Aug. 31, 1937. W. C. HUEBNER 2,091,280

PHOTOGRAPHIC CYLINDER PRINTING APPARATUS

Filed Aug. 31, 1936 8 Sheets-Sheet 1

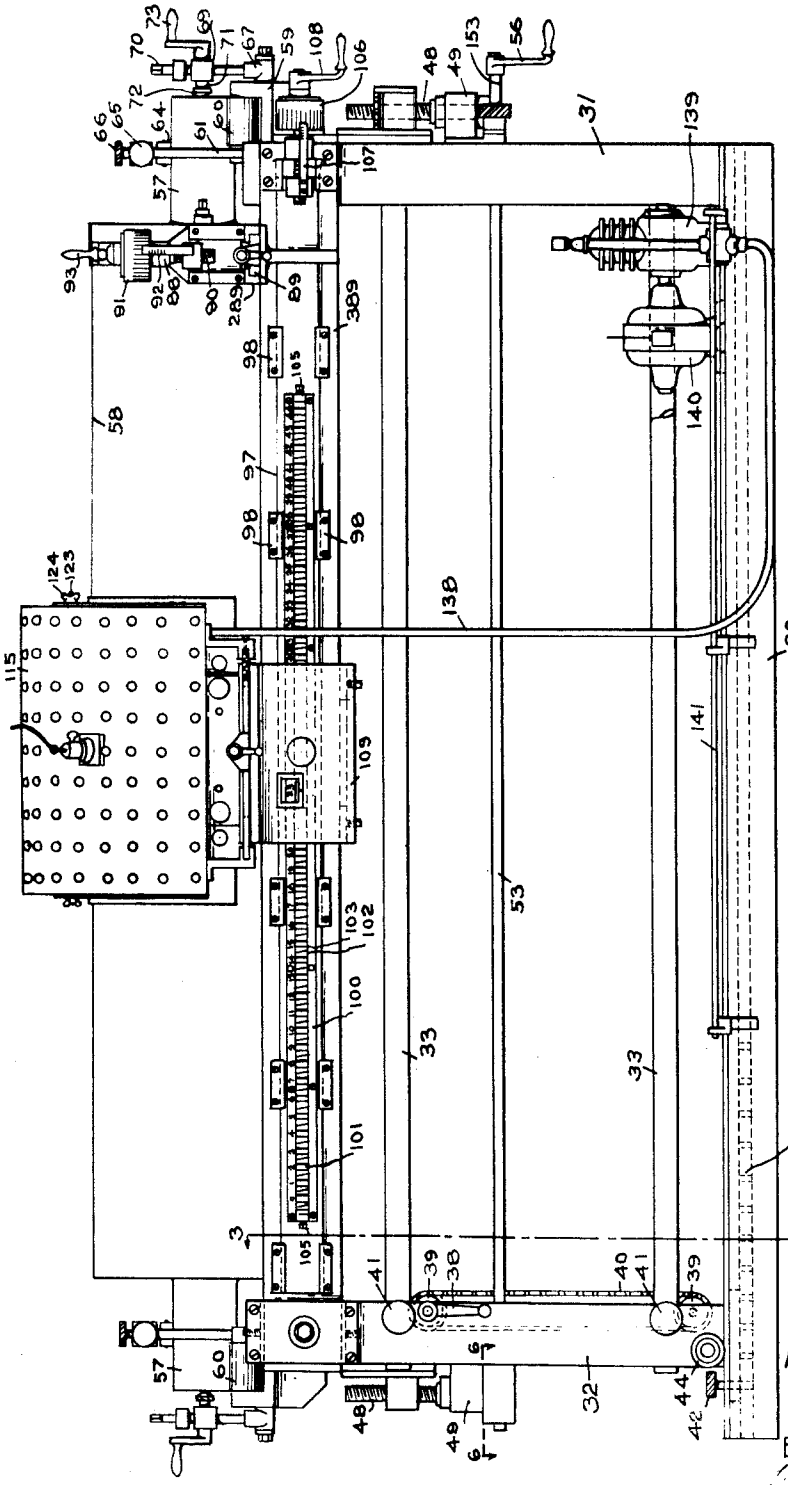


FIG. 1.

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PHOTOGRAPHIC CYLINDER PRINTING APPARATUS

Filed Aug. 31, 1936 8 Sheets-Sheet 2

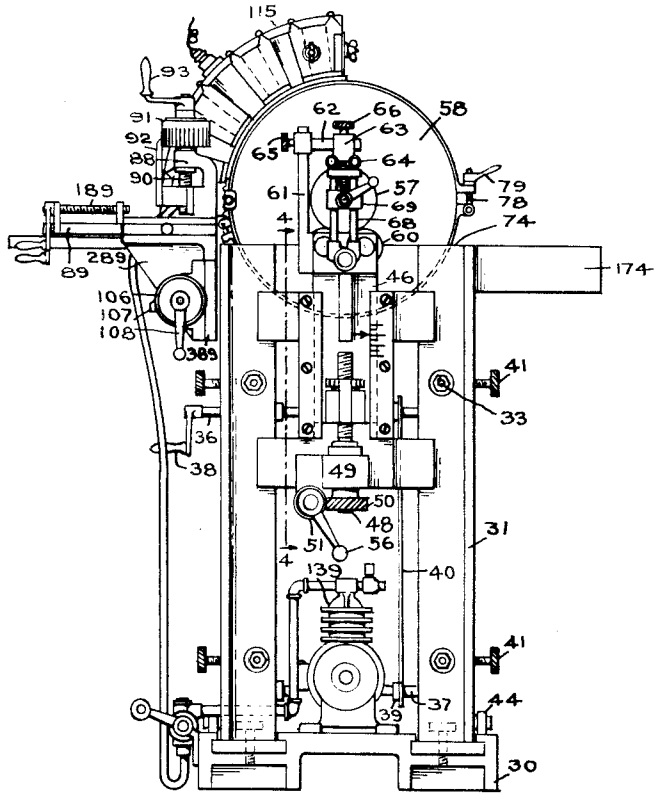


FIG. 2.

