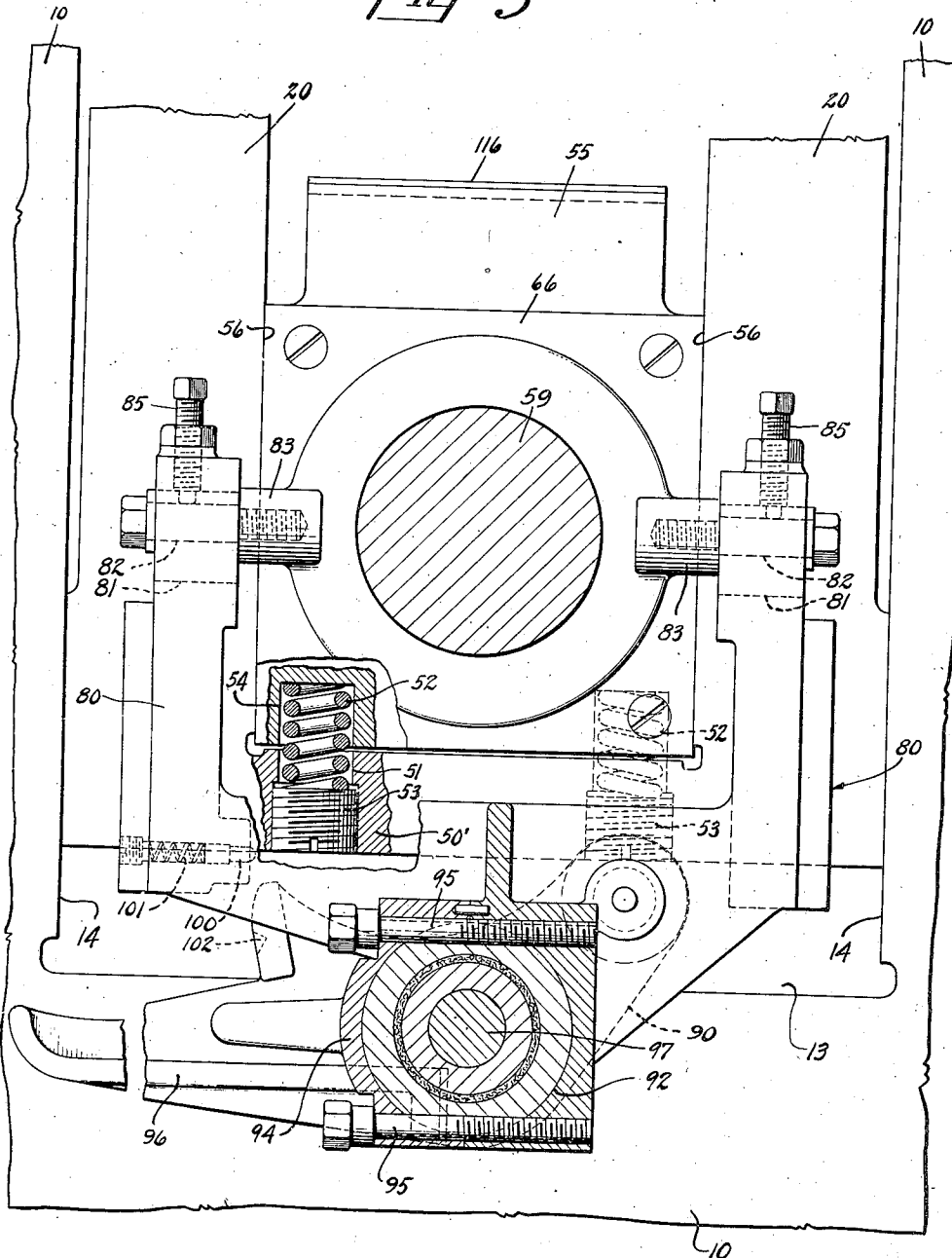
2,188,148

ROTARY PRINTING PRESS

Original Filed April 19, 1935

6 Sheets-Sheet 4

Fig 5



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Jan. 23, 1940.

