Oct. 24, 1944. F. SHURLEY 2,361,325

ROTARY PRINTING MACHINE

Filed Feb. 21, 1941 8 Sheets-Sheet 1

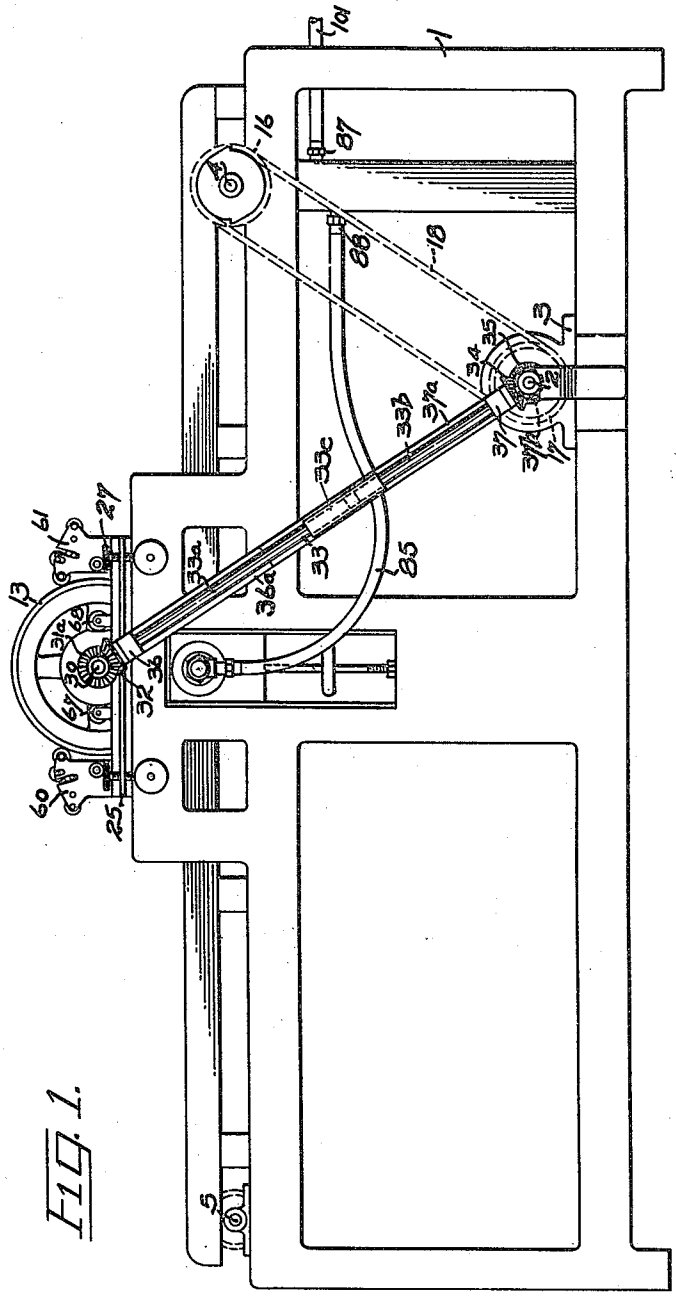

FIG. 1.

INVENTOR.
Frederick Shurley.
BY Grace L. Baldwin
ATTORNEY.

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ROTARY PRINTING MACHINE

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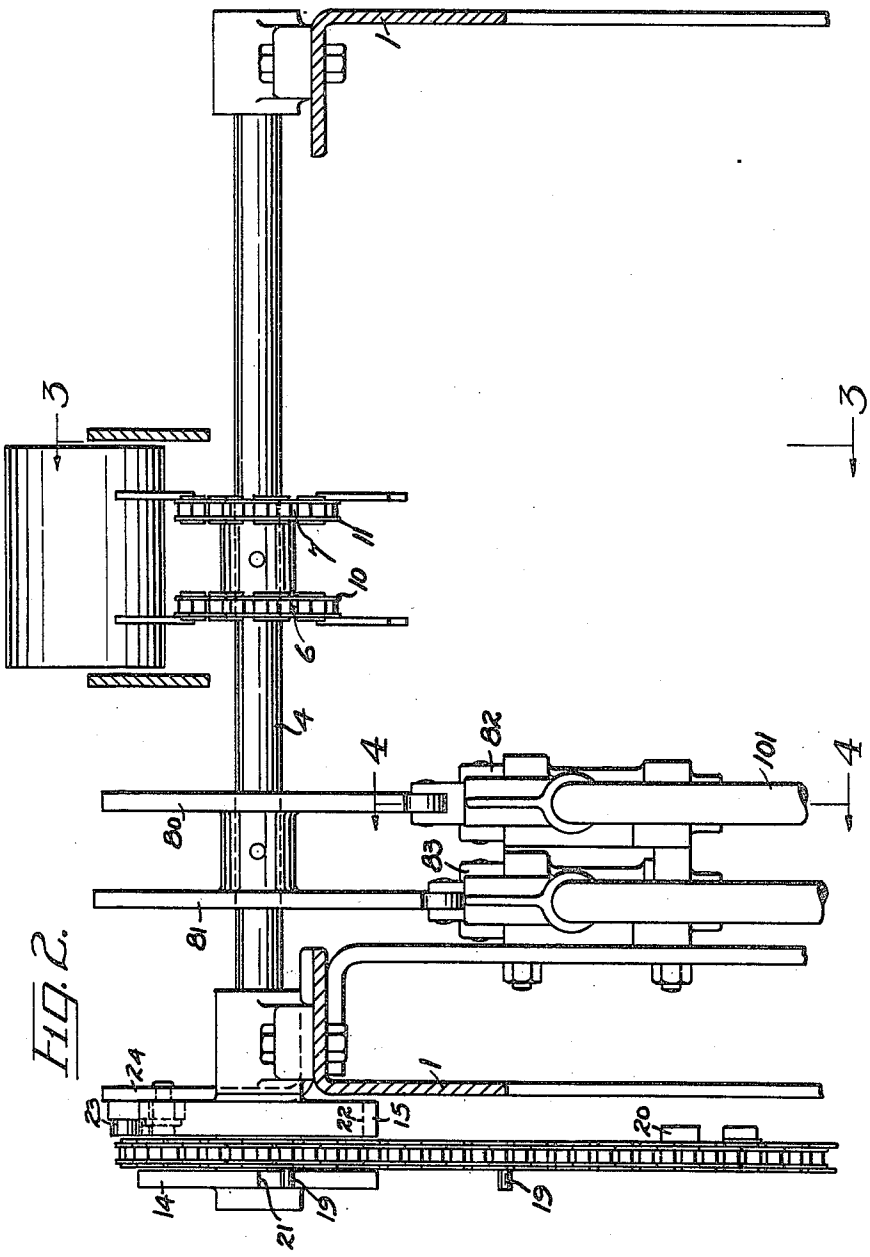

FIG. 2.

INVENTOR.
Frederick Shurley

BY Casey & Baldwin

ATTORNEY.

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ROTARY PRINTING MACHINE

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FIG. 3.