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PHOTOGRAPHIC CYLINDER PRINTING APPARATUS

Filed Aug. 31, 1936 8 Sheets-Sheet 3

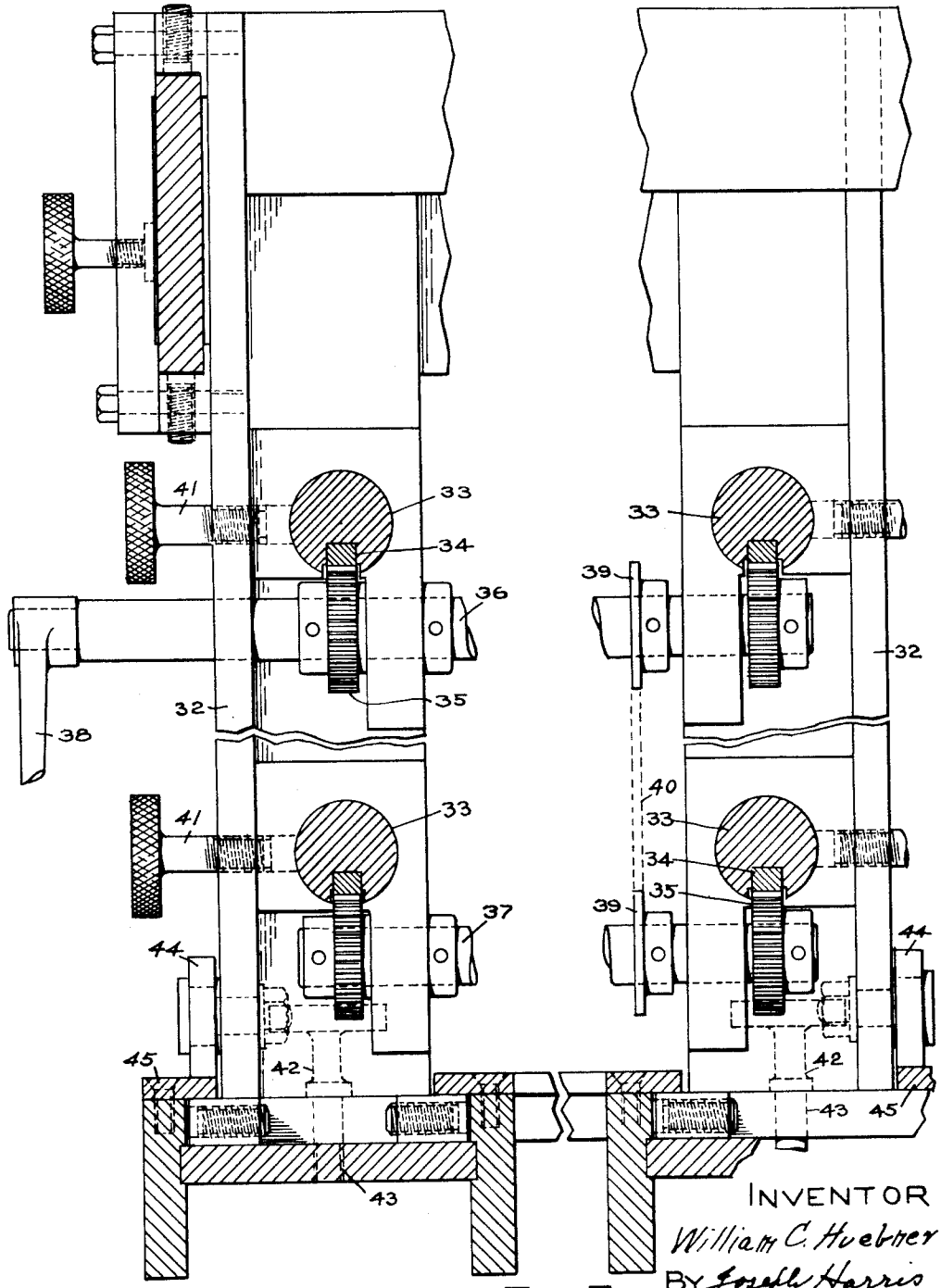


FIG. 3.

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PHOTOGRAPHIC CYLINDER PRINTING APPARATUS

Filed Aug. 31, 1936 8 Sheets-Sheet 4

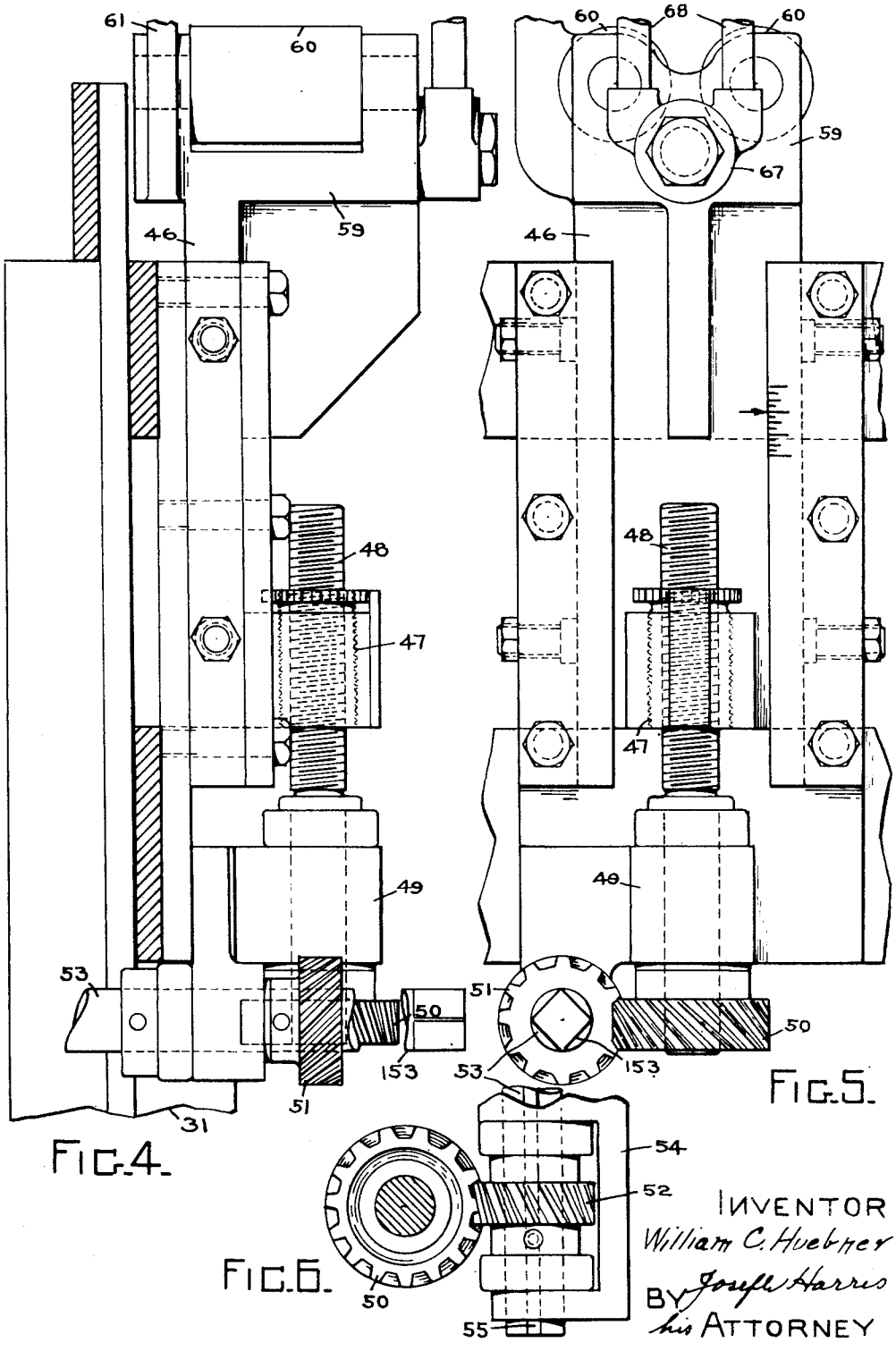


FIG. 4.

FIG. 5.

FIG. 6.