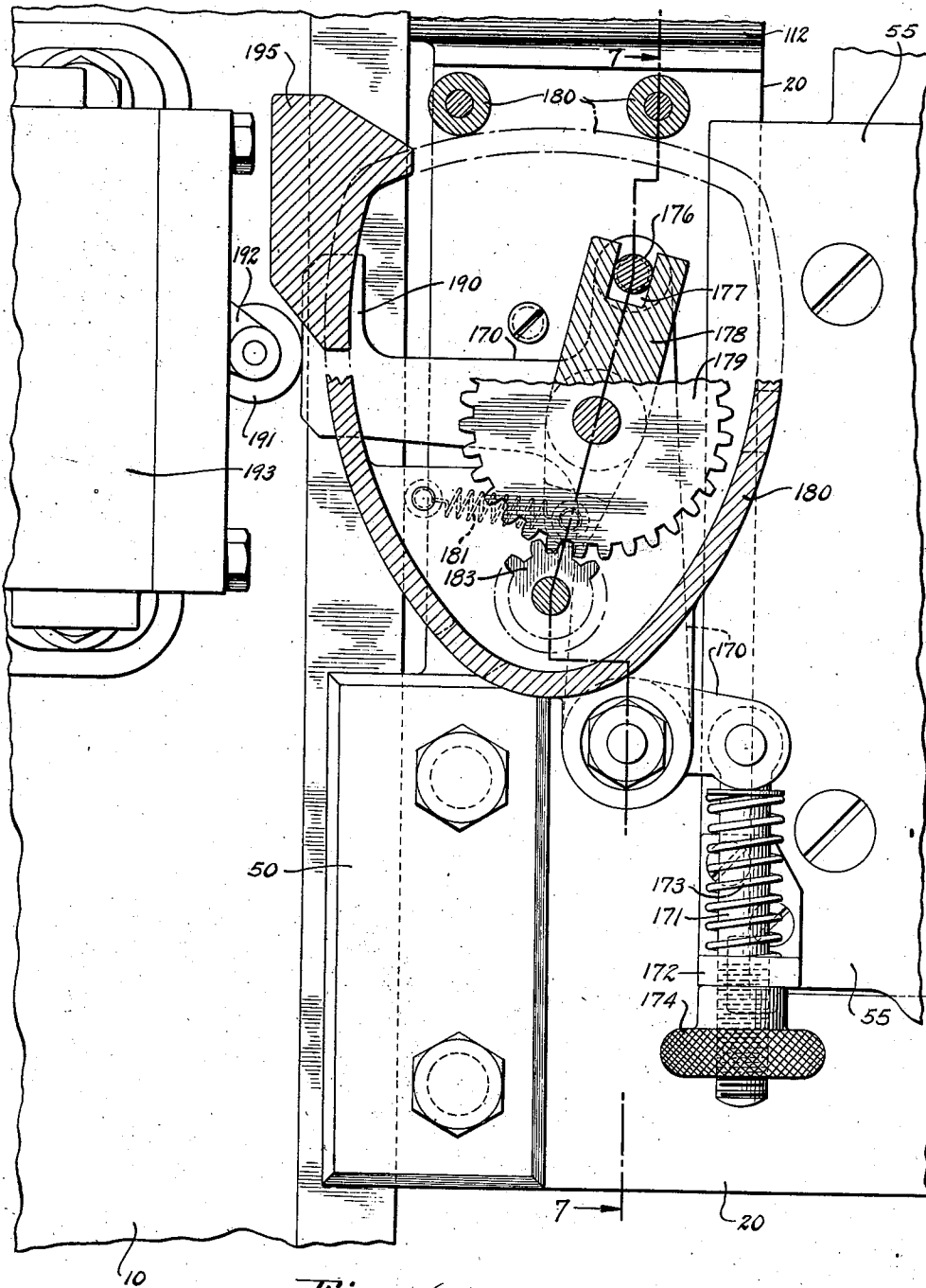
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ROTARY PRINTING PRESS

Original Filed April 19, 1935

6 Sheets-Sheet 5



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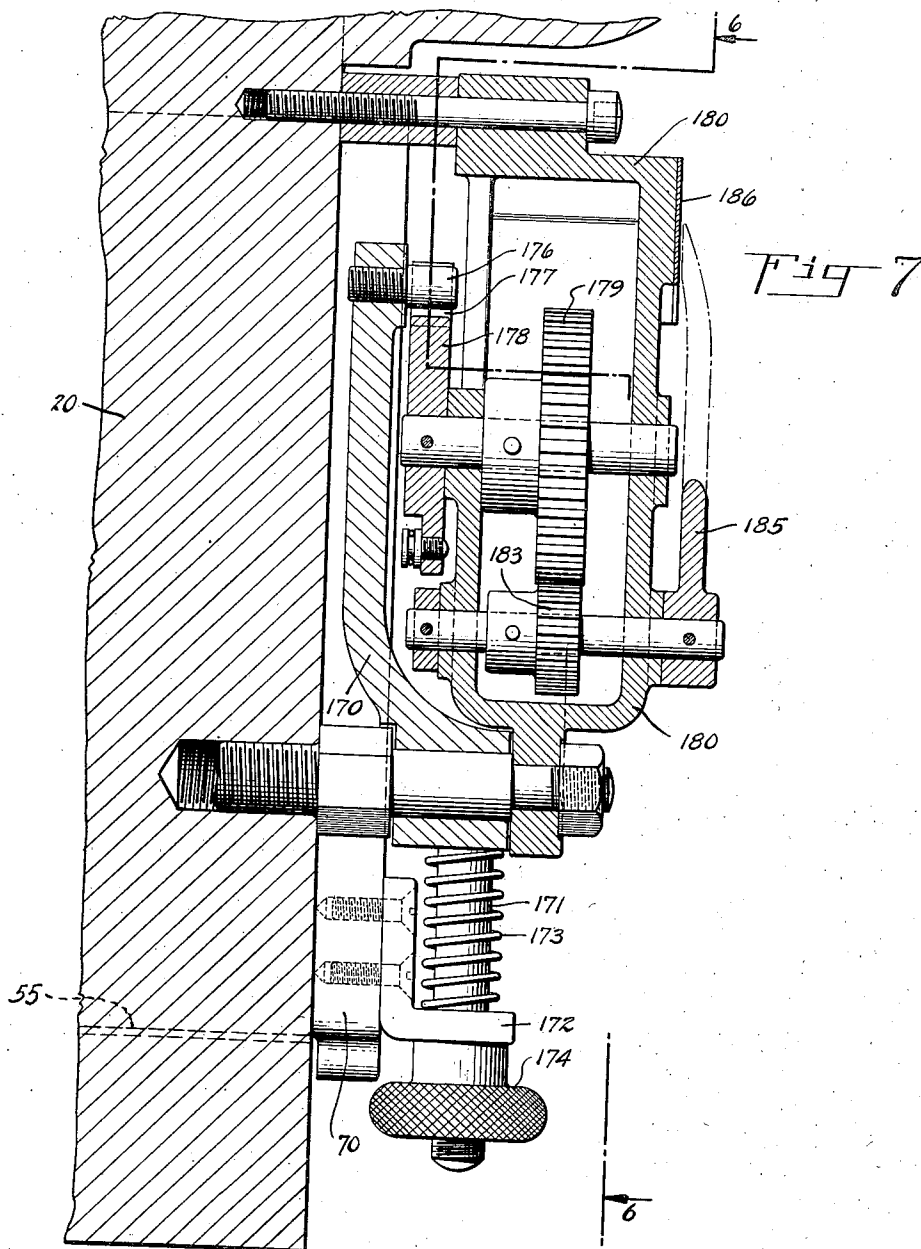
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ROTARY PRINTING PRESS

