Sept. 3, 1940. C. J. ROHLAND 2,213,569

PRINTING APPARATUS

Filed May 10, 1937 4 Sheets-Sheet 1

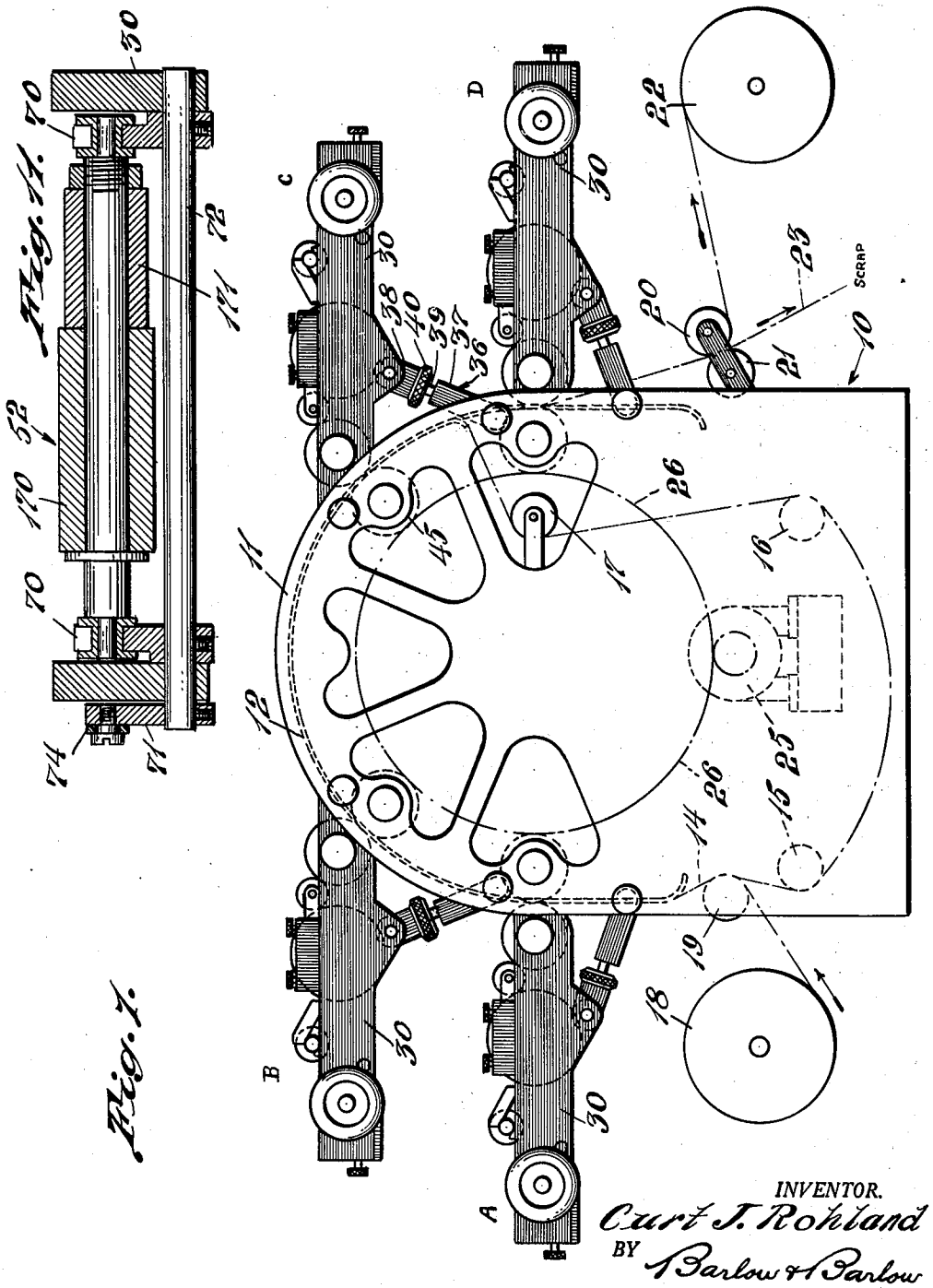


Fig. 1.

Fig. 1A.

INVENTOR.
Curt J. Rohland
BY Barlow & Barlow
ATTORNEYS.