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Aug. 31, 1937. W. C. HUEBNER 2,091,280

PHOTOGRAPHIC CYLINDER PRINTING APPARATUS

Filed Aug. 31, 1936 8 Sheets-Sheet 5

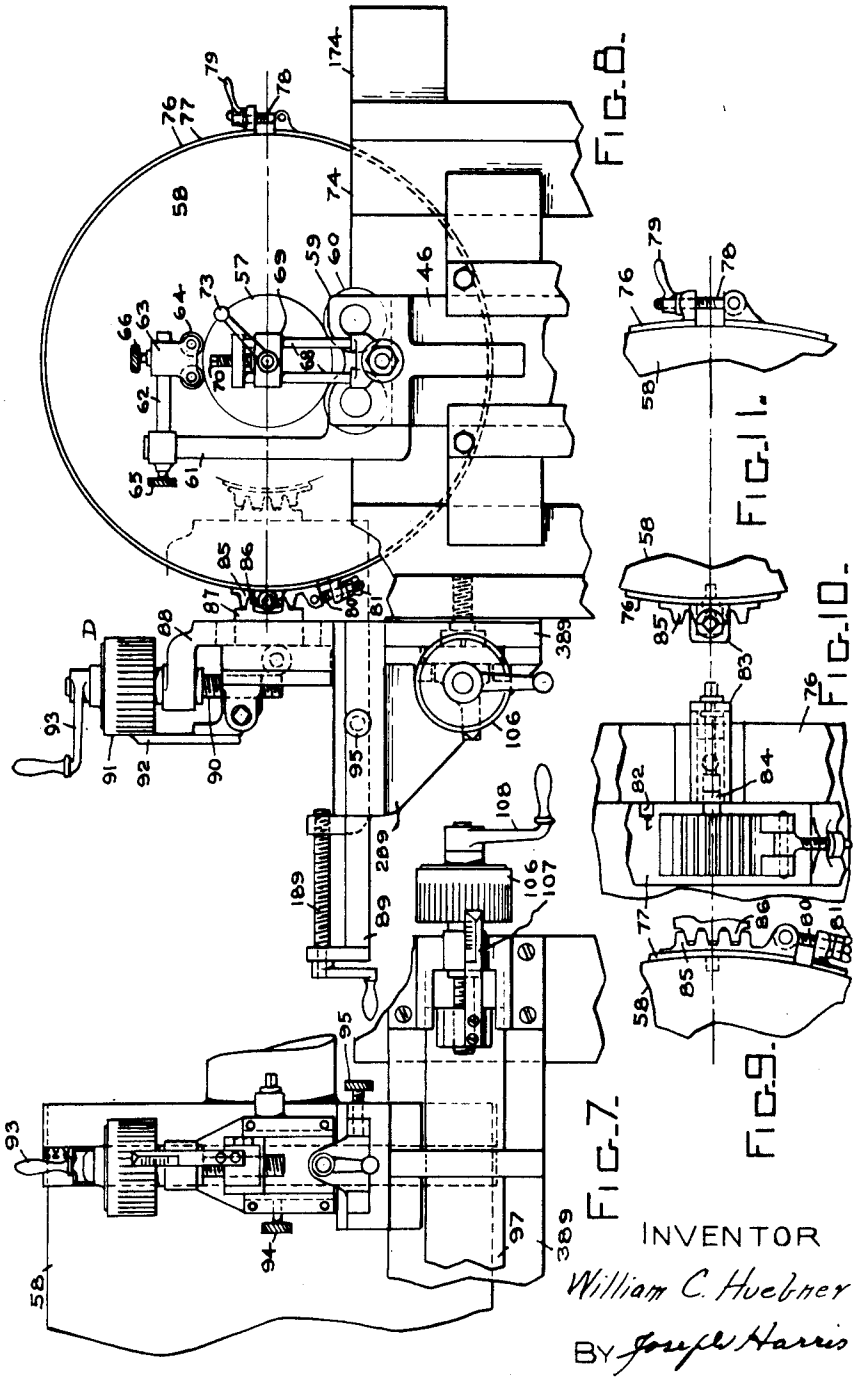


FIG. 8.

FIG. 11.

FIG. 10.

FIG. 9.

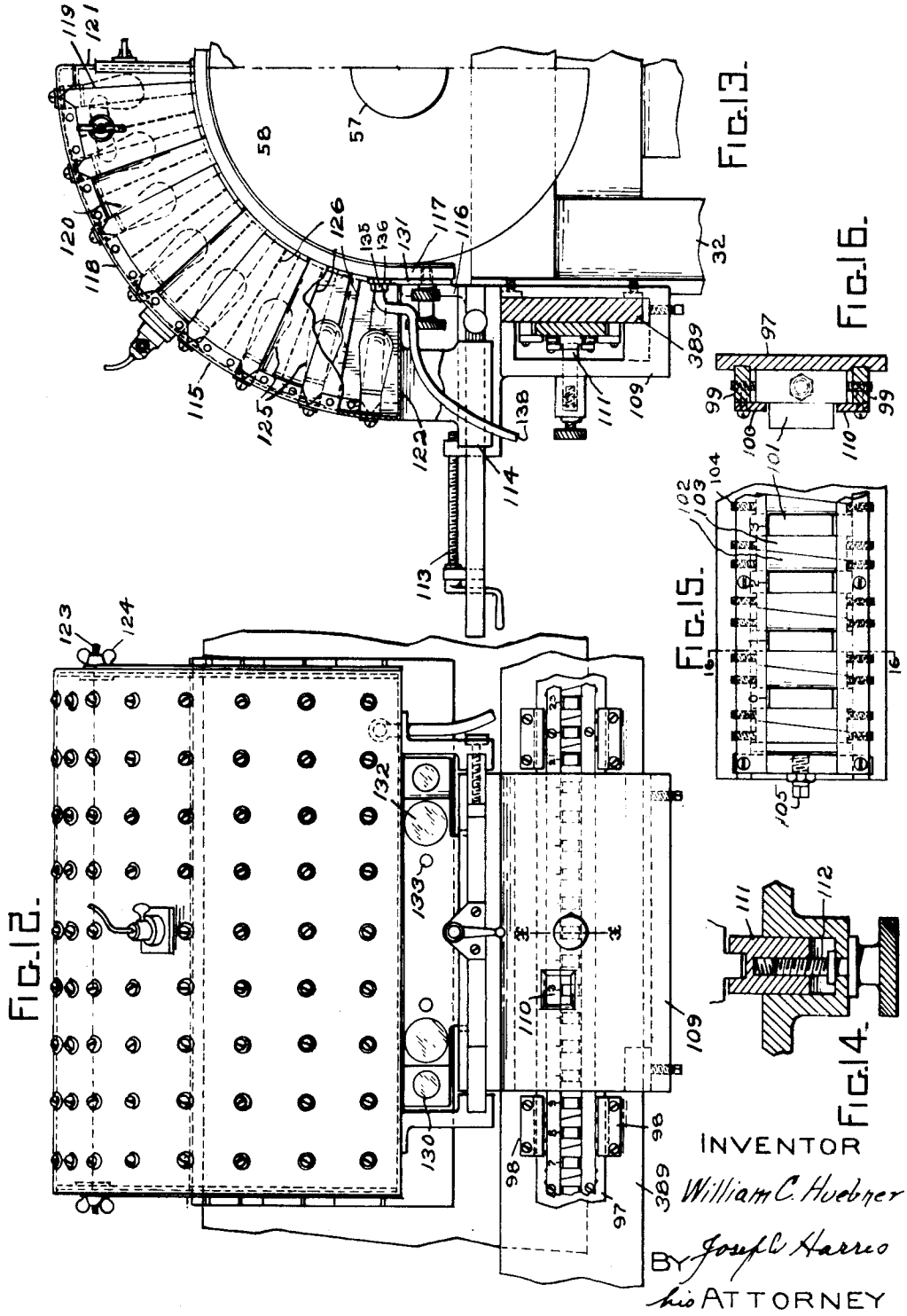
FIG. 7.