Original Filed April 19, 1935 6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

2,188,148

ROTARY PRINTING PRESS

Charles Alonzo Harless, Oak Park, Ill., assignor to
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a corporation of Illinois
Application April 19, 1935, Serial No. 17,182

Renewed June 24, 1939

32 Claims. (Cl. 101—247)

The present invention relates to rotary printing presses and more particularly to a novel and improved rotary photogravure press.

Objects and advantages of the invention will be set forth in part hereinafter, and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, construction, arrangements, combinations and improvements herein shown and described.

The accompanying drawings, referred to herein and constituting a part hereof, illustrate one embodiment of the invention, and together with the description, serve to explain the principles of the invention.

Of the drawings:

Fig. 1 is a fragmentary side elevation of an illustrative embodiment of a rotary photogravure press constructed in accordance with the present invention with certain parts broken away;

Fig. 2 is a section taken on the line 2—2 of Fig. 1;

Fig. 3 is a detailed vertical section taken on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged sectional view similar to the lower left portion of Fig. 3 but showing more details of construction;

Fig. 5 is a section taken on the line 5—5 of Fig. 4;

Fig. 6 is a detail side elevation of the indicating mechanism with its cover broken away; and

Fig. 7 is a section taken on the line 7—7 of Fig. 6.

The present invention has for its object the provision of a novel and improved press for printing by the rotary photogravure process. Another object is the provision of a rotary photogravure press having improved impression mechanism. Still another object is the provision of a rotary photogravure press in which the impression roller is resiliently supported and is variably and resiliently urged towards the printing cylinder. A further object is the provision of a rotary photogravure impression mechanism in which the impression roller and its pressure cylinder are relatively movable toward and from each other and axially with respect to each other. The invention also includes a novel means for raising, lowering and limiting the movement of the pressure cylinder and impression roller relative to the printing cylinder. Also included in

the invention are means for variably and resiliently urging both ends of the impression roller towards the printing cylinder with equal force and other means for varying the pressure on either end of the roller.

In accordance with the illustrative embodiment of the invention there are provided a pair of printing press side frames in which are rotatably mounted the usual rotary photogravure printing cylinder, together with suitable inking mechanism, web guides, etc. These side frames are provided with vertically extending guideways, the guideway in one frame being aligned with the guideway in the other frame, and in each guideway there is mounted a slidable frame carrying the pressure cylinder and impression roller. Screw means are provided for raising and lowering the frames and a motor is geared to these screw means for the simultaneous power operation of the screw means.

Preferably, and as embodied, a bearing block is resiliently mounted in each of the slidable frames, and the pressure cylinder is rotatably mounted in the bearing blocks by means of self-aligning, anti-friction bearings which permit limited angular motion of the cylinder with respect to the press frames and bearing blocks. The impression roller has its shaft ends provided with anti-friction bearings which are removably seated in arms fixed to brackets which are slidably pivoted on and depend from the bearing blocks, being adjustable thereto so that the pressure cylinder and impression roller may be held in contact with each other. Spring means are provided, carried on the slidable frames for resiliently moving both ends of the pressure cylinder and impression roller with equal force against the pressure of their resilient supporting means, to resiliently vary the pressure exerted to force the paper web against and into the inked, intagliated design on the printing cylinder.

Other means are provided for varying the resilient force acting against the ends of the cylinder and roller, so that the resilient pressure acting against the resilient supporting means may be wholly or partially relieved on either end of the cylinder, as may be required by the operating conditions of the press, as for instance when printing a fractional-width web.

Indicating means are provided for visually indicating to the operator whether normal operating pressure has been attained, and a limit switch is provided operated by the indicating means to prevent lowering of the pressure cylinder by the motor beyond the point where a

predetermined pressure is created. Other means are provided for operating the limit switch whenever the pressure cylinder is lowered to too low a point thereby safeguarding against possible damage to the delicate printing cylinders employed. The impression roller guiding arms pivotally mounted on the brackets are provided with means for holding them in raised position when the printing cylinder is to be removed, thereby giving the operator greater freedom in moving the cylinder.

It will be understood that the foregoing general description and the following detailed description as well, are exemplary and explanatory of the invention, but are not restrictive thereof.

Referring now in detail to the illustrative embodiment of the invention as shown in the accompanying drawings, there are provided a pair of press frames 10 and 11 in which is rotatably journaled a rotary photogravure printing cylinder 12 of conventional construction which is provided with suitable driving means (not shown). The side frames 10 and 11 are each provided with a rectangular opening 13 having vertical sides 14 formed as guideways, the guideways in one frame being accurately aligned with the corresponding guideways in the other frame. Within the apertures 13 and extending across the width of the press are a rotatable impression roller 15 and a rotatable pressure cylinder 16. Cylinder 16 presses against the upper surface of the impression roller while the lower surface of the impression roller 15 presses the web of paper 17 to be printed against the surface of the rotary photogravure cylinder 12 and into the minute, inked, intagliated portions of the cylinder 12 so that the ink in these portions is transferred to and remains adherent on the surface of the paper web 17.