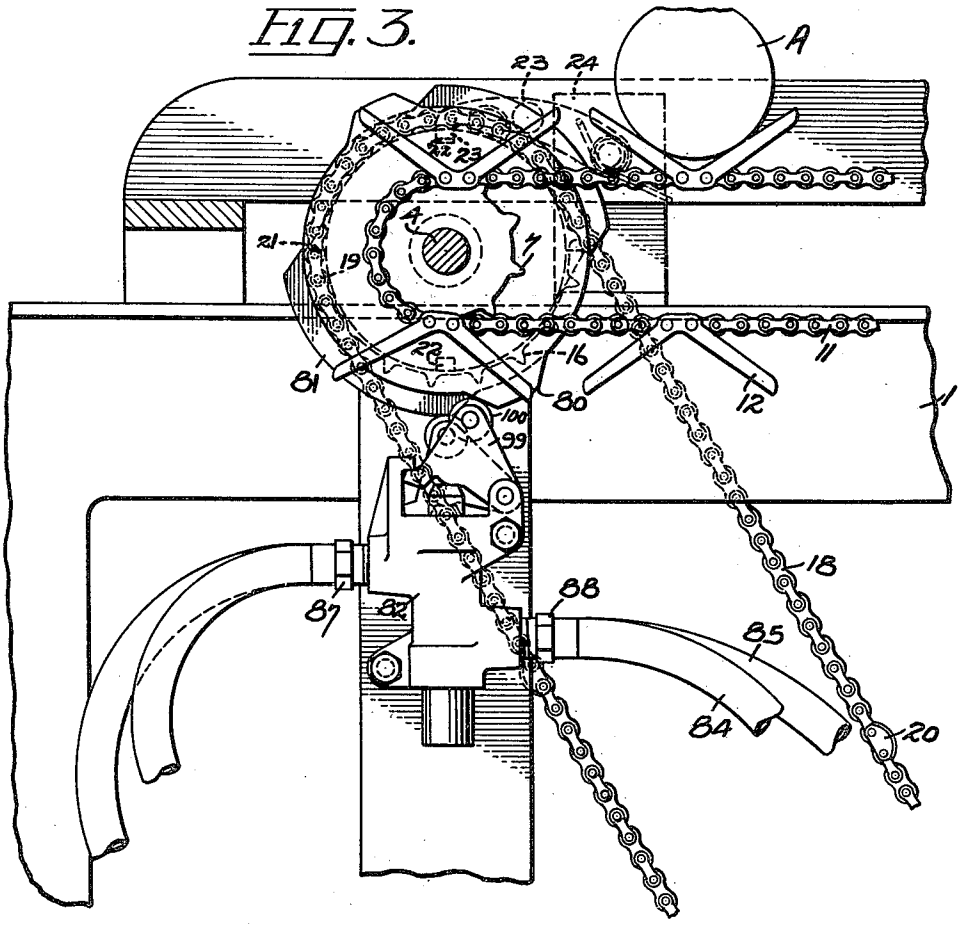
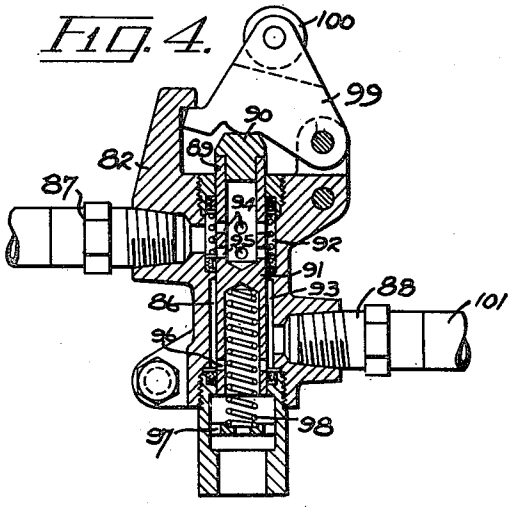


FIG. 4.



INVENTOR.
Frederick Shurley
BY Cravath & Baldwin
ATTORNEY.

Oct. 24, 1944. F. SHURLEY 2,361,325

ROTARY PRINTING MACHINE

Filed Feb. 21, 1941 8 Sheets-Sheet 4

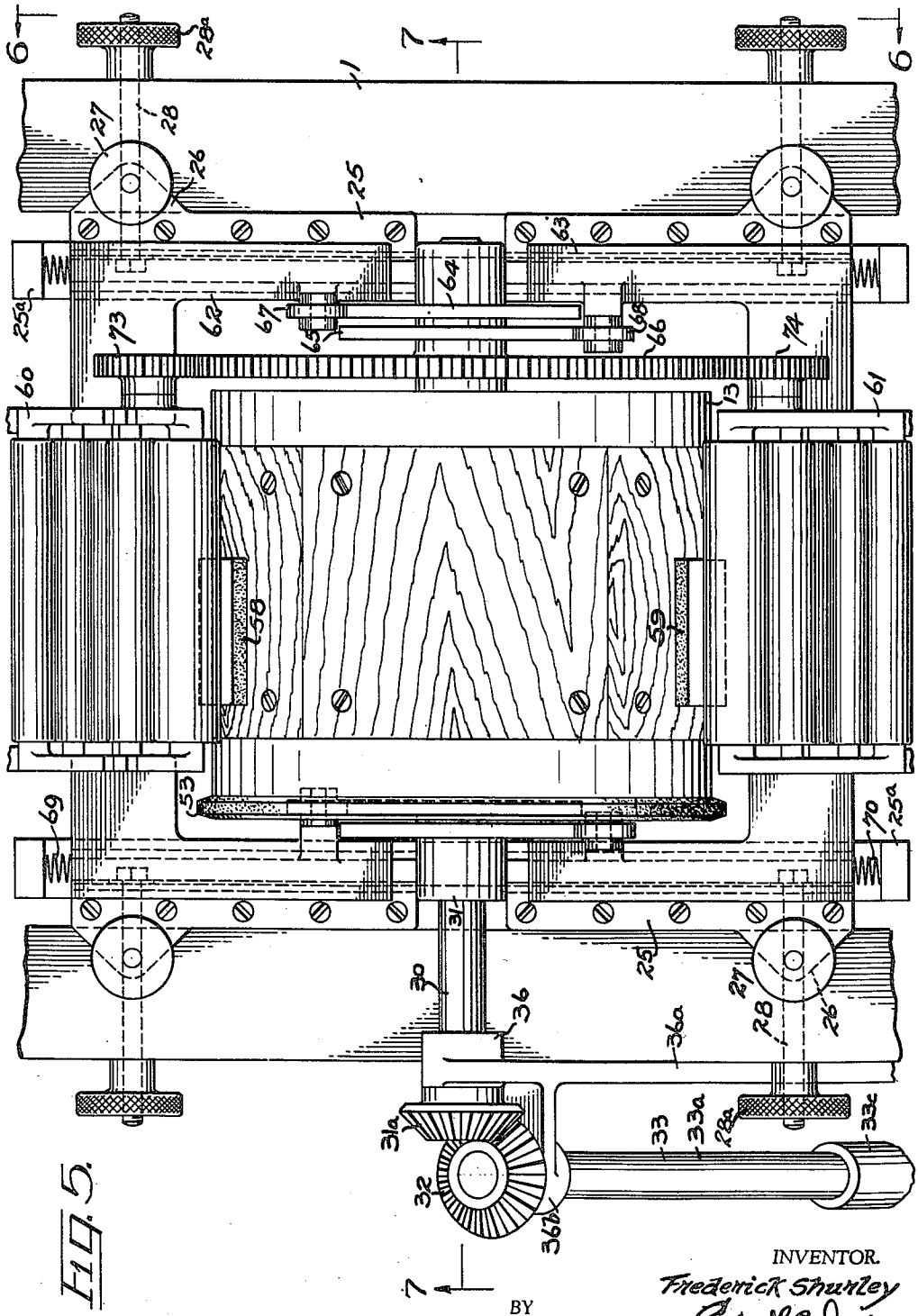


FIG. 5.