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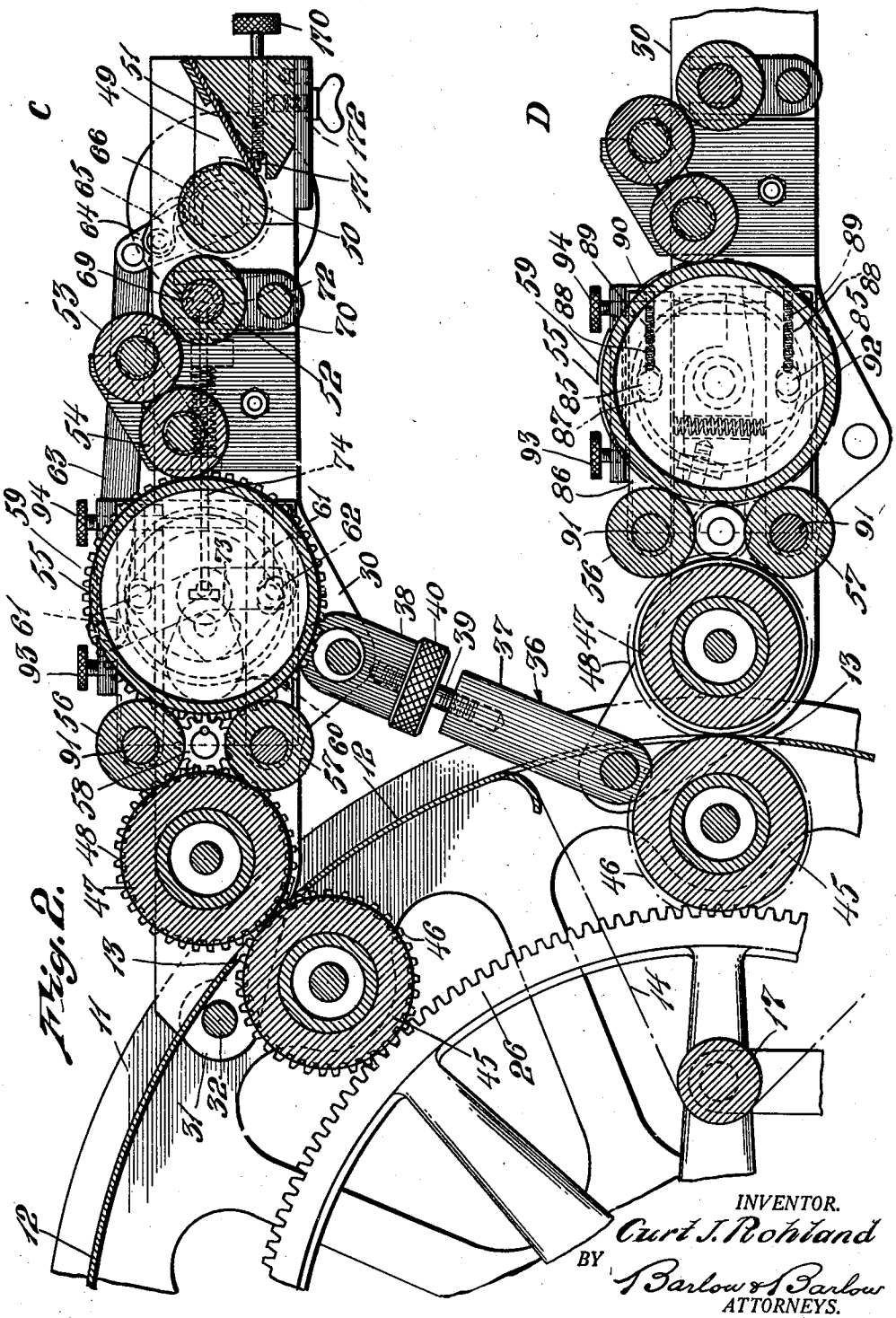


Fig. 2.

INVENTOR.
Curt J. Rohland
BY Barlow & Barlow
ATTORNEYS.