For supporting the pressure cylinder 16, there is provided at each of its ends an open frame 20 slidably mounted for vertical movement between the guideways 14 in the frames 10 and 11. Each of the frames 20 is securely fastened at its upper end to a vertical, upwardly extending screw-threaded member 21 which is in threaded engagement with a threaded sleeve 22' keyed within a worm gear 22 held against axial movement by means of the caps 23 and 24 secured to the housings 25. The housings 25 are mounted on their respective side frames 10 and 11 at the upper part of the apertures 13.

Power-driven means are provided for simultaneously rotating the worm gears 22 in either direction to raise or lower the slidable frames 20 equally and simultaneously by means of their screw-threaded supporting members 21. For this purpose, a horizontal shaft 30 extends from one side of the press to the other and is rotatably journaled in bearings 31 and 32 mounted in the housings 25. Shaft 30 has keyed to it a relatively large gear 34 meshing with a pinion 35 mounted on the shaft of motor 36 which is secured to one of the transverse press frame members 37. A housing 38 is provided for enclosing the gears 35 and 34. Within the housings 25 and meshing with the worm gears 22 are worms 40 fixed to the shaft 30, and as the motor 36 rotates in either direction, the worms 40 are driven accordingly to raise or lower the open frames 20.

In order to facilitate assembly and disassembly of the power-operating mechanism, shaft 30 is preferably formed in three sections, these sections being interconnected by means of the coupling flanges 42. Bearings 31 may be axial thrust bearings of the anti-friction type, while the bear-

ings 32 may be anti-friction radial thrust bearings. At one end, shaft 30 is provided with a squared end 30' to which a hand crank may be secured in case of failure of the power-operating means, and this square end is preferably covered by means of a cap 44. Adjacent to the gear 34, shaft 30 is provided with a bearing 45 mounted in a bracket 46 projecting from another transverse frame member 48 of the press.

For disassembly, the flanges 42 may be disconnected, threaded members 21 are disconnected from the open frames 20 and then the housings 25 with their associated gears and the open frame 20 may be removed from the press.

For guiding the open frames 20 in their vertical sliding movement within apertures 13, guide plates 50 are secured to the corners of the open frames 20, and these plates overlap the sides of guideways 14, thereby holding the open frames 20 against movement axially of the cylinder 16.

Means are provided for resiliently and rotatably supporting the pressure cylinder 16 at its ends within the open frames 20, and for this purpose the lower horizontal reach 50' of the open frames 20 is formed with one or more apertures 51 to receive the relatively stiff helically coiled springs 52 which are supported within the apertures 51 by screw plugs 53. The upper ends of springs 52 project into similar recesses 54 formed in the lower part of each pressure cylinder supporting block 55. These blocks 55 are preferably rectangular and are closely but slidably fitted between the vertical sides 56 of the lower part of their respective open frame 20, thereby permitting vertical movement of the block 55 against the resiliency of springs 52 while at the same time practically eliminating any side motion of the blocks 55.

The bearings for rotatably supporting the cylinder 16 within the bearing blocks 55 preferably comprise self-aligning roller bearings 58 fitted to the reduced shaft ends 59 of cylinder 16, and these bearings 58 are firmly held on the shaft end 59 against the shaft shoulder 60 by means of a retaining cap 61 which may be held to the shaft ends by means of screw 62. The outer race of bearings 58 is firmly held within the bearing blocks 55 by means of a retaining ring 65 which in turn is held in place by means of a retaining flange 66, bolted to the bearing block 55. On its other side, the outer race of bearings 58 is held against a flanged collar 68 which is bolted to the outer side of the bearing block 55. Along its vertical side and its bottom side the flange 70 of collar 68 is relieved where it overlaps the open frame 20, this relieving serving to limit the possible axial displacement of the cylinder 16. Oil sealing rings 71 are provided on each side of the bearing 58 to prevent leakage of lubricant from the bearing.

Impression roller 15 is preferably a relatively small roller slightly longer than the width of the web to be printed and of substantially the same length as the relatively large pressure cylinder 16 and the printing cylinder 12. For rotatably supporting the impression roller 15 there are provided a pair of U-shaped brackets 80, one at either end of the roller 15. At their upper ends, each leg of each bracket 80 is formed with an elongated vertical slot 81 through which passes a pivot screw 82 extending from lugs 83 on retaining flange 66. The two pivot screws 82 are arranged diametrically of the shaft 59 and provide a pivotal mounting for the U-shaped brackets 80, at the same time permitting vertical sliding movement of each bracket while holding the bracket against side-

wise displacement. At the top of each leg of each bracket 80, a stop screw 85 is threadedly mounted and extends vertically downwardly into contact with the upper side of the pivot screws 82, thereby limiting downward movement of the brackets 80. On the inner face of the lower reach of each bracket 80 is formed a bearing-receiving socket for receiving and supporting the impression roller shaft bearings. For this purpose, semi-cylindrical seats 92, adapted to receive the housing of bearing 93, are provided and bearing 93 is held therein by means of the removable bearing cap 94 and screws 95.