INVENTOR.
Frederick Shurley
BY Gerald Godwin
ATTORNEY.

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ROTARY PRINTING MACHINE

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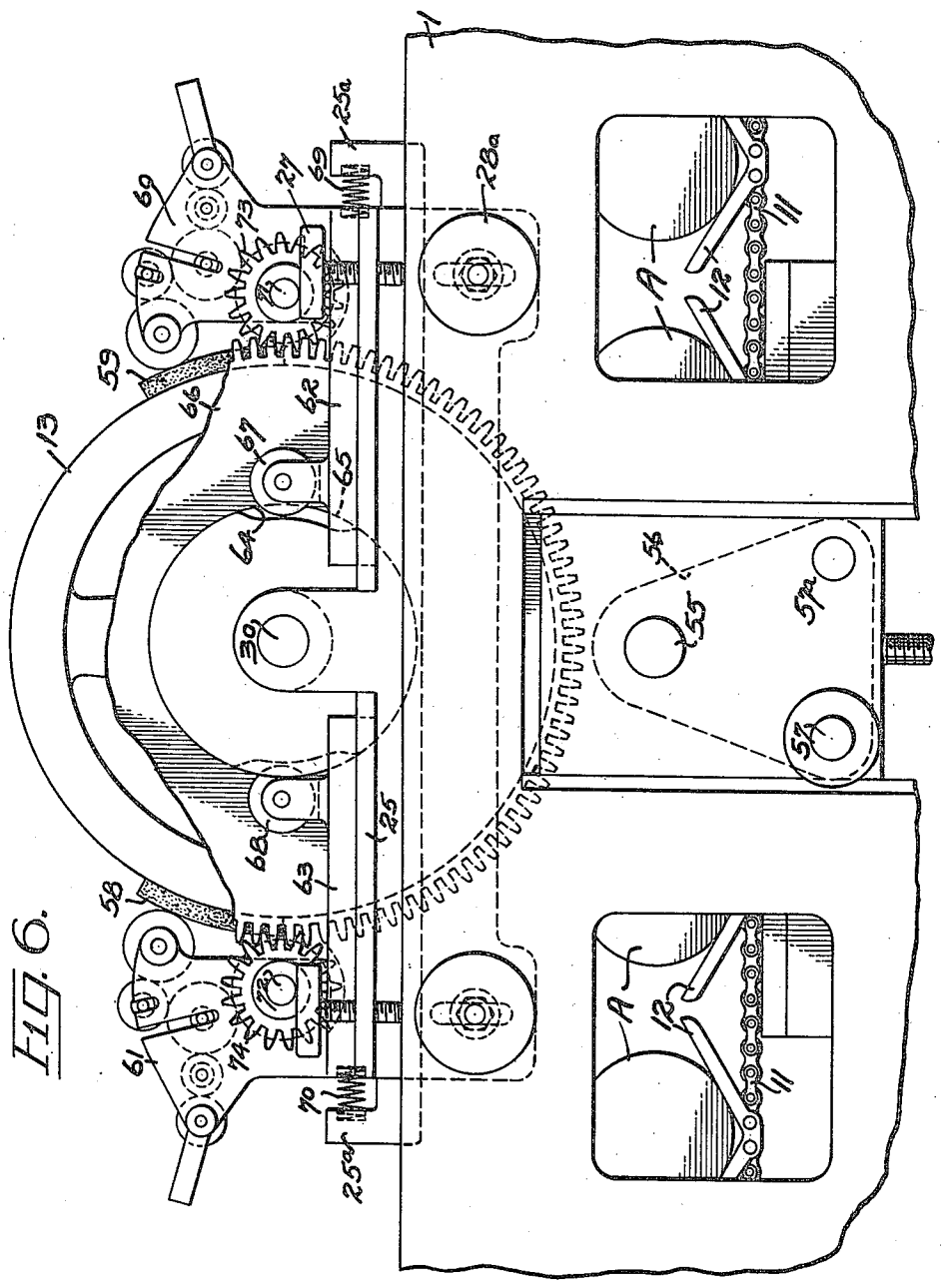

FIG. 6.

INVENTOR.
Frederick Shurley

BY Gerald F. Baldwin

ATTORNEY.

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ROTARY PRINTING MACHINE

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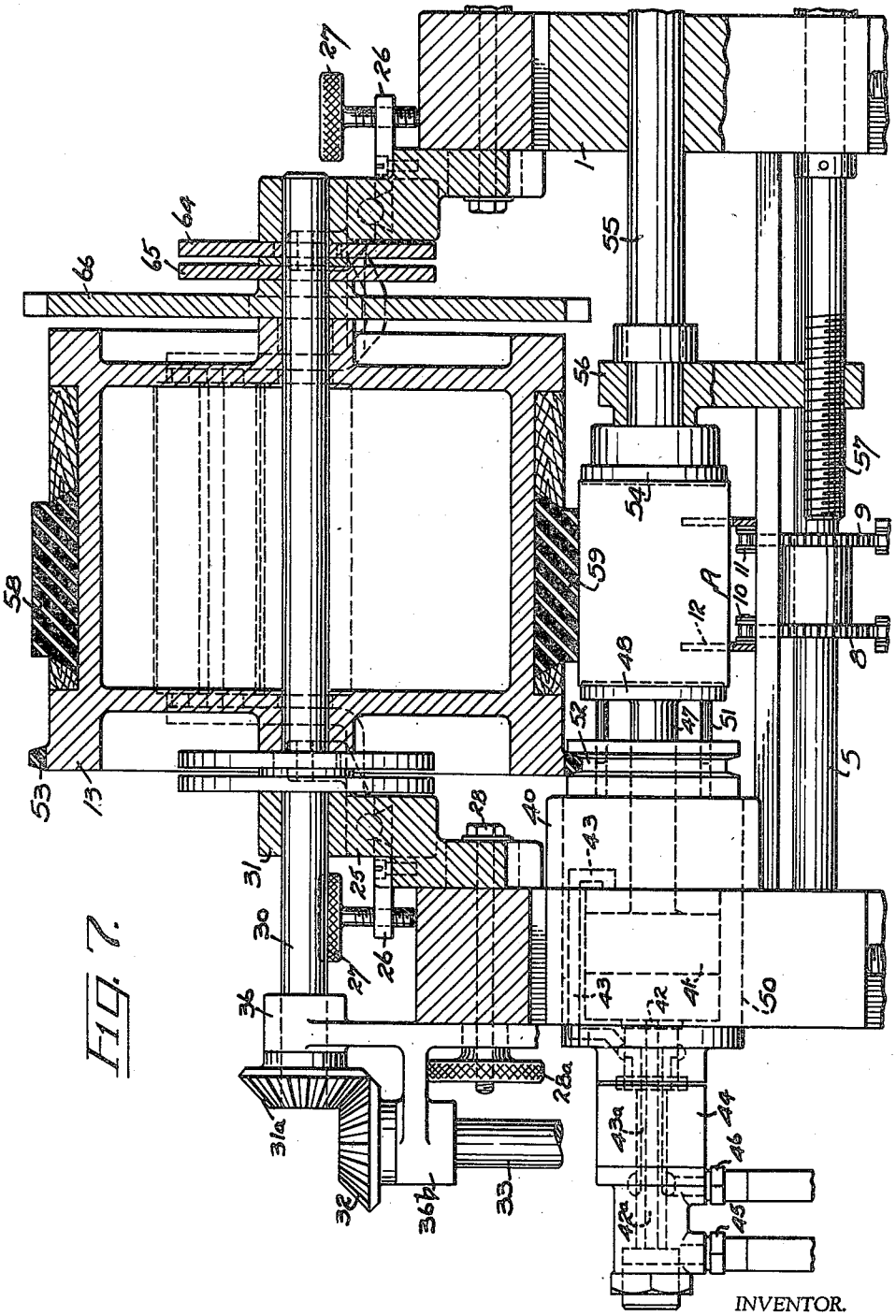