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PHOTOGRAPHIC CYLINDER PRINTING APPARATUS

Filed Aug. 31, 1936 8 Sheets-Sheet 6



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PHOTOGRAPHIC CYLINDER PRINTING APPARATUS

Filed Aug. 31, 1936 8 Sheets-Sheet 7

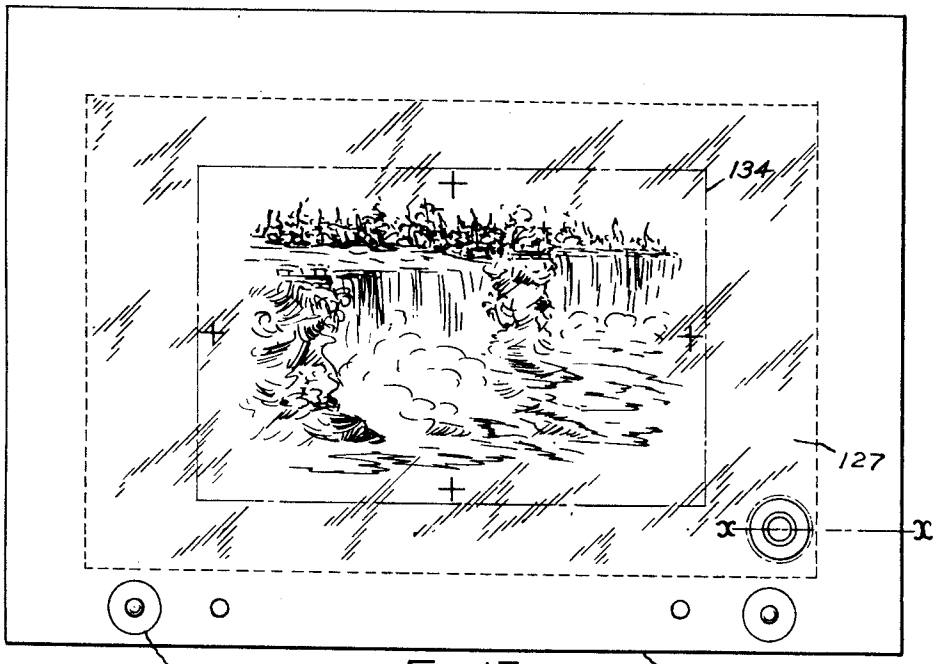


FIG. 17.

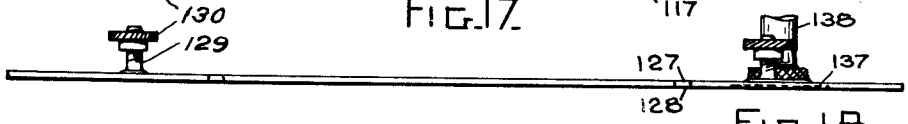


FIG. 18.

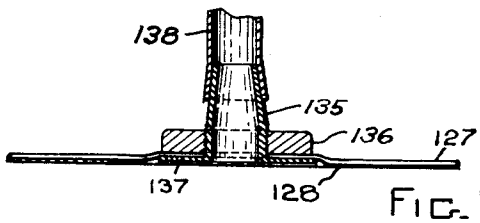


FIG. 19.

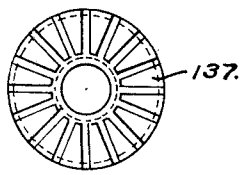


FIG. 20.

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PHOTOGRAPHIC CYLINDER PRINTING APPARATUS

Filed Aug. 31, 1936 8 Sheets-Sheet 8

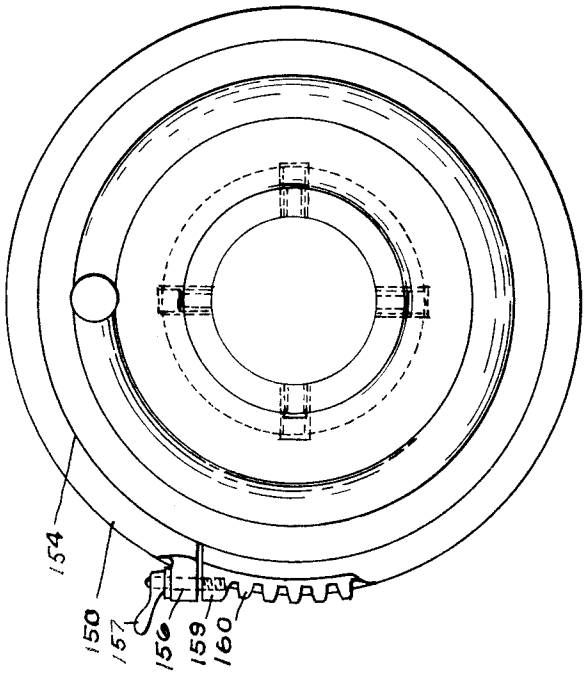


FIG. 22.

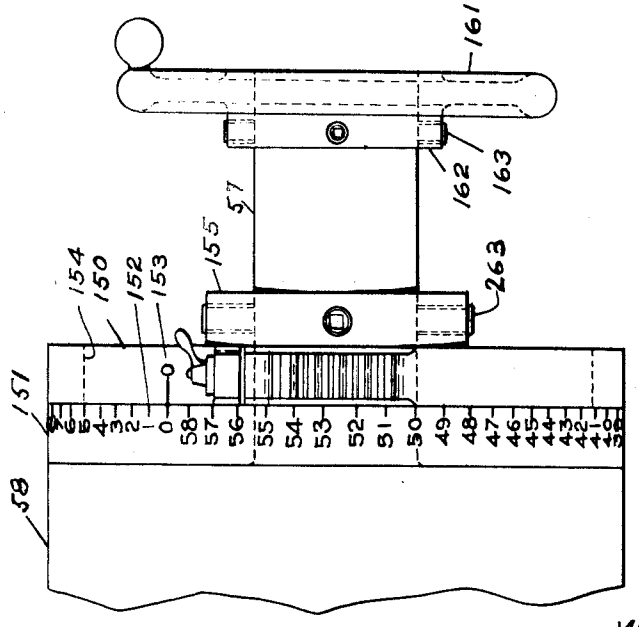


FIG. 21.

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Patented Aug. 31, 1937 2,091,280

UNITED STATES PATENT OFFICE

2,091,280

PHOTOGRAPHIC CYLINDER PRINTING APPARATUS

William C. Huebner, New York, N. Y.

Application August 31, 1936, Serial No. 98,689

16 Claims. (Cl. 95—76)

This invention relates to improvements in photographic cylinder printing apparatus.

One object of the invention is to provide a machine for photographing images in predetermined register on the cylindrical surfaces of printing cylinders such as used in gravure and the like.

Another object of the invention is to provide a photographing machine of the type indicated which is adapted for photographing images on cylinders of different diameters and different lengths.

More specific objects of the invention are: to provide simple devices for obtaining exact positions of the images to be photographed on the sensitized surfaces of the cylinders, said devices being so arranged to insure accuracy of predetermined position and location both circumferentially and longitudinally of the cylindrical surface; to provide improved means for holding the printing negative in absolutely perfect uniform contact with the cylindrical surface during the photographing of the image; to provide improved lighting means adjustable to cylinders of different diameters and further characterized by the fact that the light rays are directed through the printing film in lines confined practically to radial lines with reference to the cylindrical surface to thereby prevent undercutting in the reproduction of the image on the sensitized surface; and to provide means for holding the negative in positively predetermined position coordinated with a registration system such that the images may be reproduced on the cylindrical surface of the cylinder in exact accordance with a layout sheet either for one color or multi-color work.

Other objects of the invention will more clearly appear from the description and claims hereinafter following.