On the outer sides of brackets 80 are pivotally mounted arms 90 each of which is provided with a rail 96 adapted to serve as a track for the impression roller shaft ends 97, permitting the roller to be rolled into and out of operative position. A latch pin 100 is seated in the bracket 80 and has its end projecting therefrom, being resiliently urged outwardly by means of spring 101. This latch pin is engageable with a notch 102 formed in the upper part of arm 90 and serves to latch the arm in raised position when the printing cylinder 12 is to be removed, or whenever it may be desired to hold the arm in its raised position, as during printing.

The legs of bracket 80 are sufficiently long and screws 85 are so positioned that the upper surface of roller 15 is held very lightly in contact with the lower surface of cylinder 16, and slots 81 permit roller 15 to be moved closer to cylinder 16 under pressure.

Means are provided for resiliently pressing the cylinder bearing supporting blocks 55 downwardly against the compression of their supporting springs 52, and these means preferably comprise a single spring and connections for transmitting the resilient force of this spring equally to the two bearing blocks 55. As embodied, a wide bell crank 110 is pivotally mounted and received within the opening in each slidable frame 20, and is pivotally mounted by means of shaft 111 rotatable within lugs 112 formed integrally with the frame 20. The two bell cranks 110 are each provided with a bracing web 114 to give added strength thereto. One end of each bell crank is recessed to receive a fulcrum pin 115 bearing against a fulcrum plate 116 on the top of bearing block 55, so that oscillation of the bell cranks 110 produces a corresponding vertical movement of the bearing blocks 55 and of the cylinder shaft ends 59, and similarly vertical movement of either or both of the shaft ends 59 produces a corresponding oscillation of the bell crank 110.

The upper ends of bell cranks 110 are bifurcated and hooked, as at 120, and these upper ends of the bell cranks are resiliently urged together by means of spring 121 coiled about shaft 122. Spring 121 is compressed between a collar 124, pinned to the ends of shaft 122 by pin 125, and a collar 126 slidable on shaft 122 and provided with laterally extending stub shafts 127 which are received within the hooked portion of one bell crank 110. At its other end shaft 122 is provided with a slidable collar 130 having stub shafts 131 received within the hooked end of the other bell crank 110, and shaft 122 is threaded at 133 to receive the correspondingly threaded hand wheel 134. A locking nut 135 is provided for securing the hand wheel 134 in any desired position.

By turning hand wheel 134, the compression of spring 121 may be varied, thereby varying the downward pressure exerted against the fulcrum

plates 116 and consequently varying the pressure exerted by pressure cylinder 16 against the impression roller 15. This varying pressure also varies the pressure of impression roller 15 against the web 17 and the printing cylinder 12.

Means are provided for variably increasing the resilient pressure exerted against the bearing blocks 55 so that the pressure on either end of the cylinder 16 may be increased or be made greater than the pressure on the other end of the cylinder. For this purpose a pair of coil springs 140 and 141 are provided surrounding shaft 122 and positioned between the open frames 20. Springs 140 and 141 are normally held without being compressed between the double collet 142 and their respective collets 143, and 144, while collets 143 and 144 are held against the inner end walls of cover 145 surrounding shaft 122 and secured to transverse frames 146 supported on the inner faces of open frames 20.

A tube 150 surrounds shaft 122 and is threaded within collet 142 at one end and at its other end is fixed to hand wheel 151. Hand wheel 151 is rotatably mounted with respect to hand wheel 134 and shaft 122 by means of ball bearings 152 and 153 and together with the tubular sleeve 150 is axially movable with respect to shaft 122. Collet 143 surrounds and is slidable on tube 150, while collet 144 is slidable on shaft 122, and collet 142 is moved axially of tube 150 by rotation thereof. Means are provided to hold collet 142 against rotation and for this purpose an integral arm 155 extends upwardly therefrom through slot 156 formed in the cover 145. A rod 157 is fixed to arm 155 and is slidable in the upper part of open frame 20. An index scale 160 is mounted on the frame 120 and by reference to the index mark 161 on rod 157 it can be determined which, if either, of the springs 140 and 141 is compressed and to what extent. By turning the hand wheel 151, one or the other of the springs 140 and 141 is compressed, depending on the direction of rotation of hand wheel 151, and thereby a difference of pressure between one end and the other of cylinder 16 may be established.

Means are provided for indicating the relative position of the pressure cylinder 16 with reference to the impression roller 15 and for this purpose a bell crank 170 is pivotally mounted on one side of one of the open frames 20. To the shorter arm of bell crank 170 is pivotally connected a threaded link 171 which is slidable through a lug 172 projecting from the outside of bearing block 55. Link 171 is resiliently urged upwardly by means of spring 173 coiled about link 171 and on the other side of lug 172 a thumb screw 174 is threaded on the end of link 171. At its upper end bell crank 170 is provided with a pin 176 fitting into a slot 177 formed in the upper end of lever 178. Lever 178 is rigidly attached to gear 179 and is rotatably mounted within the casing 180 mounted on the open frame 20, and any backlash is taken up by means of tension spring 181. Gear 179 meshes with a relatively small pinion 183 also pivotally mounted in the casing 180 and connected to a pointer 185 on the outside of the casing. A scale 186 is provided to indicate the normal position of cylinders 16 and 12. As spring 121 moves the pressure cylinder 16 downwardly against the resiliency of springs 52, the pointer 185 is moved to the right, indicating a decrease in the distance between the cylinders and a corresponding increase in the pressure which is exerted against the web with

the roller 15 and cylinder 16 in normal printing position, and the pointer 185 may be initially brought to its correct and normal position by turning of the thumb screw 174.