FIG. 7.

INVENTOR.
Frederick Shurley
BY Grant Baldwin
ATTORNEY.

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ROTARY PRINTING MACHINE

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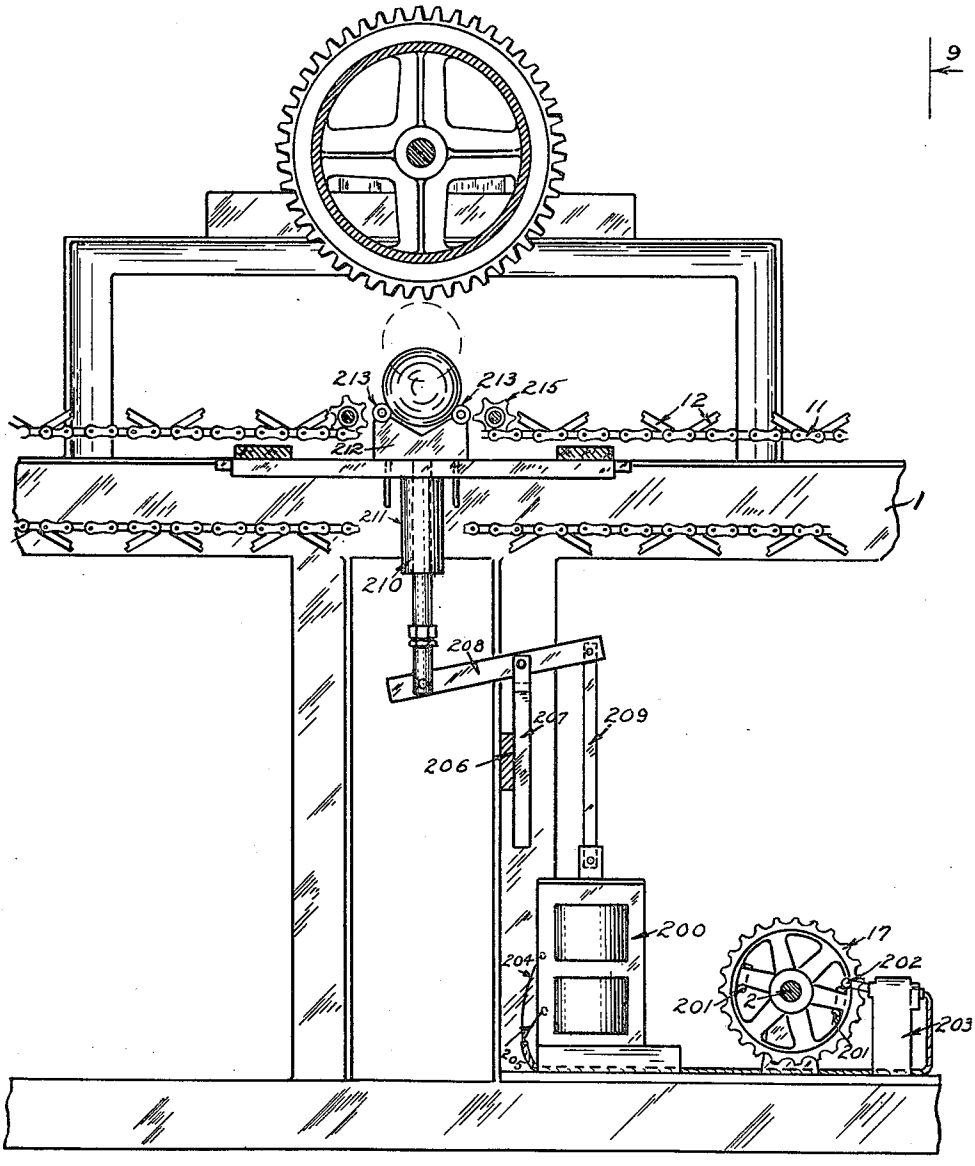