In the drawings forming a part of this specification, Figure 1 is a front elevational view of a machine embodying the improvements. Figure 2 is an elevational view of the right hand end of the machine as shown in Figure 1. Figure 3 is an enlarged vertical sectional view illustrating certain details of construction and corresponds substantially to the line 3—3 of Figure 1, parts being broken away to better accommodate the view on the sheet. Figure 4 is an enlarged detail vertical sectional view corresponding substantially to the line 4—4 of Figure 2. Figure 5 is a view of the parts shown in Figure 4, but taken at right angles thereto. Figure 6 is a horizontal sectional detail view corresponding approximately to the line 6—6 of Figure 1. Figure 7 is a front elevational view, upon an enlarged scale, of certain of the adjusting means employed in obtaining register. Figure 8 is a view at right angles of the parts illustrated in Figure 7. Figures 9 and 10 are broken detail views at right angles to each other illustrating more particularly certain means for effecting predetermined angular adjustment of the cylinder. Figure 11 is a broken view illustrating certain features of one of the bands employed on the cylinder by which its angular position is determined. Figure 12 is a front elevational view, upon an enlarged scale, of the carriage for the negative holder and associated light hood. Figure 13 is a broken, part elevational and part vertical sectional view of the parts illustrated in Figure 12 and at right angles to the latter. Figure 14 is an enlarged detail vertical sectional view, taken on the line X—X of Figure 12, illustrating the means for locking the negative holding carriage in adjusted position. Figure 15 is a front, elevational view, upon an enlarged scale, of the spacer rack used in locating the position of the negative holding carriage lengthwise of the cylinder. Figure 16 is a vertical sectional view corresponding to the section line 16—16 of Figure 15. Figure 17 is a plan view of the flexible negative holder employed in the machine. Figure 18 is an edge elevational view of the negative holder shown in Figure 17. Figure 19 is an enlarged detail section corresponding to the line X—X of Figure 17. Figure 20 is a bottom plan view of the suction plate shown in Figure 19, and Figures 21 and 22 are side and end elevational views, respectively, of another arrangement for effecting predetermined angular adjustment of the cylinder.

In said drawings, the machine is shown as provided with a heavy base 30, to one end of which is rigidly secured an upwardly extending heavy standard 31 and, at its other end, a corresponding standard 32 which, however, is horizontally adjustable on the base 30. Extending horizontally from the standard 31 to and through the opposite standard 32, is a plurality of bracing and connecting rods 33—33, four in number, arranged uniformly in pairs as best indicated in Figure 3. As will be understood, said rods 33 are permanently or rigidly secured to the standard 31 but are adapted for sliding engagement with the adjustable standard 32.

To effect adjustment of the spacing between the two standards 31 and 32 to thereby adapt the machine for use with cylinders of varying length, the following means are preferably employed, particular reference being had to Figures 1 and 3. Each of the rods 33 is provided on its under side with a longitudinally extending rack 34 with which cooperates a pinion 35, the pinions 35 being arranged in pairs on transversely extending shafts 36 and 37 suitably journaled in the standard 32. The upper shaft 36 may be provided with a crank arm 38 on an extended end thereof and, to insure simultaneous and equal rotation of all four pinions, the shafts 36 and 37 have secured thereto sprocket gears

39—39 with which cooperates a sprocket chain 40. With the construction described, it is evident that upon rotation of the crank arm 38, the standard 32 will be moved either toward or from the fixed standard 31, the application of the moving force being distributed equally at four points through the pinions and racks. When the standard 32 has been adjusted to the desired position, it may be securely locked by set screws 41—41 having blocks at their inner ends to frictionally engage the rods 33, as clearly shown in Figure 3. Additional means for retaining the standard 32 in adjusted position may be employed in the form of dowel pins 42 entered through the bottom of the standard 32 into dowel openings 43 in the base 30 as shown in Figures 1 and 3. To facilitate the adjustment of the standard 32, the same may be provided with anti-friction rollers 44 at each side thereof, the same riding upon tracks 45 supported on the base 30.

As hereinbefore indicated, the machine is also so constructed that it will accommodate cylinders of different diameters and to this end and also to provide for the necessary angular adjustments of the cylinder for photographing the images on different portions thereof, the following means are preferably provided. Referring more particularly to Figures 1, 2 and 4, each standard 31 and 32 has vertically slidably mounted and guided on its outer side, a heavy cross-head 46. At its lower end, each cross-head is provided with a nut 47 with which engages a vertically disposed adjusting screw 48. Each screw 48 is suitably journaled in a fixed bracket 49 carried by the respective standards and at their lower ends, the screws 48 have secured thereto helical gears 50. Cooperable with the gears 50 are other helical gears 51 and 52 carried by a longitudinally extending shaft 53 mounted in suitable bearings in the standards 31 and 32. The right hand gear 51 is rigidly secured to the shaft 53 whereas the left hand gear 52 (see Figure 6) is confined within a housing 54 secured to the standard 32, said gear 52 being rotatable in unison with the shaft 53 but slidable therealong by means of a spline connection 55. In this manner it will be evident that, notwithstanding any adjusted position of the standard 32, the two vertical adjusting screws 48 will always be operated simultaneously and equally. To adjust the screws, the shaft 53 may be provided with an extension 153 at its right hand end as viewed in Figure 1, to which is applied a crank arm 56.

To support the trunnions 57—57 of the cylinder 58, each of the cross-heads 46 is provided at its upper end with a bifurcated casting 59 in which are journaled two anti-friction rollers 60—60 horizontally spaced so as to provide two rolling lines of contact for the cylinder trunnions 57, as evident. To steady the cylinder when in position, each casting 59 is provided with an upwardly extended arm 61 on which is vertically adjustably mounted a horizontal arm 62 and on which in turn is horizontally adjustably mounted a block 63 carrying a pair of steadying rollers 64 adapted to engage the top side of the trunnion. The arm 62 is locked in position by a set screw 65 and the block 63 by a similar set screw 66.

To prevent endwise movement or play of the cylinder, once it has been mounted on the trunnion supports, each cross-head is provided with a bracket 67 from which are extended upwardly a pair of guide rods 68—68 and on which is vertically adjustably slidable a block 69, adjustment thereof being effected through an adjusting screw 70. Extending through the block 69 horizontally and axially of the cylinder is a short shaft 71, screw threaded in the block 69 and having a centering point 72 at its inner end and a crank handle 73 at its outer end. By adjusting the centering point 72 vertically in alinement with the axis of the cylinder and then screwing the same inward, the two center points 72 engage the usual counterbores at the ends of the cylinder trunnions and thus serve to prevent endwise play, as will be evident.

The cylinders with which the present invention is concerned, are relatively heavy and must be handled with extreme care in order to avoid injury to the surfaces of the cylinder or the sensitized coatings thereon. To facilitate entering the cylinders into the machine and removing the same therefrom, each of the standards 31 and 32 is provided along the top thereof with a horizontal supporting ledge 74 having an extension to the rear of the machine, 174. When the rollers are brought up to the machine, the same are deposited with their trunnions on the extensions 174 and then rolled into position in line with the trunnion supporting rollers 60, which during this operation will be lowered below the ledges 74. When the cylinders are in proper position, the trunnion supporting rollers are then elevated so as to lift the trunnions from the ledges 74 and thus support the cylinders on the rollers 60.

From the preceding description, it will be seen that the machine is adapted for use with cylinders of both varying diameter and varying length, thus increasing its all round utility in plants having printing cylinders of varying sizes.