Means are also provided for preventing injury to the mechanism through possible carelessness of the operator in lowering the cylinders by motor 36. For this purpose bell crank 170 is formed with a latterly projecting shoe 190, projecting through the side of casing 180 and adapted to contact with the roller 191 mounted at the end of switch-operating arm 192 of limit switch 193 so that when the cylinder 16 and roller 15 are returned to their normal operating position, or when the pressure between cylinder 12 and roller 15 increases beyond a predetermined amount, shoe 190 moves the lever 192 sufficiently to open the limit switch 193 and thereby interrupt the supply of power to motor 36.

In case the pressure cylinder 16 is lowered with the impression roller 15 removed, no pressure would be indicated by the pointer 186 or shoe 190, and to guard against possible lowering of the impression roller supporting brackets 96 and 80 into contact with the surface of the printing cylinder 12, stop 195 is provided on the open frame 20, being positioned so as to open the limit switch 193 on movement of the pressure cylinder 16 only slightly below its normal operating position. A second limit switch 197 is also provided in the motor circuit to be operated by the stop 195, thereby preventing damage through the attempt to raise the pressure cylinder 16 to too great a height.

In initially setting the press for proper operation, the open frames 20 are lowered to their proper position, and thereby establish a predetermined pressure between the cylinders 12 and 15. When this pressure has been established, the pointer 185 is set at zero, and thereafter indicates normal impression pressure for cylinder 12 or another cylinder of the same size.

In the operation of the illustrative embodiment, the rotary photogravure printing cylinder is driven at the desired operating speed, driving the web of paper 17 to be printed, the impression roller 15 and pressure cylinder 16, by frictional contact.

With the printing cylinder 12 in position for operation, motor 36 is operated to lower the cylinder 16 and roller 15 until roller 15 passes the paper web 17 against cylinder 12 with sufficient pressure to operate switch 193, stopping motor 36. The hand wheel 134 is then turned until the proper pressure has been attained, as indicated by pointer 185.

In this condition, roller 15 rests against cylinder 12 and is held against excessive axial movement by means of brackets 80, while cylinder 16 is supported by contact with roller 15 and by springs 52, and is pressed resiliently downwardly by means of spring 121 acting against the bell cranks 110, which transform the horizontal compression of spring 121 into vertical compression of springs 52 and the resiliently covered roller 15.

When printing a fractional width web and when using a fractional width printing cylinder 12, hand wheel 151 is turned to compress one or the other of springs 140 and 141, thereby increasing the resilient pressure against the cylinder 16 and roller 15 at one end only, relative to the other end. When spring 141 is compressed, the pressure is increased on the left (Fig. 3) end of cylinder 16 and roller 15, and may be controlled so that the pressure between the left end of roller 15 and

cylinder 12 is the same as the pressure of the right end of the fractional width cylinder against the corresponding part of the roller 15.

As cylinders 12 and 16 and roller 15 rotate, cylinder 16 and roller 15 rise and fall, and either end of these members may move independently of the other end, while the pressure on both ends is always equal (or when springs 140 and 141 are in use in an exact predetermined ratio) and cylinder 16 and roller 15 are permitted such limited angular and axial movement is as required by the irregularities in the surface of cylinder 12 or roller 15.

The invention in its broader aspects is not limited to the specific mechanisms shown and described but departures may be made therefrom within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its chief advantages.

What I claim is:

1. In a rotary photogravure printing press an impression roller, a pressure cylinder, means for rotatably supporting said cylinder, and pivotally mounted means radially movable with respect to said cylinder for rotatably supporting said roller whereby the roller may move toward and from said cylinder and axially thereof.

2. In a rotary photogravure printing press an impression roller, a rotatable pressure cylinder, resiliently supported bearings for said cylinder, bearings for said roller at the ends thereof, links pivotally interconnecting said cylinder and roller bearings, a spring, and means for applying force from said spring at either end of the cylinder against the resiliently supported cylinder bearings.

3. In a rotary photogravure printing press two press frame members having guideways, a slide in each guideway and vertically movable therein, a bearing support in each slide, springs supporting said support in each slide, a pressure cylinder rotatably mounted in said bearing support, an axially-movable impression roller mounted beneath said cylinder and held parallel therewith, and means for compressing said springs.

4. In a rotary photogravure printing press an impression roller, bearings for rotatably mounting the roller by its ends, means for resiliently supporting the bearings, a spring and means for applying the force of said spring against both ends of the roller to move it and its bearings against their resilient supporting means.

5. In a rotary photogravure printing press an impression roller, a spring, means for applying the force of said spring against both ends of the roller, a pair of springs and means for optionally applying the force of one or the other of said springs against an end of the roller.

6. In a rotary photogravure printing press an impression roller, means for independently resiliently supporting the ends of the roller, a spring, means for variably compressing the spring, and means for applying the force of said spring against both ends of the roller to move it against its resilient supporting means.

7. In a rotary photogravure printing press an impression roller, means for independently resiliently supporting the ends of the roller, a spring, means for variably compressing the spring and means for variably applying the force of said spring against the ends of the roller to move it against its resilient supporting means.

8. In a rotary photogravure printing press a

pressure cylinder, an impression roller, vertically movable bearing members for said cylinder, a frame mounted on said members and depending therefrom and provided with pivoted arms in which the roller is mounted, and means for holding said arms in raised position while a printing cylinder is moved.

9. In a rotary photogravure printing press a pressure cylinder, independently movable bearing blocks in which said cylinder is rotatably mounted, depending frames slidably pivoted on said blocks, and an impression roller rotatably mounted in said frames to contact with said cylinder.