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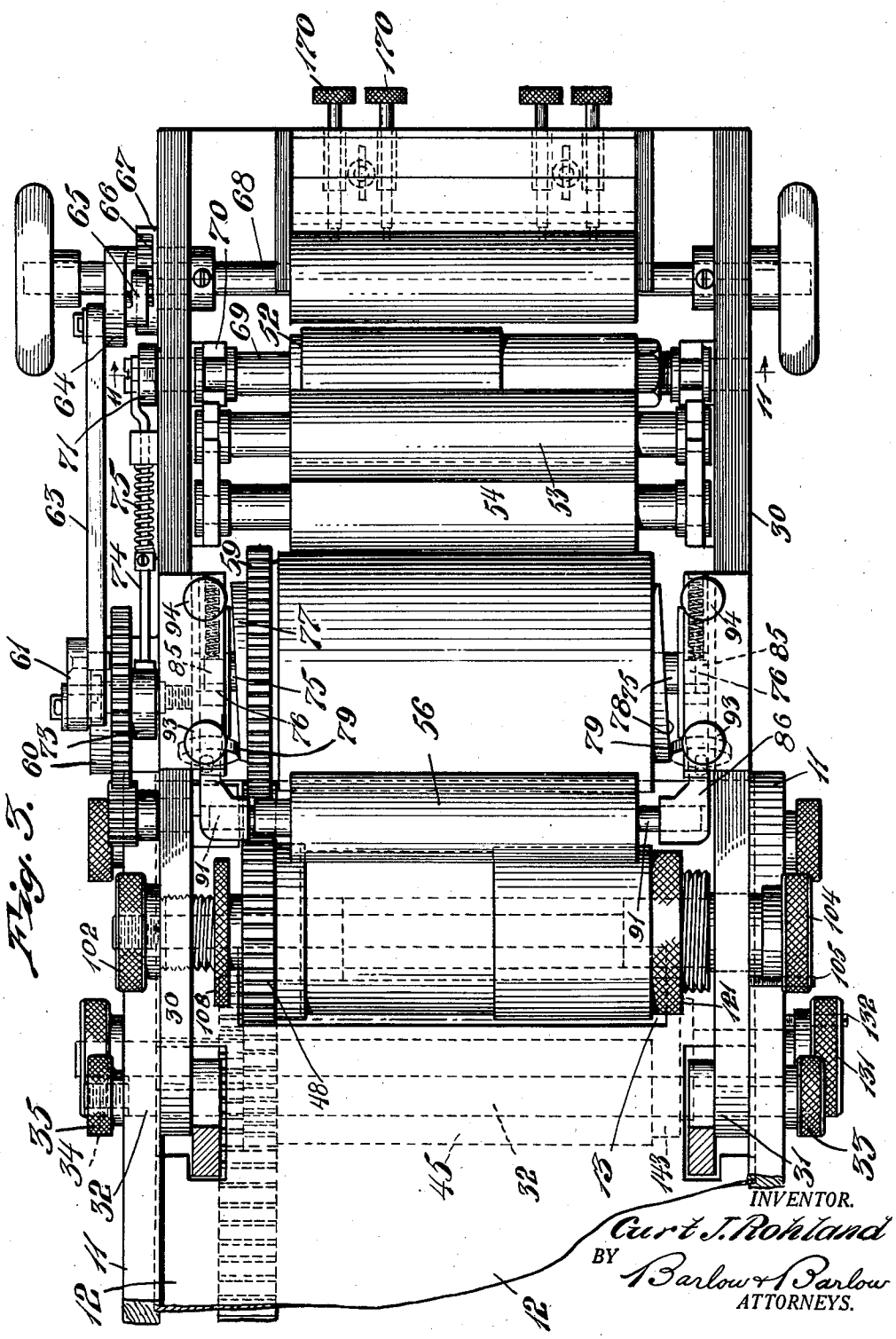


Fig. 3.

INVENTOR.
Curt J. Rohland
BY
Barlow & Barlow
ATTORNEYS.

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Fig. 4

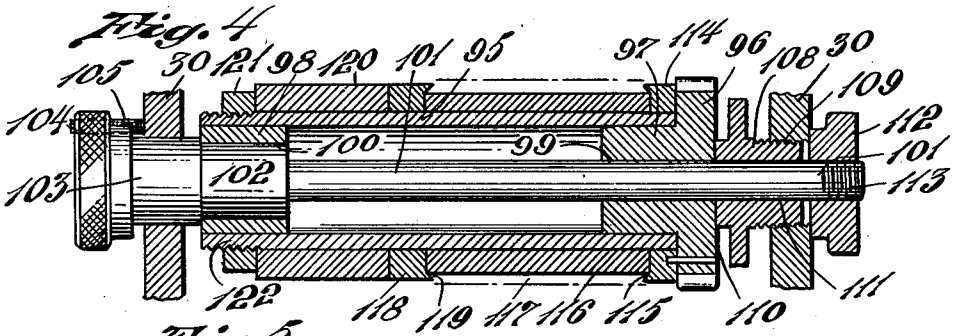


Fig. 5.

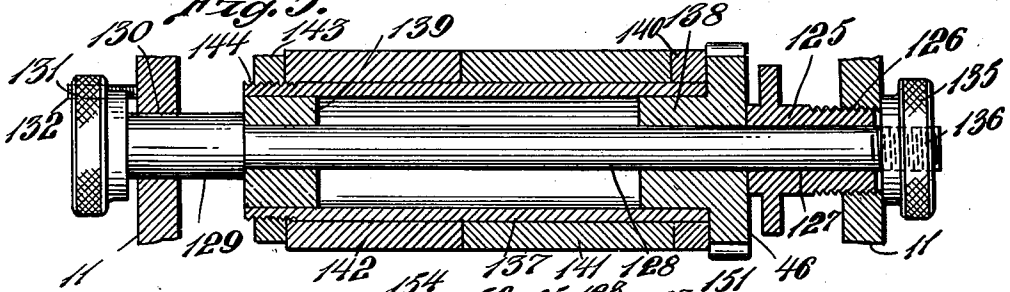


Fig. 6.