In order to insure proper location and position of any image to be photographed onto the sensitized surface of a cylinder, that is, insure register, two things are highly essential. One is to know and to be able to repeat at any time, the position of the negative lengthwise of the cylinder. The second is to know and be able to repeat at will, the position of the negative circumferentially of the cylinder. These positions must be known to within .001 to .003 of an inch, particularly in multi-color work where the different color separation negatives must be photographed onto the different color cylinders so as to insure positive register of all the photographic images when the edition is printed.

In Figures 7 to 11 are illustrated the means for determining the angular or rotative position of the cylinder. As there shown, the said means include two bands 76 and 77 located adjacent each other and at the right hand end of the cylinder, as viewed in Figure 1, it being understood that said bands are applied to the cylinder preferably before the cylinder is inserted in the machine. The band 76, at the extreme end of the cylinder, is split and adapted to be securely clamped to the cylinder by means of the screw and nut arrangement 78 and 79 and, once secured to the cylinder, is permanently left in such secured position. The second band 77 likewise consists of a split ring adapted to be clamped to the cylinder by the screw and wing nut arrangement 80—81, as shown.

The band 77 is provided with a series of notches 82 along that edge thereof adjacent the band 76, said notches being uniformly circumferentially spaced predetermined units of measurement such, for instance, as one inch apart and may be numbered for convenience. The band 76 is provided with a small housing 83 arranged lengthwise of

the cylinder and in which is slidably mounted a spring influenced latch 84, the inner end of which is adapted to engage in any one of the notches 82, the latch being engaged with the zero notch, as illustrated best in Figure 10.

Provided on the band 77 is a short segmental rack 85 which is adapted to engage a short rack section 86 carried by a block 87 vertically adjustable in the upstanding arm 88. The arm 88 is rigid with the carriage 89 horizontally adjustable by means of screw 189 on a bracket 289, the latter being secured to a heavy bar 389 extending horizontally and lengthwise of the machine and, at its right hand end in turn secured rigidly to the standard 31. Vertical adjustment of the rack block 87 is effected through a vertically disposed micrometer adjusting screw 90 having threaded engagement with the block and swiveled in an extension of the arm 88. At its upper end, the screw 90 carries a graduated micrometer wheel 91 with which is associated an indicator finger 92, the screw and micrometer wheel being rotated by suitable means, such as a crank handle 93.

When the rack block 87 has been adjusted vertically to the desired position, it may be locked by a set screw 94 and the carriage 89 also locked in adjusted position by set screw 95.

With the means described, it is apparent that the rack block 87 may be brought to a position directly horizontally in line with the axis of the cylinder, regardless of the diameter of the trunnions thereof and may also be adjusted radially inwardly and outwardly with respect to the axis of the cylinder, thereby adapting it for engagement with the segmental rack 85 of the band 77, likewise for cylinders of different diameters.

In using the angular adjusting means for the cylinder to obtain the circumferential adjustment, the following procedure is employed. The two bands 77 and 76 are clamped to the cylinder in the relation shown in Figure 10, that is, with the latch 84 engaging in the zero notch of the band 77. The rack block 87 is then accurately positioned in line with the axis of the cylinder and engaged with the segmental rack 85 of the band 77. The zero or starting position is thus obtained on the cylinder, circumferentially. Should the layout sheet require a positioning of the center of the negative other than on the zero or starting point, circumferentially of the cylinder, and at a lesser distance than the spacing between the notches 82, such minor micrometer adjustment is effected through the micrometer screw 90 which, when rotated, will rotate the cylinder the desired amount either clockwise or counter clockwise as the layout sheet may call for. Should it be desired to reproduce the image from the same negative at a different point around the circumference of the cylinder or photograph an image from an entirely different negative, the adjustment of the cylinder therefor is obtained as follows. With the two rack sections 85 and 86 still kept in mesh, the band 77 is loosened sufficiently so that the cylinder may be rotated within the same. The latch 84, carried by the other band 76, is then disengaged from the zero notch and the cylinder with the band 76 rotated the desired angular amount until the latch 84 is brought opposite the proper notch 82 and engaged therewith. The band 77 is then retightened and thus another position circumferentially of the cylinder, for photographing the same or a different image is obtained. Should the layout sheet call for a position of the image differing from that determined by the spacing of the notches 82, the micrometer adjustment may be effected in the same manner, as previously described. From the preceding description, it will be seen that the exact position of any negative, circumferentially of the cylinder may be determined on one or a plurality of cylinders. In cylinders varying materially in diameter, different sized bands will be employed, as will be understood.

To obtain the proper position of the negative and holder therefor, lengthwise of the cylinder, the following means are preferably employed, particular reference being had to Figures 1 and 12 to 16. The heavy guide bar 389, previously referred to, while rigidly secured at its right hand end to the standard 31, is slidable within and relative to the left hand standard 32. The guide bar 389 has slidably mounted thereon a rack carrying plate 97 guided by a plurality of plates 98. The plate 97, as best shown in Figures 12, 15 and 16, carries a special rack particularly designed to insure absolutely uniform spacing of the rack teeth. As there shown, said rack comprises upper and lower plates 99 to the outer edges of which are secured retainer plates 100, thus forming a space for the reception of a series of rectangular blocks 101 and oppositely disposed interposed wedge blocks 102 and 103. A series of set screws 104 are entered through the plates 99 to engage the opposite ends of the wedge blocks 102 and 103. The entire series of blocks, when properly adjusted as hereinafter described, are then securely locked by an end set screw 105. As shown in the drawings, the rectangular blocks 101 extend outwardly beyond the retainer plates 100 and form the true rack. To obtain the necessary accurate spacing of the rack blocks 101, each interposed pair of wedge blocks 102 and 103 are adjusted vertically relatively to each other to increase or decrease the spacing, as will be apparent. With this construction, extreme accuracy of spacing of the rack blocks 101, considered both individually and as a group, may be obtained, to thus insure accurate location of the negative carriage, hereinafter referred to.

The rack carrying plate 97 is horizontally adjusted with reference to the fixed bar 389 by a micrometer screw and micrometer wheel 106 at the end thereof, said screw having swiveled engagement with a bracket carried by the standard 31 and threaded engagement with the plate 97. An indicator finger 107 is associated with the micrometer wheel and the latter and associated screw are rotated by a crank handle 108.

Horizontally slidably mounted on the guide bar 389 is the negative carriage 109, the same being provided with a sight hole 110 through which the block rack may be seen and the indicator numbers associated therewith, as clearly shown in Figure 12. Transversely adjustably mounted in the carriage 109 is a locking block 111 adjusted inwardly and outwardly by the adjusting screw 112. When the carriage 109 has been adjusted to the desired point relative to the rack, the locking block 111 is screwed in so as to engage the desired rack block, as shown in Figure 14. Should the layout sheet call for a point intermediate the unit spacing of the rack blocks 101, such micrometer adjustment is effected through the micrometer screw and wheel 106, previously described, which shifts the entire rack carrying arrangement relative to the fixed guide bar 389. With the construction just described, it is evident that the position of the negative carrier 109 lengthwise of the cylinder may be accurately determined and repeated at

will so that, combined with the adjusting means for the cylinder circumferentially, the exact position of the negative carrier both longitudinally and circumferentially is obtainable.