10. In a rotary photogravure printing press a pair of press frames having guideways, one frame at either side of the press, a slidable frame in each guideway, screw means for raising and lowering the slidable frames, a motor for operating the screw means, a pressure cylinder, bearing blocks in which said cylinder is rotatably mounted, resilient means supporting said blocks on said slidable frames, an impression roller, brackets in which said roller is rotatably journaled, means for pivotally and slidably supporting said brackets on said bearing blocks, a spring mounted on one of the slidable frames, means for applying the force of said spring to said cylinder and roller against the resilient supporting means, a second resilient means, means for applying the force of said second resilient means against either end of the cylinder and roller, means for indicating the relative position of the pressure cylinder with reference to the printing cylinder, a limit switch preventing lowering of the slidable frames by the motor below a predetermined point, and means controlled by the pressure indicator for operating the limit switch on too great pressure between the pressure and printing cylinders.

11. In a rotary photogravure printing press a pair of press frames having guideways, one frame at either side of the press, a slidable frame in each guideway, a pressure cylinder, bearing blocks in which said cylinder is rotatably mounted, resilient means supporting said blocks on said slidable frames, an impression roller, brackets in which said roller is rotatably journaled, means for pivotally and slidably supporting said brackets on said bearing blocks, a spring mounted on one of the slidable frames, means for applying the force of said spring to said cylinder and roller against the resilient supporting means, a second resilient means, means for applying the force of said second resilient means against either end of the cylinder and roller, and means for indicating the relative position of the pressure cylinder with reference to the printing cylinder.

12. In a rotary photogravure printing press a pair of press frames having guideways, one frame at either side of the press, a slidable frame in each guideway, a pressure cylinder, bearing blocks in which said cylinder is rotatably mounted, an impression roller, brackets in which said roller is rotatably journaled, means for pivotally and slidably supporting said brackets on said bearing blocks, means for indicating the relative position of the pressure cylinder with reference to the printing cylinder, a limit switch preventing lowering of the slidable frames by the motor below a predetermined point, and means controlled by the indicator for operating the limit switch on too great pressure between the pressure and printing cylinders.

13. In a rotary photogravure printing press a

pair of press frames having guideways, one frame at either side of the press, a slidable frame in each guideway, a pressure cylinder, bearing blocks in which said cylinder is rotatably mounted, an impression roller, means for supporting said roller on said bearing blocks, means for indicating the relative position of the pressure cylinder with reference to the printing cylinder, limit switch means for preventing lowering of the slidable frames below a predetermined point, and means controlled by the indicator for operating the limit switch on too great pressure between the pressure and printing cylinders.

14. In a rotary photogravure printing press a pair of press frames having guideways, one frame at either side of the press, a slidable frame in each guideway, screw means for raising and lowering the slidable frames, a motor for operating the screw means, a pressure cylinder, bearing blocks in which said cylinder is rotatably mounted, resilient means supporting said blocks on said slidable frames, an impression roller, brackets in which said roller is rotatably journaled, means for pivotally and slidably supporting said brackets on said bearing blocks, a spring mounted on one of the slidable frames, and means for applying the force of said spring to said cylinder and roller against the resilient supporting means.

15. In a rotary photogravure printing press a pair of press frames having guideways, one frame at either side of the press, a slidable frame in each guideway, screw means for raising and lowering the slidable frames, a motor for operating the screw means, a pressure cylinder, bearing blocks in which said cylinder is rotatably mounted, resilient means supporting said blocks on said slidable frames, an impression roller, brackets in which said roller is rotatably journaled, means for pivotally and slidably supporting said brackets on said bearing blocks, a spring mounted on one of the slidable frames, means for applying the force of said spring to said cylinder and roller against the resilient supporting means, and means for indicating the relative position of the pressure cylinder with reference to the printing cylinder.

16. In a rotary photogravure printing press a pair of press frames having guideways, one frame at either side of the press, a slidable frame in each guideway, screw means for raising and lowering the slidable frames, a motor for operating the screw means, a pressure cylinder, bearing blocks in which said cylinder is rotatably mounted, resilient means supporting said blocks on said slidable frames, an impression roller, brackets in which said roller is rotatably journaled, means for pivotally and slidably supporting said brackets on said bearing blocks, a spring mounted on one of the slidable frames, means for applying the force of said spring to said cylinder and roller against the resilient supporting means, means for indicating the relative position of the pressure cylinder with reference to the printing cylinder, a limit switch preventing lowering of the slidable frames by the motor below a predetermined point, and means controlled by the indicator for operating the limit switch on too great pressure between the pressure and printing cylinders.

17. In a rotary photogravure printing press a pair of press frames having guideways, one frame at either side of the press, a slidable frame in each guideway, a pressure cylinder, bearing blocks in which said cylinder is rotatably mounted, resilient means supporting said blocks on said slid-

able frames, an impression roller, brackets in which said roller is rotatably journaled, means for pivotally and slidably supporting said brackets on said bearing blocks, and means for indicating the relative position of the pressure cylinder with reference to the printing cylinder.

18. In a rotary photogravure printing press a pair of press frames having guideways, one frame at either side of the press, a slidable frame in each guideway, a pressure cylinder, bearing blocks in which said cylinder is rotatably mounted, resilient means supporting said blocks on said slidable frames, an impression roller, brackets in which said roller is rotatably journaled, means for pivotally and slidably supporting said brackets on said bearing blocks, a spring mounted on one of the slidable frames, and means for applying the force of said spring to said cylinder and roller against the resilient supporting means.