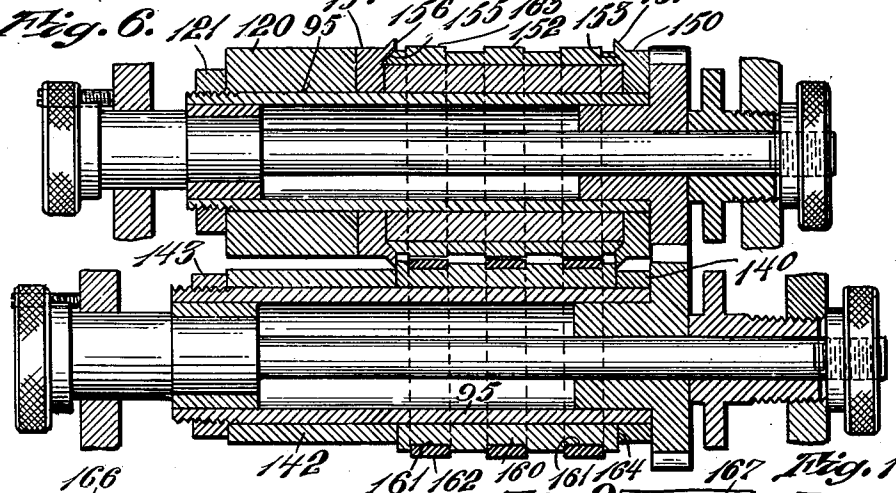


Fig. 10.

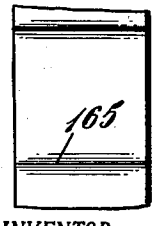
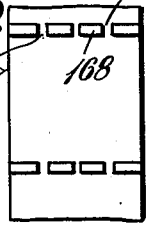


Fig. 9.



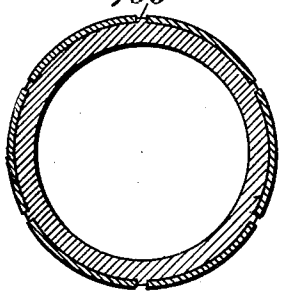


Fig. 7.

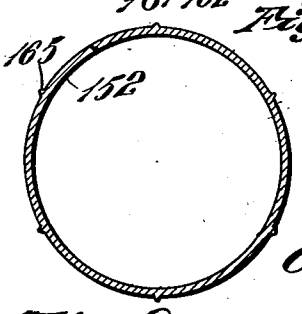


Fig. 8.

INVENTOR.
Carl J. Rohland
BY Barlow & Barlow
ATTORNEYS.

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2,213,569

UNITED STATES PATENT OFFICE

2,213,569

PRINTING APPARATUS

Curt J. Rohland, Seekonk, Mass., assignor to Paul-Rohland, Inc., a corporation of Rhode Island

Application May 10, 1937, Serial No. 141,613

15 Claims. (Cl. 101—181)

This invention relates to a printing apparatus; and has for one of its objects the provision of an apparatus in which there may be printing of the work in any desired number of different colors and embossing or severing the work as it is discharged from the machine, all in a single pass of the work through the machine without transfer to a different machine for the cutting operation.

Another object of the invention is to travel the work through the machine with greater accuracy so that it will better register with the parts which are to print and/or cut the work than is provided by printing or cutting work in a single flat plane by rotating means.

Another object of the invention is the provision of a plurality of units each one of which handles the printing of a certain specific color with an arrangement so that any desired number of units may be supplied or removed from the machine when different numbers of colors are desired.

Another object of the invention is to adjust each of the printing units so that different sorts of work may be accommodated as to pressure applied and the like.

Another object of the invention is to provide each of the print units with the printing rolls and ink conveying rolls with their axes in substantially the same plane so that from the standpoint of thickness of the dimension of the units they may be multiplied and several of these may be used with such an arrangement that the ink reservoirs of each of the units is accessible to the operator.

Another object of the invention is to dispose or travel the work over an arcuate apron or on a radius so that the work will better register with each of the stations where it is to be manipulated and also will pull away from the cutting or printing in a better degree than were the work disposed and traveled along a straight line or in a single plane.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described, and particularly pointed out in the appended claims.