FIG 8

INVENTOR.
Frederick Shurley

BY
Gerald P. Baldwin
His Attorney

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ROTARY PRINTING MACHINE

Filed Feb. 21, 1941 8 Sheets-Sheet 8

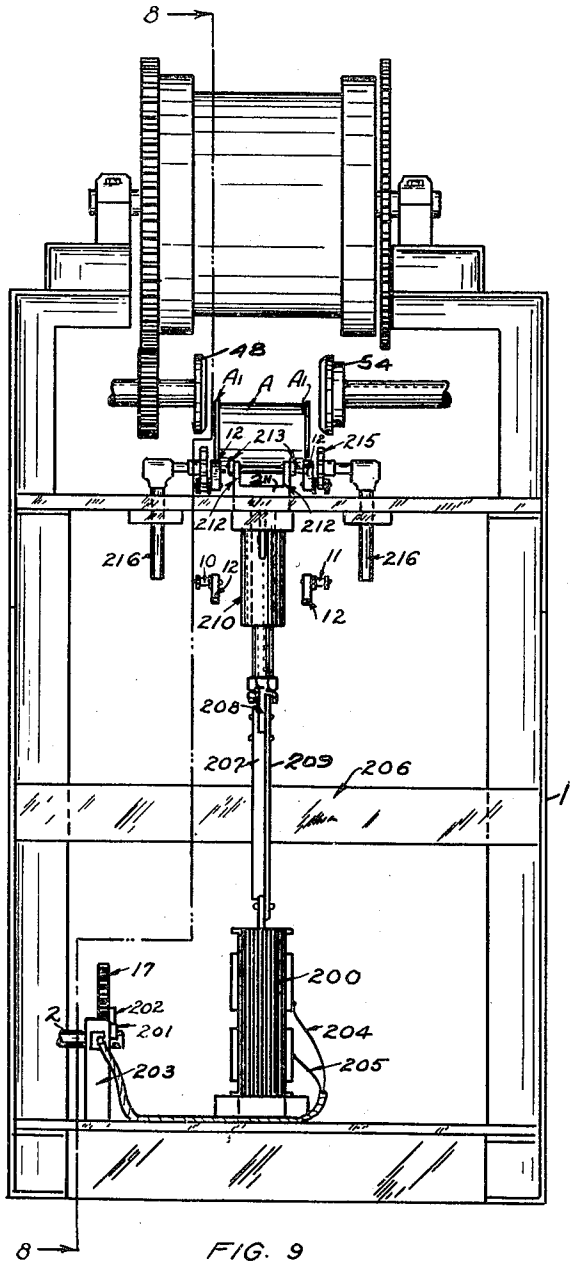

FIG. 9

INVENTOR.
Frederick Shurley
BY Carroll S. Baldwin
his Attorney

UNITED STATES PATENT OFFICE

2,361,325

ROTARY PRINTING MACHINE

Frederick Shurley, Windsor, Ontario, Canada

Application February 21, 1941, Serial No. 380,024
In Canada June 28, 1940

13 Claims. (Cl. 101—38)

This invention relates to improvements in rotary printing machines, and refers particularly to rotary printing machines with which cylindrical articles, such as bottles, tumblers, jars, cans and the like may be printed, labelled or embossed in a plurality of different colors simultaneously.

The invention aims, among other things, to provide a rotary printing machine wherein means are provided: for continuously rotating a cylinder carrying a plurality of printing plates, and for inking each plate during each rotation of the cylinder with a different attachment each of which is adapted to ink its plate a different color; wherein means are provided for moving cylindrical workpieces to be printed intermittently into position for printing in a plurality of colors in a single operation and moving them from printing position when printed; wherein means are provided for positively engaging each workpiece for rotation as it is moved into printing position and for releasing it when printing has been completed; wherein positive means are provided for rotating the workpiece being printed at the same peripheral speed as that of the printing plates during the printing operation; and wherein means are provided for adjusting the distance between the axis about which the printing plates are rotated and that of the work engaging means so that workpieces of different diameters may be printed.

When silk or metal screens are employed for printing it is necessary to dry each color before printing in another color, and moreover printing in this manner necessitates the use of a relatively heavy layer of color and also not infrequently results in a ragged, uneven color edge. It is then also an object of the invention to provide a rotary printing machine provided with means for printing in a plurality of colors directly onto the work at one setting and without having to wait for one color to dry before printing thereon in another color, thereby materially increasing the speed of production; and also to permit printing by the application of either a relatively thin layer of color or a relatively thick one since ceramic or vitreous enamels require perfect opacity, and in either case producing unblurred even edges in the resultant printing.

A further object of the invention is to provide a rotary printing machine wherein the printing plates may be made of rubber, composition, or other somewhat resilient material so that perfectly clear and regular imprints may be obtained on workpieces having slightly irregular surfaces.

Yet another object of the invention is to provide a rotary printing machine whereby different colors may be intermingled in designs which include fine detail, and the different colors applied in a single operation.

Another object of the invention is to provide a rotary printing machine including, in one embodiment, elevating means for raising workpieces from an intermittently moved conveyor mechanism to chucks by which they are held in rotary engagement with the printing plates; and wherein the movement of the elevating means is synchronized with the intermittent movement of the conveyor mechanism.

Another object of the invention is to provide such a rotary printing machine wherein chucks engage and disengage the workpieces; wherein the chuck engaging movement is automatic and the chucks are adapted to engage the ends of circular workpieces so that there peripheral surfaces may be printed throughout their entire height; and wherein the chuck movement for engaging the workpieces is synchronized with the movement of the elevating means.

Having thus briefly stated some of the objects and advantages of the invention I now describe the invention in detail with the aid of the accompanying drawings, in which:

Figure 1 illustrates a side elevation of the machine.

Figure 2 is an enlarged partial plan view showing the head shaft for the conveyor mechanism and the intermittent drive therefor.

Figure 3 is a view taken on the line 3—3 of Figure 2.

Figure 4 is a section on the line 4—4 of Figure 2, further enlarged.

Figure 5 is an enlarged view in plan showing the central portion of the machine and the printing cylinder.

Figure 6 is a side view on the line 6—6 of Figure 5.

Figure 7 is a section on the line 7—7 of Figure 5.

Figure 8 is a partial side view showing a modified arrangement taken as a section on the line 8—8 of Figure 9, and includes elevating means for raising the workpieces from the conveyor means into substantially axial alignment with the chucks.

Figure 9 is a section on the line 9—9 of Figure 8.

Referring to the drawings, 1 designates a frame having a drive shaft 2 mounted transversely thereof which in the present instance consists of the shaft of an electric motor 3. Mounted cross-

wise of the frame towards each extremity are head and tail shafts 4 and 5 having head sprockets 6 and 7 and tail sprockets 8 and 9 respectively mounted thereon. A conveyor chain 10 passes around the sprockets 6 and 8, and a second conveyor chain 11 around the sprockets 7 and 9. 12 denotes carriers which are secured to the chains 10 and 11 in opposed pairs to support cylindrical workpieces A, and carry them to and from printing position beneath the cylinder 13 mounted for rotation substantially centrally of the length of the machine.

Loosely mounted on the head shaft 4, between two cams 14 and 15 fixed upon the latter, is a sprocket 16; and fixed on the drive shaft 2 is a second sprocket 17. Extending around these sprockets 16 and 17 is a chain 18 having spaced pins 19 extending laterally from one side and spaced fingers 20 extending from its opposite side. Formed on the cam are two substantially opposed radially projecting lands 21 one of which is adapted to be engaged by each of the pins 19 so that partial rotation is intermittently imparted to the head shaft 4. In order to prevent accidental rotation of the shaft 4 the cam 15 is provided with opposed and substantially radial apertures 22 either of which may be engaged by a dog 23 pivotally mounted on a bracket 24 secured to the frame 1. The fingers 20 are so spaced that each in turn engages the dog 23 and withdraws it from one of the apertures 22 just prior to the time that one of the pins 19 contacts the cam 14 and commences to rotate the latter and the head shaft 4. As soon as the other aperture 22 is opposite the dog 23 the latter draps therein; this occurs just as the pin 19 by which the cam 14 has been rotated disengages itself from the latter. Thus intermittent rotation is imparted to the head shaft 4 and to the conveyor chains 10 and 11.

Mounted transversely of the frame 1 and substantially centrally of its length is a carriage 25. The latter has laterally projecting ears 26 having threaded openings therethrough to receive vertical adjusting screws 27 the lower extremities of which rest upon the frame 1, so that by adjusting these screws the height of the carriage above the conveyor chains 10 and 11 may be regulated. Extending through horizontal openings formed in the sides of the frame 1 are locking bolts 28 so that by tightening nuts 28*a* thereon vertical adjustment of the carriage is positively maintained.