Radially adjustably mounted on the carriage 109 by means of the adjusting screw 113 is a sub-carriage 114 on which is supported the light hood 115 and also the attaching bar 116 to which the negative film holder 117 is in turn detachably secured. Referring first to the light hood 115, the same is of special construction, preferably as follows. The same comprises an arcuate outer wall 118 of preferably heavy sheet metal adapted to be flexed however within reasonable limits. The light hood is also provided, at its ends, with sheet metal walls 119 having a plurality of radial slits 120 providing sections that are adapted to slide over each other to thus adapt the light hood to varying curvatures within reasonable limits. The light hood is also provided with top and bottom radial extending walls 121 and 122, thus providing a complete closure for the lamps, except for the inner arcuate face of the light hood which is adjacent the cylinder. The light hood is made flexible to adapt the same to cylinders of varying diameter, as will be understood, and in practice, the same will be set to the proper curvature so as to insure proper contact of the negative and negative holder with the cylinder for approximately one-fourth of the cylinder surface. To secure the light hood in its adjusted curved condition, longitudinally extending rods 123 may be employed, the same having wing nuts 124 to clamp the overlapped sections of the end walls when adjusted.

To insure the necessary amount of light to obtain proper exposures, the outer curved wall 118 of the light hood has secured thereto a relatively large number of lamp bulbs 125 arranged in longitudinal and circumferential series, as shown in Figures 12 and 13. In order that the rays from the bulbs may be projected radially through the negative onto the sensitized surface of the cylinder and to prevent or at least minimize any of the rays striking the cylindrical surface tangentially or at an angle to the radii, a plurality of partitions 126 are provided in the lamp hood, the same extending longitudinally between the several series of lamps and disposed radially with respect to the cylinder. Said partitions may be conveniently carried by the slit sections of the end walls of the light hood.

In conjunction with the special light hood just described, there is preferably employed a flexible film holder 117 preferably of that type disclosed in my Patent No. 2,000,390, granted May 7, 1935. Said holder comprises a transparent flexible, relatively heavy supporting film 127 (see Figures 17 to 19) having disposed therearound and secured thereto a rubber sealing gasket 128 to thereby provide a central work area. On one edge of the negative holder is provided a pair of attaching screws and nuts 129 and 130 located in predetermined positions and by which the negative holder may be secured to an adaptor bar 131 which in turn may detachably be secured to the upstanding flange 116 of the sub-carriage (see Figure 13) hereinbefore referred to, by the screws 132. The adaptor bar 131 and the flange 116 are provided with cooperable dowels and dowel openings indicated at 133 in Figure 12. In practice, the flexible film holder will be mounted in a registering machine and the negative film proper, indicated at 134 in Figure 17, applied to the inner face of the supporting film 127 in the desired registered position. The negative holder is then secured to the adaptor bar which bears a predetermined relation to the negative holder and the adaptor bar then applied to the sub-carriage flange 116 also in predetermined relation with reference thereto. In this manner, the position and location of the negative relative to the main negative carriage 109 is accurately predetermined so that, by reason of the longitudinal and circumferential adjustments relative to the cylinder hereinbefore described, the exact position and location of the negative relative to the sensitized surface of the cylinder is also predetermined. As will be apparent, the negative holder proper, on account of its flexible nature, will readily adapt itself to the surface of the cylinder and light hood without the necessity of employing any stretching means of any character and without danger of displacing the negative proper 134 with respect to the various registering devices referred to.

To insure full and perfect pressure contact of the negative proper with the sensitized surface of the cylinder during an exposure, as necessary, vacuum is preferably employed, the same being obtained through a nipple 135 secured to the film support 127 by an outside threaded washer 136 and an inside radially grooved plate 137. The latter is grooved in order to facilitate withdrawal of the air from beneath the supporting film when the suction is applied. A flexible hose connection 138 is extended through a suitable slot in the bottom wall 122 of the light hood to and connected with a suction pump 139 operated from a motor 140 mounted on the base of the machine. For convenience of operation, the suction is controlled through a pivotally mounted foot lever 141. For a more detailed description of the negative holder proper, reference may be had to my said prior Patent No. 2,000,390.

In using the type of light hood and negative holder described, should the size of the negative proper be such that the same only occupies a part of the film support 127, suitable masking devices may be applied over such areas through which light is not intended to pass, to thus prevent light action on undesired portions of the cylinder surface. As will be understood by those skilled in the art, different size light hoods and different size negatives may be employed, dependent upon the size of the work being done.

Referring now to the modified construction shown in Figures 21 and 22, the cylinder angular adjusting means comprise a disk 151 of the same diameter as the cylinder 58 and a band 150. The disk 151 is provided with a scale 152 therearound and with which cooperates an indicator zero line 153 on the band 150. The disk 151 is formed with a circular section 154 of reduced diameter and which provides a bearing for the band 150 and relative to which the band 150 may be rotated or adjusted, as hereinafter described. Outwardly of the reduced section 154, said disk 151 is provided with a hub section 155 which, through means of set screws 263 may be securely and rigidly clamped to the trunnion 57 of the cylinder.

The band 150 is split and terminates in large ends, as shown in Figure 22, one of said ends 159 being threaded to receive the tightening or clamping screw 156 having a handle 157 thereon. The band 150 is also provided with a segmental rack 160 which corresponds to the rack 85 previously described in connection with the structure shown in Figures 7 to 11. As will be understood, said segmental rack 160 is adapted to en-

gage and cooperate with the vertically adjustable rack block 87, previously described, or its equivalent, for effecting the micrometer angular adjustments of the cylinder.

The operation of the adjusting means shown in Figures 21 and 22 is similar to that previously described for the construction shown in Figures 7 to 11, that is, the disk 151, being securely clamped to the trunnion of the cylinder will retain a fixed position relative to the cylinder. The major angular adjustments are made by first loosening the band 150 and then setting the zero mark thereof opposite the desired mark of the scale 152 and the band thereupon clamped tightly. Such additional micrometer adjustments as may be necessary are then effected by adjusting the rack block 87, previously referred to.

To facilitate rotation of the cylinder when making the angular adjustments, the trunnion of the cylinder may have secured thereto a hand wheel 161 having a hub 162 rigidly secured to the trunnion by set screws 163.

Although there has herein been shown and described what is now considered the preferred manner of carrying out the invention, the same is merely illustrative and all changes and modifications are contemplated that come within the scope of the claims appended hereto.

What is claimed is:

1. In a photographic cylinder printing machine, the combination with a framework having means thereon for supporting a cylinder; of a carriage slidably mounted on said framework parallel to the cylinder axis; a printing element holder detachably mounted on said carriage and having yieldable means engageable with and being conformable to the cylinder surface; means for creating a vacuum between said holder and cylinder surface; and illuminating means.

2. In a machine of the character described, the combination with supporting means for a printing cylinder having a sensitized surface; of illuminating means; a holder for a printing element adapted to conform to and engage the cylinder sensitized surface, said holder having means to provide an air seal with the cylinder surface; means for exhausting air from beneath the holder when engaged with the cylinder; a carrier; cooperable means on the carrier and said holder for detachably securing the latter to the carrier in predetermined position and location; and means for relatively adjusting the cylinder and carrier with the holder thereon, both circumferentially and longitudinally.

3. In a machine of the character described, the combination with supporting means for a printing cylinder having a sensitized surface; of illuminating means; a flexible holder for a printing element adapted to conform to and engage the cylinder sensitized surface, said holder having means to provide an air seal with the cylinder surface; means for exhausting air from beneath the holder when engaged with the cylinder; a carrier; cooperable means on the carrier and said holder for detachably securing one edge of the latter to the carrier in predetermined position and location; means for adjusting the carrier with the holder thereon longitudinally of the cylinder; and means for adjusting the cylinder circumferentially predetermined amounts relative to the carrier and holder.