In the accompanying drawings:

Fig. 1 is a side elevation somewhat diagrammatic of the arrangement of some of the functioning parts of the apparatus;

Fig. 2 is a side elevation on a larger scale of the two units shown at the right of Fig. 1;

Fig. 3 is a top plan view of the upper unit shown in Fig. 2;

Fig. 4 is a sectional view on line 4—4 of the printing cylinder;

Fig. 5 is a sectional view on line 5—5 of the bearer roll;

Fig. 6 is a sectional view of the printing and cutting roll and also bearer roll such as shown in both Figs. 4 and 5, which will be used in the last unit to operate upon the work;

Fig. 7 is a sectional view of the working portion of a bearer roll;

Fig. 8 is a sectional view of one form of a printing and cutting roll plate;

Figs. 9 and 10 are face views of fragmental portions of the cutting roll and the bearer roll showing the disposition of the soft and hard portions of these rolls for operation of the cutters; and

Fig. 11 is a sectional view of the ink transfer roll and the mounting therefor taken substantially on line 11—11 of Fig. 2.

In rotary printing usually any cutting to be done on the work is performed in a separate operation after being printed. Any embossing or cutting which is done at the time of the printing usually occurs while the work is traveling in a single plane or against a flat plate in the reciprocating type of press printing. The present apparatus is so arranged that it may print by means of rotary cylinders and also cut at the same time as printing so that the operation of the machine may be materially speeded up and yet all of the desired functions performed in one apparatus. I further provide for a plurality of different printing units, each of which may be utilized for carrying and handling a different color so that a variety of colors may be had in the operation of the machine; and the following is a more detailed description of the present embodiment of this invention, illustrating the preferred means by which these advantageous results may be accomplished:

With reference to the drawings, I have shown in Fig. 1 a general arrangement of the apparatus. There is a framework designated generally 10 and consisting of a pair of spaced supporting end standards 11 with openings at intervals therethrough and an arcuate fixed apron or supporting plate 12 located between these standards 11 and upon which surface the work to be traveled rests, there being suitable openings as 13 at spaced intervals along the apron 12 at which the different printing units operate and through which the different printing units are driven. A cushioning belt 14 extends over this fixed apron 12 and is guided about the pulleys 15 and 16 and the inwardly spaced pulley 17 positioned to prevent the belt from passing through the last operating unit of the machine where severing occurs, although severing may be had against this belt if desired.

The supply of the web material to be printed is indicated at 18 and is led from this reel over a guide pulley 19 and thence over the fixed apron 12 and belt 14 through the apparatus, which will be more fully described later, and fed by means of nip rolls 20 and 21 driven by some suitable

means (not shown) to the reeling mechanism 22 to be suitably reeled for transmittal to some other location, while the portion of the web which is unused and is designated as scrap 23 may be delivered to some container or the like for suitable disposal. A motor 25 through suitable reduction gears drives the large gear 26 from which power is supplied to the different units.

The units for operating upon the work may be of any suitable number. I have here illustrated four which are designated A, B, C and D. The units are generally alike, although they may vary in certain details, which will be hereinafter pointed out. Each consists of a frame member 30 which is pivoted to the spaced end standards 11 by reason of the ears 31 extending between these standards and receiving the pivot pin 32 which is provided with a head 33 at one end and a threaded portion 34 at the other end upon which the nut having a knurled head 35 is positioned. Each of these frame members 30 may be adjusted about this pivot connection with the standards 11 by means of an adjustable link designated 36 and consisting of a member 37 pivoted to the standard 11 and a member 38 pivoted to the frame 30, these members having a threaded connection between them by reason of the threaded part 39 and the nut or handle portion 40 so that an adjustment of this linkage 36 may be had to swing the frame 30 about its pivot 32, to vary the space between the print cylinder and the bearer to accommodate work of different thicknesses.

A bearer roll designated 45 is mounted in the standards 11 at the location of each of the openings 13 in the apron 12. This roll is driven by means of a gear 46 fixed thereon which meshes with the large gear 26 operated by the motor 25. A printing cylinder or mandrel 47 is mounted on a removable spindle in the frame member 30 which is driven by means of a gear 48 meshing with the gear 46 of the bearer roll 45. Ink is supplied to the printing cylinder 47 from the ink reservoir 49 by means of a series of rolls 50, 52, 53, 54, 55, 56 and 57. This reservoir consists of a pocket formed between the roll 50 and the doctor blade 51. This doctor blade 51 is adjusted to control the amount of ink delivered by means of a plurality of threaded members 170 which engage the undersurface of the doctor blade as at 171 so as to force it closer to or allow it to be spaced a little more from the reservoir roll 50. After these members 170 are adjusted they are locked in place by wing bolts 172 that their position may be maintained and the ink supply definitely controlled.