The cylinder 13 is secured upon a print shaft 30 supported in bearings 31 on the carriage 25. Secured on one extremity of the print shaft 30 is a bevel gear 31*a* which meshes with a bevel gear 32 fixed on one extremity of a telescopic shaft 33 on the opposite extremity of which another bevel gear 34 is secured which meshes with a gear 35 on the drive shaft 2. In the present instance the telescopic shaft 33 consists of two aligned shaft portions 33*a* and 33*b* connected at their adjacent etremities by a sleeve 33*c* in the opposite ends of which the said shaft portions are permitted axial movement but are held against independent rotation in a conventional manner. The shaft 33 is supported adjacent its extremities in bearings 36 and 37 formed upon two portions 36*a* and 37*a* of an extensible bracket the extremities of which are provided with bearings 36*b* and 37*b* which encircle the shafts 30 and 2 respectively.

Provided on one side of the frame 1 is a double acting rotary air cylinder 40 having a plunger 41 therein. Extending through the rear portion of the cylinder 40 are two passages 42 and 43 which are in registry with passages 42*a* and 43*a* respectively in a stationary fitting 44 and terminate at their outer extremities in connections 45 and 46. The passage 42 also opens into the rear of the cylinder 40, and the passage 43 opens into the front of the latter. Fixed on the front extremity of a rod 47 extending from the plunger 41 is a carrier plate 48 adapted to bear against one extremity of a cylindrical workpiece A to be printed, and extending between the plate 48 and the front extremity of the cylinder 40 are a plurality of pins 51 which extend through a pulley 52 engaged and driven by a suitable driving element 53 mounted around the periphery of the cylinder 13. Thus the carrier plate 48 is rotated at the same speed as that of the cylinder 13, and by correctly proportioning the pulley 52 and element 53 the workpiece A turns at the same peripheral speed as that of the printing plates 58 and 59, hereinafter referred to, which are carried by the cylinder 13. The carrier plate 48 is also advanced towards and withdrawn from the longitudinal axis of the machine in a manner hereinafter described by pressure exerted on opposite sides of the plunger 41.

Opposite the axially movable carrier plate 48 and in axial alignment with it is a second carrier plate 54, which is mounted for rotation but is held against axial movement once its spacing from the plate 48 has been adjusted. The plate 54 is suitably mounted for rotation on one extremity of a rod 55 mounted at its opposite extremity in the frame 1 for axial movement. Depending from the rod 55 intermediately of its length and secured thereto is a member 56 having a threaded opening therethrough for the passage of a screw 57 which is also supported for rotation by the frame 1. By turning the screw 57 the spacing of the carrier plate 54 from the other carrier plate or chuck 48 is adjusted. The guide pin 57*a* assists in holding the member 56 against rotary movement.

Secured to the cylinder 13 and on different circumferential portions thereof are printing plates 58 and 59 which are inked in the following manner by conventional inking attachments 60 and 61 respectively which distribute ink of different colors. Mounted for reciprocation longitudinally of the carriage 25 are slides 62 and 63 on which the attachments 60 and 61 respectively are carried. Fixed on the print shaft 30 are two cams 64 and 65 and a spur gear 66 having specially formed deep teeth. Mounted on the slide 62 is a contact roller 67 which engage the periphery of the cam 64 and is retained in contact therewith by a spring 69; and mounted on the slide 63 is a contact roller 68 which engages the periphery of the cam 65 and is retained in contact therewith by a spring 70. These springs 69 and 70 extend between the outer extremity of the slides 62 and 63 respectively and upward projections 25*a* formed on the carriage 25. Mounted for rotation on the inking attachments 60 and 61 are ink drive shafts 71 and 72 having gears 73 and 74 respectively thereon which are provided with specially formed deep teeth to engage the teeth of the gear 66. Consequently as the print shaft 30 turns the ink drive shafts 71 and 72 are rotated and these in turn cause the conventional inking rollers on the attachments 60 and 61 to revolve. Due to the formation of the cams 64 and 65 each printing plate 58 and 59 is inked during each rotary passage past its inking attachment 60 and 61 respectively.

Secured to the head shaft 4 are cams 80 and 81 which operate valves 82 and 83 respectively by which air pressure is permitted to pass into and from the connections 45 and 46 through hose 84 and 85 respectively, and thus cause reciprocation of the plunger 41 and the axially movable carrier plate 48 by which one extremity of the workpiece A is engaged, to hold the latter securely between that carrier plate or chuck and the other carrier plate or chuck 54.

Since the two valves 82 and 83 are identical I will now describe the valve 82 in detail: Provided in the valve 82 is a cylinder 86 open at both extremities. Opening into the upper portion of the cylinder 86 is a radial feed connection 87, and extending radially from the lower portion of the said cylinder is a flow connection 88 connected to the hose 84. Mounted for reciprocation in the cylinder 86 is a sleeve 89 closed at its upper extremity 90, closed intermediately of its length by a transverse wall 91, and open at its lower extremity. Formed in that portion of the bore of the cylinder 86 into which the feed connection 87 extends is an upper annular chamber 92, and formed in that portion of the cylinder bore in which the flow connection 88 terminates is a lower annular chamber 93. Extending through the upper enclosed portion of the sleeve 89 are two vertically spaced rows of radial passages 94 and 95 both of which register with the upper annular chamber 92 when the valve is closed; and formed through the lower portion of the sleeve 89 are other radial passages 96 which then connect the lower annular chamber 93 with the lower open end of the sleeve 89.

Extending from the bottom of the cylinder 86 is a spider 97 which supports one extremity of a helical spring 98 the opposite end of which bears against the lower face of the transverse wall 91 of the sleeve 89. Pivoted on the body of the valve 82 above the top of the cylinder 86 is an actuating member 99 having a roller 100 mounted thereon which rotates against the periphery of the cam 80. When the valve is in the closed position shown pressure fluid from the connection 46 is freely exhausted through the flow connection 88, the lower annular chamber 93, the radial passages 96, and the lower open end of the sleeve 89; at which time the feed connection 87, which is fed continuously from a source of fluid pressure (not shown) through a suitable tube indicated at 101, is closed, since both the radial passages 94 and 95 register with the closed portion of the sleeve bore and with the upper annular chamber 92. As the cam 80 rotates it forces the actuating member 99 and the sleeve 89 downward so that the radial passages 94 register with the annular chamber 92 and the radial passages 95 with the lower annular chamber 93, so that the fluid pressure then passes from the feed connection 87 into the flow connection 88, at which time the radial passages 96 are below, and no longer in communication with, the lower annular chamber. Thus by movement of the cams 80 and 81 pressure fluid is intermittently admitted into opposite ends of the cylinder 40 to move the carrier plate or chuck 48 in opposite directions.