4. In a machine of the character described, the combination with supporting means for a printing cylinder having a sensitized surface; of illuminating means; a flexible holder for a printing element adapted to conform to and engage the cylinder sensitized surface, said holder having means to provide an air seal with the cylinder surface; means for exhausting air from beneath the holder when engaged with the cylinder; a carrier; cooperable means on the carrier and said holder for detachably securing one edge of the latter to the carrier in predetermined position and location; means for adjusting the carrier with the holder thereon longitudinally of the cylinder; and means for adjusting the cylinder circumferentially predetermined amounts relative to the carrier and holder, said last named means comprising relatively coarse adjustable devices and micrometer adjustable devices.

5. In a machine of the character described, the combination with supporting means for a printing cylinder having a sensitized surface; of a flexible holder for a printing element adapted to conform to and engage the cylindrical sensitized surface; means for pressing the printing element into intimate contact with the cylindrical surface; means for relatively adjusting the cylinder and holder both circumferentially and longitudinally; illuminating means including a light hood flexible to conform to the cylinder; and means for adjusting the hood relatively to and from the cylinder surface.

6. In a machine of the character described, the combination with supporting means for a printing cylinder having a sensitized surface; of a flexible holder for a printing element adapted to conform to and engage the cylindrical sensitized surface; means for pressing the printing element into intimate contact with the cylindrical surface; means for relatively adjusting the cylinder and holder both circumferentially and longitudinally; and illuminating means including a hood having a plurality of light sources therein and provided also with partitions disposed radially of and extending into proximity with the cylinder surface to thereby confine the projected rays of light to lines substantially radial of the sensitized surface.

7. In a machine of the character described, the combination with supporting means for a printing cylinder having a sensitized surface; of a flexible holder for a printing element adapted to conform to and engage the cylindrical sensitized surface; means for pressing the printing element into intimate contact with the cylindrical surface; means for relatively adjusting the cylinder and holder both circumferentially and longitudinally; illuminating means including a light hood flexible to conform to the cylinder, said hood having a plurality of light sources therein and provided also with partitions disposed radially of and extending into proximity to the cylinder; and means for adjusting said illuminating means relatively toward and from the cylinder surface.

8. In a machine of the character described, the combination with supporting means for a cylinder having a sensitized surface; of means for photographing a printing element onto said surface; and devices for adjusting the position of the cylinder circumferentially comprising, a pair of bands adapted to be clamped to the cylinder, cooperable interengageable means on the bands for adjusting the same relatively circumferentially predetermined amounts when one band remains clamped and the other is loosened with respect to the cylinder, and cooperable means located on one of the bands and mounted on the cylinder supporting means for finely angularly adjusting the cylinder.

9. In a machine of the character described, the combination with a frame; of trunnion supports mounted on said frame and on which the trunnions of a printing cylinder are adapted to rotate; a carriage mounted on said frame movable toward and from a cylinder when mounted on said trunnion supports; a member adjustably mounted on said carriage to move at right angles to said line of movement of the carriage; a pair of bands adapted to be clamped around the cylinder; cooperable interlocking means on one of said bands and said member for effecting rotation of the cylinder upon adjustment of said member; and cooperable interengageable means on the two bands for interlocking the same in different angularly disposed positions.

10. In a machine of the character described, the combination with a frame; of supports for the trunnions of a printing cylinder, mounted on said frame; a carriage horizontally adjustable on said frame in a direction substantially radial of the cylinder; a member vertically adjustably mounted on said carriage; a pair of bands adapted to be clamped around the cylinder; cooperable interlocking means on one of said bands and said vertically movable member for effecting rotation of the cylinder upon vertical adjustment of said member; and cooperable interengageable means on the two bands for interlocking the same in different relatively angularly disposed positions, said trunnion supporting means being vertically adjustable to thereby adapt the axes of different diameter cylinder trunnions to be brought into horizontal alinement with said vertically adjustable member.

11. In a machine of the character described, in combination: a supporting framework comprising a base and a pair of standards mounted thereon, said standards being relatively adjustable toward and from each other; cylinder trunnion supporting means vertically adjustably mounted on said standards; a negative holder carriage horizontally slidably mounted on said framework and parallel to the axis of the cylinder; means for effecting both relatively coarse and relatively fine adjustment of said carriage lengthwise of the cylinder; a sub-carriage adjustably mounted on said carriage to move toward and from the cylinder; a light hood on said sub-carriage; a printing element detachably secured to said sub-carriage; and means for effecting both relatively coarse and relatively fine angular adjustment of the cylinder on said trunnion supports.

12. In a machine of the character described, the combination with a supporting framework comprising a base and a pair of standards thereon, said standards being adjustable relatively toward and from each other, said standards being provided also with supporting ledges at their tops; of cylinder trunnion supports vertically adjustably mounted on the standards, said supports being adjustable to operative positions above and below the respective ledges; a negative holder carriage horizontally slidably mounted on said framework; means for effecting adjustment of said carriage lengthwise of the cylinder; a sub-carriage adjustably mounted on the carriage to move toward and from the cylinder; a light hood on said sub-carriage; a flexible printing element support detachably secured to said sub-carriage; and means for effecting angular adjustment of the cylinder on the trunnion supports.

13. In a machine of the character described, the combination with a main framework; of cylinder supporting means on said framework; a carriage horizontally slidably mounted on said framework; a sub-carriage mounted on said carriage and adjustable toward and from the cylinder; a flexible film support attached to the sub-carriage; a flexible light hood on the sub-carriage; means for creating a vacuum between said film support and the cylinder surface; and means for effecting angular adjustment of the cylinder.

14. In a photographic printing machine, a precision rack comprising: a series of spaced rack tooth blocks, a pair of oppositely disposed wedge blocks between each pair of rack tooth blocks, and means for relatively adjusting the wedge blocks endwise to thereby adjust the spacing between the rack tooth blocks.

15. In a machine of the character described, the combination with a main framework comprising a base and standards relatively adjustable toward and from each other; of trunnion supporting rollers mounted on each standard; means for simultaneously raising and lowering said trunnion supporting rollers; a carriage horizontally slidably mounted on said framework; means for locking said carriage in predetermined adjusted position; a sub-carriage mounted on said carriage to move horizontally toward and from the cylinder; a flexible lamp hood mounted on said sub-carriage and conformable to the curvature of the cylinder surface; a flexible film support detachably secured along one of its edges to said sub-carriage in predetermined position and location, said film support having means for effecting an air seal with the cylinder surface beneath the light hood; means for exhausting air from between said film support and the cylinder surface; a second carriage horizontally adjustably mounted on said framework to move toward and from the cylinder; a rack block vertically adjustably mounted on said second named carriage; and a pair of bands adapted to be clamped on the cylinder adjacent said rack block, one of said bands having a rack section cooperable with the rack block; and cooperable means on the two bands for interlocking the same in angularly predetermined adjusted positions.

16. In a machine of the character described, the combination with supporting means for a cylinder having a sensitized surface; of means for photographing a printing element onto said surface; and devices for adjusting the position of the cylinder angularly predetermined amounts about its axis comprising: a pair of circular members adapted to be secured to the cylinder adjacent each other, said members having cooperable, relative angular position-indicating means thereon, one of said members being fixed with respect to the cylinder, releasable means for locking the other of said members relative to the cylinder to thereby permit desired relative angular adjustment between the two members, and cooperable means carried by said releasable means and the cylinder supporting means for angularly adjusting the cylinder relative to the supporting means when both of said members are locked to the cylinder.

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