The roll 50 rotates intermittently while the roll 52 is oscillated to alternately contact with the roll 50 and the conveyor roll 53 which in turn transmits the ink to the conveyor roll 54, thence to the inking drum 55 and from this inking drum by means of the conveyor rolls 56 and 57 to the printing cylinder. The oscillating inking drum 55 is driven by means of its gear 59 from the gear 48 through the spur gear 58, while the rolls 54, 56 and 57 are driven by frictional contact with the drum 55, the roll 53 driven by frictional contact with the roll 54, and the roll 52 driven by frictional contact with either the roll 53 or 50. A cam 60 rocks the lever arm 61 which is pivoted as at 62 and which is connected by means of the link 63 to a lever arm 64 which carries a pawl 65 to engage the ratchet teeth 66 on the ratchet guard 67 which is fixed to the shaft 68 upon which the roll 50 is mounted. An adjustable guard 67 covers a portion of the ratchet wheel. At each reciprocation the roll 50 is moved an amount dependent on the adjustment of the guard so as to determine the number of teeth which are gripped on the ratchet wheel, the guard serving to cause the ratchet to slide over some teeth according to its setting.

The roll 52 has a shaft 69 which is mounted in the U-shaped bearings 70, while the lever arm 71 which is pivoted as at 72 also is connected to this shaft 69 at one of its ends. A cam 73 operates the rod 74 against the action of the spring 75 tending to hold it against the face of the cam so as to swing the lever arm 71 about its pivot and rock the shaft 69 and roll 52 from contact with the roll 63 to contact with the roll 50.

As rotary movement is transmitted to the printing drum to turn it about its pivot trunnions 75 in suitable bearings 76 a transverse movement is also given the drum by reason of the cam faces 77 and 78 which are diametrically oppositely disposed and which engage the guiding rolls 79 so that as the cylinder rotates it is also moved axially back and forth to better distribute its printing ink, both for the reception of the same from roll 54 and the transmission of the ink to the conveying rolls 56 and 57.

Pins 85 extend inwardly from the opposite sides of frame 30 and a bar 86 having an opening 87 receives the pin 85. These bars also each have a bore 88 receiving a spring 89 which has one end engaging the pin 85 and the other end engaging an adjustable abutment 90 which is threaded in the end of the bore 88. At the opposite end of each of the bars 86 there is a bearing for the shaft 91 one of which mounts the rolls 56 and the other of which mounts the roll 57. These rolls are drawn against the ink drum 55 by means of these springs 89, while they are rocked about their pivots 85 by a spring 92 tending to swing these rolls away from each other, while the thumb screw 93 for roll 56, and 94 for roll 57, engaging the bars swing the roll about their pivot so that they will firmly contact the printing plate on the cylinder 47.

The printing cylinder 47 is shown in more detail in Fig. 4. Here the frame member 30 is shown in which the print cylinder has its support. The cylinder or mandrel consists of a tubular member 95 which has a gear 96 at one end with a neck portion 97 having a forced fit with the tubular member 95 so as to function as a part thereof, while there is a bushing 98 having a forced fit with the other end of the tube, as illustrated. The gear member 97 has a bore 99, while the bushing has a bore 100 for the reception of spindle 101 which fits the bore 99 and has an enlarged portion 102 for fitting the bore 100. This spindle also has an enlarged portion 103 against which the bushing 98 abuts at one end while it has a head portion 104 which has a threaded pin 105 to engage the frame 30 by which its engagement may be adjustable. An adjustable bearing 108 has threaded engagement with the frame 30 as at 109 and forms an abutment for the end 110 of the gear or body portion of the mandrel, while its bore 111 receives the spindle 101 which is bound firmly in position by the nut 112 having engagement with the threads 113 of the spindle 101. This spindle does not turn but the mandrel turns on the spindle. To mount the printing plate in position I provide a collar 114 having undercut edges 115, which collar abuts the gear 96; a backing up plate 116 engages this collar and serves as a support for the print plate 117. A

binding collar 118 having undercut edges 119 engages the opposite edge of the printing plate 117 and the whole is secured in position through a washer 120 which is urged toward the gear end of the mandrel by means of a nut 121 having threaded engagement as at 122 with the tubular portion 95 of the mandrel. The taper of the undercut edges binds the print plate firmly in position.