The operation of the machine is briefly as follows: Due to the intermittent rotation of the head shaft 4 the conveyor chains 10 and 11 are intermittently moved, and the movement is such that each time a workpiece A to be printed is moved into position beneath the cylinder 13, and a second workpiece just printed is moved toward the head shaft 4. It is, of course, understood that the opposed pairs of carriers 12 are spaced a distance equal to the travel of the conveyor chains during each intermittent movement. Just prior to cessation of each movement of the conveyor chains and to the rotation of the head shaft 4, the cam 80 depresses the valve sleeve 89 and opens the connection between the feed connection 87 and the flow connection 88. Then pressure fluid is admitted into the rear of the cylinder 40 and the carrier plate 48 is advanced to engage a workpiece A between it and the opposed carrier plate 54. The circular driving element 53 which is in engagement with the pulley 52 rotates the cylinder 40 and the carrier plate 48, so that the peripheral speeds of the workpiece A being printed and the printing plates 58 and 59 are the same, and, since the cylinder 13 is continuously rotated through the telescopic shaft 33 and the print shaft 30, the workpiece engaged between the carrier plates or chucks 48 and 54 is printed in sequence by the printing plates 58 and 59. It is believed that the means for inking each of these plates by moving the inking attachments 60 and 61 respectively into contact with them by the springs 69 and 70 as the contact rollers 67 and 68 rotate against the cams 64 and 65 has been already sufficiently described. When the printing operation is complete the head shaft 4 is again rotated, and, as soon as that occurs, the cam 81 closes the valve 83 and the cam 80 opens the valve 82. Then the carrier plate 48 is positively withdrawn from the workpiece just printed and the latter is free to travel away from printing position upon the carriers 12.

The purpose of making the carriage 25 vertically adjustable is so that the spacing between the printing plates and the axis of the carrier plates may be varied to accommodate workpieces of different diameters. When workpieces of different diameter are to be printed suitable means must be provided for maintaining uniformity in the peripheral speeds of the workpieces and the printing plates. This may be accomplished as by changing the pulley 52 for one of another diameter.

Figures 8 and 9 show a somewhat modified arrangement for handling articles to be printed, and refers to the printing of workpieces or cans A having outward peripheral flanges A' around their extremities. The purpose in this instance is to support a workpiece by its extremities during printing and upon its flanges when upon the conveyors so that the carriers 12 will not contact the printed peripheral wall during removal from printing position when the printing is liable to be still wet and therefore liable to become blurred or smeared. In order to insure that the carriers 12 will receive the flanges A' when the workpieces are dropped from between the carrier members 48 and 54 the carriers 12 are of appreciable width and spaced to support the workpieces by their flanges. Moreover in this modification means are also provided for elevating each workpiece from the conveyors 10 and 11 when positioned beneath but substantially in vertical alignment with the carrier members 48 and 54.

Mounted on the frame 1 is a solenoid 200 which is intermittently energized. On the sprocket wheel 17 mounted on the drive shaft 2 are cams 201 which engage and move a pivoted arm 202 extending from a switch 203 from which suitable leads 204 and 205 extending to the solenoid 200. Thus the solenoid is energized in synchronism with the movement of other parts of the machine, and particularly with movement of the carrier

member 48 and that of the intermittently moved chains 10 and 11. Extending between opposite sides of the frame 1 and suitably supported thereby is a member 206 having a vertical support 207 welded or otherwise suitably secured thereto. Pivoted on this support is a link 208 connected at one extremity to a projection 209 extending from the core of the solenoid, and the other extremity of the link is pivotally attached to an elevator member 210 which is supported for vertical movement in a guide 211. The upper extremity of the member 210 is provided with two spaced and laterally opposed brackets 212 each having a pair of spaced rollers 213 mounted thereon for rotation. The spacing between each longitudinally disposed pair of rollers 213 should be less than the diameter of the workpiece A so that each longitudinal pair supports opposite sides of the workpiece or can to raise it substantially into horizontal alignment with the carrier members 48 and 54 when the solenoid 200 is energized.

In order to retain the conveyor chains 10 and 11 and the carriers 12 at their correct spacing to receive the flanges A' of a workpiece or can when the latter is dropped back onto them from between the members 48 and 54 after printing has been completed, ratchet wheels 215 may be laterally supported on vertically movable brackets 216 to bear against the upper faces of the chains 10 and 11 on both sides of the location where the workpieces are dropped.

While in the foregoing the preferred embodiments of the invention have been described and shown, it is understood that further alterations and modifications may be made thereto provided the said alterations and modifications fall within the scope of the appended claims.

What I claim is:

1. In a rotary printing machine, a frame, a conveyor carried by said frame and having a rotary drive shaft, a power unit, means for intermittently transmitting rotary motion from the power unit to the drive shaft, a cylinder disposed over the conveyor transversely thereof and having a rotatably mounted shaft, a transmission between the power unit and the cylinder shaft, impression means carried by said cylinder, article holding chucks rotatably mounted under the cylinder at opposite sides of the conveyor, means for shifting articles upwardly clear of the conveyor and into position between said chucks, one chuck being driven from the cylinder at a surface speed the same as that of the cylinder, a piston connected with said chuck and movable therewith as a unit for shifting the said chuck transversely of the conveyor toward and away from the other chuck, fluid pressure means for controlling movement of said piston including valves disposed adjacent the drive shaft of the conveyor for moving the shiftable chuck into and out of a gripping position in timed relation to movement of the conveyor, inkers for the impression means, shiftable toward and away from the cylinder, and means carried by the cylinder shaft for alternately shifting the inkers towards and away from the cylinder in timed relation to movement of the cylinder and the blocks.

2. In a rotary printing machine, a frame, a cylinder extending transversely of the frame and having a rotatably mounted shaft, impression means carried by the cylinder, means for inking the impression means as the cylinder rotates, a conveyor for moving articles into and out of position under the cylinder, means for shifting articles upwardly clear of the conveyor under the cylinder, chucks rotatably mounted under the cylinder at opposite sides of the conveyor, one chuck being shiftable toward and away from the other into and out of position to grip an article between the chucks and rotatably support the article, a drive carried by one chuck and rotated from the cylinder for turning the article at a surface speed the same as that of the cylinder turns, means for intermittently driving said conveyor to move articles thereon under the cylinder and then stop movement of the conveyor during printing of the said article, and means actuated from the driving means of the conveyor for effecting movement of the shiftable chuck into and out of a gripping position in timed relation to stopping of the conveyor.

3. In a printing machine, a frame, a cylinder rotatably mounted in the frame, impression means carried by the cylinder, an endless conveyor extending longitudinally in the frame under the cylinder and having a drive shaft rotatably mounted in the frame, an intermittent drive for said shaft including a disc carried by the shaft and having abutment lugs extending therefrom and a sprocket chain having side pins for successively engaging the lugs and rotating the shaft, chucks under the cylinder at opposite sides of the conveyor for gripping articles upon the conveyor and rotatably supporting articles, means for shifting the articles on the conveyor under the cylinder upwardly from the conveyor to a position between the chucks, means for rotating the chucks at surface speed the same as that of the cylinder, and fluid actuated means for moving one chuck into and out of a gripping position including valves, and cams carried by the drive shaft of said conveyor and engaging the valves to adjust the same and move the shiftable chuck in timed relation to movement of the conveyor.