19. In a rotary photogravure printing press a pair of press frames having guideways, one frame at either side of the press, a slidable frame in each guideway, screw means for raising and lowering the slidable frames, a motor for operating the screw means, a pressure cylinder, bearing blocks in which said cylinder is rotatably mounted, resilient means supporting said blocks on said slidable frames, an impression roller, brackets in which said roller is rotatably journaled, means for supporting said brackets on said bearing blocks, a spring mounted on one of the slidable frames, and means for applying the force of said spring to said cylinder and roller against the resilient supporting means.

20. In a rotary photogravure printing press a pair of press frames having guideways, one frame at either side of the press, a slidable frame in each guideway, screw means for raising and lowering the slidable frames, a motor for operating the screw means, a pressure cylinder, bearing blocks in which said cylinder is rotatably mounted, resilient means supporting said blocks on said slidable frames, an impression roller, brackets in which said roller is rotatably journaled, means for supporting said brackets on said bearing blocks, a spring mounted on one of the slidable frames, means for applying the force of said spring to said cylinder and roller against the resilient supporting means, means for indicating the relative position of the pressure cylinder with reference to the printing cylinder, a limit switch preventing lowering of the slidable frames by the motor below a predetermined point, and means controlled by the indicator for operating the limit switch on too great pressure between the pressure and printing cylinders.

21. In a rotary photogravure printing press, a printing cylinder, bearings in which it is removably mounted, an impression roller, vertically movable frames in which said roller is removably mounted, movable arms extending from said frames for guiding said roller into running position and means for holding said arms out of the path of the cylinder as it is removed or replaced.

22. In a rotary photogravure printing press, a pressure cylinder, a printing cylinder, a cylinder for pressing on the pressure cylinder to press a web against the printing cylinder, independently resiliently movable members for supporting the pressure cylinder, and self-aligning anti-friction bearings carried by said members and by which said pressure cylinder is rotatably journaled.

23. In a rotary photogravure printing press, the combination of an impression member, means

for resiliently pressing the member against a cylinder to be printed from, means for independently varying the resilient pressure exerted on both ends of the cylinder, and means for operating the independent means for both ends from one end of the cylinder.

24. In a rotary photogravure printing press, slidable cylinder bearing supporting members, a pressure cylinder mounted in said members, an impression roller, brackets in which said roller is rotatably journaled, means for pivotally supporting said brackets on said bearing supporting members, means for indicating the relative position of the pressure cylinder with reference to the printing cylinder, motor means for raising and lowering the cylinder, a limit switch preventing lowering of the slidable members by the motor below a predetermined point, and means controlled by the indicator for operating the limit switch.

25. In a rotary photogravure printing press, a pressure cylinder, vertically movable bearing blocks in which said cylinder is rotatably mounted, an impression roller, means for supporting said roller on said bearing blocks, means for indicating the relative position of the pressure cylinder with reference to the printing cylinder, resilient means for pressing the pressure cylinder downwardly against the impression roller and means for preventing more than a predetermined movement between the pressure cylinder and frame during printing.

26. In a rotary photogravure printing press, slidable bearing supporting members, screw means for raising and lowering the slidable members, a motor for operating the screw means, a pressure cylinder, said cylinder being rotatably mounted in said bearing supporting members, an impression roller, brackets in which said roller is rotatably journaled and means for pivotally supporting said brackets on said bearing supporting members.

27. In a rotary photogravure printing press, vertically movable bearing blocks, screw means for raising and lowering the blocks, a motor for operating the screw means, a pressure cylinder, said cylinder being rotatably mounted in said bearing blocks, resilient means acting on said blocks, an impression roller, brackets in which said roller is rotatably journaled and means for indicating the relative position of the pressure cylinder with reference to the printing cylinder.

28. In a rotary intaglio printing press, a design cylinder, a main sliding head, an impression roll carried thereby, an auxiliary head having a limited sliding movement in the main head, a back-up roll carried by the auxiliary head, and means acting through the auxiliary head and back-up roll for bringing the impression roll into coaction with the design cylinder at a predetermined printing pressure.

29. In a rotary intaglio printing press, a design cylinder, a main sliding head, an impression roll carried thereby, an auxiliary head having a limited sliding movement in the main head, a back-up roll carried by the auxiliary head, means acting through the auxiliary head and back-up roll for bringing the impression roll into coaction with the design cylinder with printing pressure, and means for automatically limiting the printing pressure.

30. In a rotary photogravure printing press a pair of press frames having guideways, one frame at either side of the press, a slidable frame in each guideway, a pressure cylinder, bearing

5 blocks carried by said slidable frames and in which said cylinder is rotatably mounted, an impression roller, brackets in which said roller is rotatably journaled, means for supporting said brackets on said bearing blocks, and means for indicating the relative position of the pressure cylinder with reference to the printing cylinder.

10 31. In a rotary intaglio printing press, a design cylinder, a main sliding head, an impression roll carried thereby, an auxiliary head having a limited sliding movement in the main head, a back-up means including a roll carried by the auxiliary head, and means acting through the auxiliary head and back-up means for bringing

the impression roll into coaction with the design cylinder at a predetermined printing pressure.

32. In a rotary intaglio printing press, a design cylinder, a main sliding head, an impression roll carried thereby, an auxiliary head having a limited sliding movement in the main head, a back-up means including a roll carried by the auxiliary head, means acting through the auxiliary head and back-up means for bringing the impression roll into coaction with the design cylinder with printing pressure, and means for automatically limiting the printing pressure.

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