The bearer roll is shown in more detail in Fig. 5 and is similar in many respects to the mounting of the printing cylinder. It is mounted in the standard 11 of the apparatus. There is an adjustable bearing 125 having threaded engagement as at 126 with the standard 11 and provided with a bore 127 for the reception of a spindle 128. This spindle is enlarged as at 129 to extend through the bearing 130 in the opposite standard 11 and is provided with a head 131 which has some suitable adjustable means as at 132 for engagement with the frame 11. A nut 135 has threaded engagement with the threaded end 136 of the spindle 128 to bind this spindle in position. The tubular body of this bearer roll is designated 137 and has the gear 46 provided with a neck portion 138 to extend into this tubular member with a sufficiently tight fit so that the two parts will turn together, while there is a bushing 139 having a forced fit with the opposite end of the tube 137 to provide a bearing for the spindle 128. A collar 140 is slid over the tube 137 and then the bearer or make ready surface 141 is positioned on this tubular cylinder which is of a sufficient dimension to accommodate the print plate 117 and after which there is a spacing washer 142 provided, through which the parts are held together against the gear by the nut 143 having threaded engagement as at 144 with the tube 137.

The hereinbefore described print cylinder and bearer roll are such as would be used in units A, B or C, but a different pair of rolls will be used in unit D which is the last unit to operate upon the work where some cutting of the work is desired to be accomplished at the same time that the last printing and/or embossing occurs, and accordingly, I have illustrated the modification which is necessary for this cutting action to occur. The printing cylinder and bearer roll will be mounted the same as that above described. However, in place of having a collar 114 the collar now designated as 150 will be slid upon the print cylinder 95 and will be provided with cutting edges 151 in addition to the undercut to receive a printing and embossing plate 152 to be bound beneath the beveled surfaces 153 of the collar 150. The binder member 154 also has the beveled surfaces 155 and a cutter 156, the same as the cutter 151. The filling in washer 120 and binding nut 121 will be the same as heretofore. The bearer cylinder will have a washer as 140 but instead of having a plain back up surface 141 I will provide a member 160 with recesses 161 receiving rubber bands 162 which will be opposite the raised portions 163 for embossing on the print roll, while the edges 164 of this bearer surface snugly fit within and form cooperating cutting edges with 151 and 156 so that as rotation occurs any material which extends across these cutting edges will be severed by action of the cutting edge shearing against the surface 164 of the bearer roll, while the embossing will take place by reason of the raised portions 163 forcing the stock into the rubber surfaces 162 while allowing their remaining surfaces to be maintained in the general plane of the stock between these embossed portions. The usual washer 142 will be provided and binding nut 143 for this bearer roll.

Where it is desired that a perforation extend transversely of the travel of the work for later tearing the work apart, the printing cylinder or plate will have raised portions 165 extending transversely of the travel of the work or axially of the roll, which raised portions may be interrupted at intervals and serve by means of engagement with corresponding steel portions 166 on the bearer roll to provide points of cutting or perforation of this stock, it being usually desired that these cutting edges be interrupted at such points as 167 so that a continuous cut across the work is not provided, but is held together at the portion 168 of resilient material so that the work may be torn apart after the same is reeled up and transmitted to such location as may be desired.

The roll 52 is unique in some respects in that it is made up of one or more short sections 170, 171, the section 170 being larger and utilized for transferring the ink from the reservoir roll 50 to the roll 53. In other words, if I am utilizing stock which is of a width only half that of the printing roll, such for instance as that shown in Figs. 4 and 5, I will then transfer ink only one-half of the width of the capacity of the machine, thereby saving ink which may be used. This roll is thus made up so that the larger diameter sections and smaller diameter sections may be suitably arranged upon its axis or spindle to position the large diameter section in the desired location.

The foregoing description is directed solely towards the construction illustrated, but I desire it to be understood that I reserve the privilege of resorting to all the mechanical changes to which the device is susceptible, the invention being defined and limited only by the terms of the appended claims.

I claim:

1. In a printing apparatus, a support, an arcuate apron provided with a plurality of openings on said support, a cushioning belt trained over said apron, means for moving said belt, a web to be printed positioned on and movable with said belt, and a plurality of units each having a printing cylinder positioned at one of said openings to print on the convex side of said web, and a bearer roll for each of said printing cylinders positioned on the opposite side of said cushioning belt and at the location of said opening.

2. In a printing apparatus, a support, an arcuate apron provided with a plurality of openings on said support, a cushioning belt trained over said apron, means for moving said belt, a web to be printed positioned on and movable with said belt, a plurality of units each having a printing cylinder positioned at one of said openings to print on the convex side of said web, and a guide adjacent one of said openings for guiding said cushioning belt out of engagement with the web and one of said units.

3. In a printing apparatus, means to move the web to be printed on a curvature, and a plurality of units for printing the work on the convex side of said web pivoted to a support, each of said units having an adjustable link pivoted thereto and to said support for additionally supporting and adjusting each of the units to and from the work.

4. In a printing apparatus, a support, a common gear rotatably mounted on said support,

means for rotating said gear, a plurality of units for printing the work, each unit being spaced from each other and pivotally secured on said support and provided with a print cylinder and adjustable about its pivot to move the print cylinder to and from the work, individual impression cylinder for each printing cylinder of said units and secured to said support and each provided with a pinion gear meshing with said common gear to be rotated thereby.