4. In a printing machine, a frame, a drum rotatably mounted in the frame, impression means carried by the drum, an endless conveyor in the frame extending under the drum and having a drive shaft, an intermittent drive for said shaft, rotatable chucks under the drum at opposite sides of the conveyor, means for shifting articles on the conveyor upwardly therefrom while under the cylinder and into position between the chucks, one chuck being shiftable transversely of the conveyor toward and away from the other into and out of position to grip an article and rotatably support the article between the chucks, a pulley carried by one chuck, the said chuck being slidable through said pulley, a friction band about said drum turning therewith and engaging the pulley for frictionally rotating the chucks and an article gripped between the chucks at a surface speed corresponding to that of the cylinder, and means for moving the shiftable chuck into and out of a gripping position having control means actuated from the drive shaft of the conveyor for adjusting the shiftable chuck in timed relation to the movement of the conveyor.

5. In a printing machine, a frame, a drum rotatably mounted in the frame, impression means carried by the drum, an endless conveyor in the frame extending under the drum and having a drive shaft, an intermittent drive for said shaft, rotatable chucks under the drum at opposite sides of the conveyor, means for shifting articles on the conveyor upwardly therefrom and into position between the chucks, one chuck being shiftable transversely of the conveyor toward and away from the other into and out of position to grip an article on the conveyor and rotatably sup-

port an article between the chucks, means driven from said drum for rotating the chucks and an article gripped between the same at a surface speed corresponding to that of the cylinder, and fluid actuated means for shifting the shiftable chuck into and out of a gripping position including a cylinder having a piston therein provided with a rod extending through the inner end of the cylinder and rigidly fixed to the shiftable chuck, valves for controlling flow of fluid into and out of the cylinder to move the piston and adjust the position of the shiftable chuck, and actuating means for the valves including levers carried by the valves and cams for operating the levers carried by the drive shaft of the conveyor.

6. In a printing machine, a frame, a drum rotatably mounted in the frame, printing blocks carried by the drum, an endless conveyor in the frame extending under the drum, means for intermittently driving the conveyor and successively moving articles thereon into position under the drum, article gripping chucks rotatably mounted under the drum at opposite sides of the conveyor, means for rotating the chucks and an article gripped between the same at a surface speed corresponding to that of the drum, means actuated in timed relation to movement of the conveyor for controlling gripping of an article by the chucks, a cradle movable vertically in the frame and through the conveyor for shifting an article upwardly from the conveyor and supporting the article in position between the chucks and subsequently returning a printed article downwardly onto the conveyor, and means actuated in timed relation to movement of the conveyor and the drum for raising and lowering the cradle.

7. In a rotary printing machine, a rotary cylinder having printing plates thereon, a conveyor mechanism to carry work to a position under the cylinder and therefrom after printing, means for imparting intermittent movement to the conveyor mechanism, means to raise the work clear of said conveyor, rotary supporting means to rotatably support the work above the conveyor in position for contact with the printing plates including flat gripping plates rotatably mounted under the cylinder at opposite sides of the conveyor, one gripping plate being shiftable toward and away from the other whereby the plates may grip and support the work between them, and means actuated by the conveyor moving means in timed relation to movement of the conveyor for moving one of the carriers into and out of position to engage the work between them, the last mentioned gripping plate being continuously rotated from the cylinders at a speed corresponding to the surface speed of the cylinder in all positions of adjustment.

8. In a rotary printing machine, the combination of a cylinder mounted for rotation and having printing plates thereon, rotary supporting means for work to be printed disposed under the cylinder and including two spaced alined carrier plates to support the work having axes parallel with the axis of the cylinder, said plates having flat work-engaging faces confronting each other, one of said plates being mounted for axial reciprocation toward and from the other plate into and out of position to grip work between the plates and rotatably support the work, means for continuously rotating one of the plates from the cylinder at a speed corresponding to the surface speed of the cylinder, a conveyor mechanism passing under the supporting means between the carrier plates, means imparting intermittent movement to said conveyor mechanism, means under the conveyor below the space between the carrier plates for raising the work clear of the conveyor, means actuated by the means for intermittently moving the conveyor mechanism for moving the movable carrier plate toward the other just prior to cessation of movement of the conveyor mechanism for gripping work between the plates, and means also actuated by the means for intermittently moving the conveyor mechanism for moving the movable plate in the opposite direction upon resumption of movement of said conveyor mechanism.

9. In a rotary printing machine, the combination of a conveyor mechanism including endless members spaced transversely from each other, rotary supporting means at opposite sides of the conveyor mechanism for gripping the ends of a work-piece transported by the conveyor mechanism, means shiftable vertically between the endless members for elevating a work-piece from the conveyor mechanism into position for engagement by the supporting means, means actuated in timed relation to movement of the carrier mechanism, and the elevating means for causing engagement of the work-piece by said supporting means when said work-piece is elevated, means causing disengagement of the work-piece by said supporting means after a printing operation, and opposed carriers on the endless members of the conveyor mechanism to receive opposite ends of the work-piece when the latter is disengaged by said supporting means.

10. In a rotary printing machine, the combination set forth in claim 9; including means for engaging the endless members of the conveyor mechanism and retaining the opposed carriers at the required spacing to receive ends of the work-piece when the carriers are passing beneath the supporting means.

11. In a rotary printing machine, a rotary printing cylinder, two spaced carrier plates having axes parallel with the axis of the cylinder to grip work between them and support work for printing, one of said plates being mounted for axial reciprocation into and out of gripping position, companion drive members associated with the cylinder and the slidable carrier plate and being continuously in operative engagement with each other for transmitting rotation to said carrier plate at surface speed of the cylinder when the cylinder is rotating, a conveyor mechanism including a head shaft, said mechanism extending past the carrier plates, means for imparting intermittent rotation to the head shaft, means for raising the work under the cylinder clear of the conveyor mechanism, means actuated by the head shaft just prior to its cessation of rotation for moving the movable carrier plate toward the other for gripping an article to be printed and rotatably mounting the article between the plates, and means actuated by the head shaft rotation immediately upon resumption of its movement for moving said movable carrier plate away from the other plate.

12. In a rotary printing machine, the combination of a printing cylinder mounted for rotation and having imprinting means thereon, means for rotatably supporting work to be printed including grippers spaced from each other, one gripper being shiftable toward and away from the other, a conveyor mechanism including two parallel chains extending beneath and spaced between said grippers of said supporting means and carrying wide opposed carriers to support opposite extremities of the work, said chains being adapted to transport the work to and from a position

under the supporting means, elevator means including two laterally opposed brackets movable vertically between the conveyor chains into and out of engagement with work carried by the conveyor, and means intermittently operated for raising said brackets to engage the work and lift it from the chains into position for engagement by the supporting means.

13. In a rotary printing machine, the combination set forth in claim 12; including means for simultaneously and intermittently moving the chains, and the means for raising the brackets being actuated in timed relation to movement of the chains by the means for moving the chains.

FREDERICK SHURLEY.