5. In a printing apparatus, a support, a common gear rotatably mounted on said support, means for rotating said gear, a plurality of units for printing the work, each unit comprising a printing cylinder having a gear thereon and ink transferring cylinders, each unit being pivotally secured on said support and in spaced relation with each other, individual impression cylinder secured to said support for each printing cylinder of said units and each provided with a gear meshing with said printing cylinder gear and with said common gear for rotating said printing cylinder and said impression cylinder.

6. In a printing apparatus, a support, a plurality of printing units carried by said support, each of said units having a frame portion carrying a printing cylinder and inking means, and means to removably mount said cylinder on said frame comprising a spindle upon which said cylinder rotates, and a locking member releasably secured to said spindle and engaging said frame for detachably securing said spindle to said frame whereby upon the release of said locking member said spindle may be disengaged from said frame and withdrawn therefrom and said printing cylinder may be then removed from said unit without disturbing other elements of the apparatus.

7. In a printing apparatus, a support, a plurality of printing units carried by said support, each of said units having a frame portion carrying a printing cylinder and inking means, and means to removably mount said cylinder on said frame comprising a spindle upon which said cylinder rotates, said spindle having an abutment at one end for engaging a portion of said frame and threaded at its other end for releasably receiving a locking member for detachably securing said spindle to said frame whereby upon the disengagement of said locking member from said spindle it may be withdrawn from said frame and said printing cylinder then removed from said unit without disturbing other elements of the apparatus.

8. In a printing apparatus, a support, means to move a web to be printed with relation to said support, a self-contained printing unit provided with a print cylinder for printing the work, means to pivotally mount said unit on said support, an expandable link having one end connected to said support and the other end connected to said unit, and adjustable means within said link intermediate its said ends to operatively vary the length between the ends of said link to change the position of the unit.

9. In a printing apparatus, a support, means to move a web to be printed with relation to said support, a plurality of self-contained printing units each provided with a print cylinder for printing the work, a pivot located eccentric to the axis of the print cylinder for mounting each of said units on said support, a plurality of expandable links each having one end connected to said support and the other end connected to one of said units, and adjustable means within each link intermediate its said ends to operatively vary the length between the ends of said link to change the position of the unit and move the print cylinder to and from the work.

10. In a printing apparatus, a stationary support, an arcuate apron fixed on said support, a cushioning belt trained over said apron, means for moving said belt over said apron, a web to be printed positioned on and movable with said belt, a plurality of units at spaced locations along said belt and each provided with a rotary print cylinder for contacting and printing the web.

11. In a printing apparatus, a stationary support, an arcuate apron fixed on said support, a cushioning belt trained over said apron, means for moving said belt over said apron, a web to be printed positioned on and movable with said belt, a plurality of units each provided with a rotary print cylinder for printing the web, means to pivotally support each of said units for adjustment as a whole about its pivot to move the print cylinder to and from the web.

12. In a printing apparatus, a cushioning belt for backing up the work, means for moving said belt, a web to be printed positioned on and movable with said belt, a unit privided with a rotary print cylinder for printing the web, means separating the paths of travel of said belt and web after printing, and means for acting on the web alone after separation from the cushioning belt for cutting through portions of said web.

13. In a printing apparatus, a fixed arcuate apron, a cushioning belt engageable with said apron for backing up the work, means for moving said belt along said apron, a web to be printed positioned on and movable with said belt, a unit provided with a rotary print cylinder for printing the web, means separating the paths of travel of said belt and web after printing, and means for acting on the web alone after separation from the cushioning belt for cutting through portions of said web.

14. In a printing apparatus, a fixed arcuate apron provided with an opening therein, a cushioning belt for backing up the work engageable with said apron, means for moving said belt along said apron, a web to be printed positioned on and movable with said belt, a unit provided with a rotary print cylinder for printing the web, said cushioning belt passing through said opening in said apron and said web continuing along said apron for separating the paths of travel of said belt and web after printing, and means for acting on the web alone after separation from the cushioning belt for cutting through portions of said web.

15. In a printing apparatus, a fixed arcuate apron provided with a first opening and a second opening therein, a cushioning belt for backing up the work engageable with said apron, means for moving said belt along said apron, a web to be printed positioned on and movable with said belt, a unit provided with a rotary print cylinder for printing the web, said cushioning belt passing through the first said opening in said apron and said web continuing along said apron for separating the paths of travel of said belt and web after printing, said second opening being located in said apron along the portion of which said web alone travels, and cutting rolls on opposite sides of the web acting through said second opening for cutting portions of said web.

CURT J. ROHLAND.