

No. 695,816.

Patented Mar. 18, 1902.

E. LAMBERT.

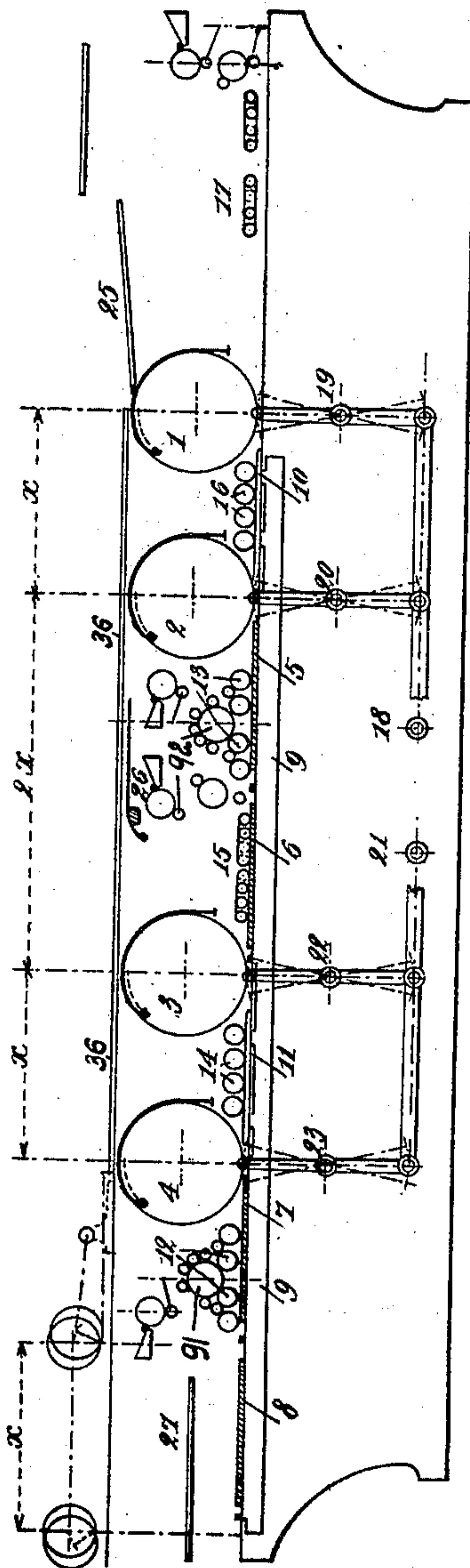
MACHINE FOR PRINTING IN A PLURALITY OF COLORS.

(Application filed Jan. 22, 1901.)

(No Model.)

8 Sheets—Sheet 1.

Fig. 1



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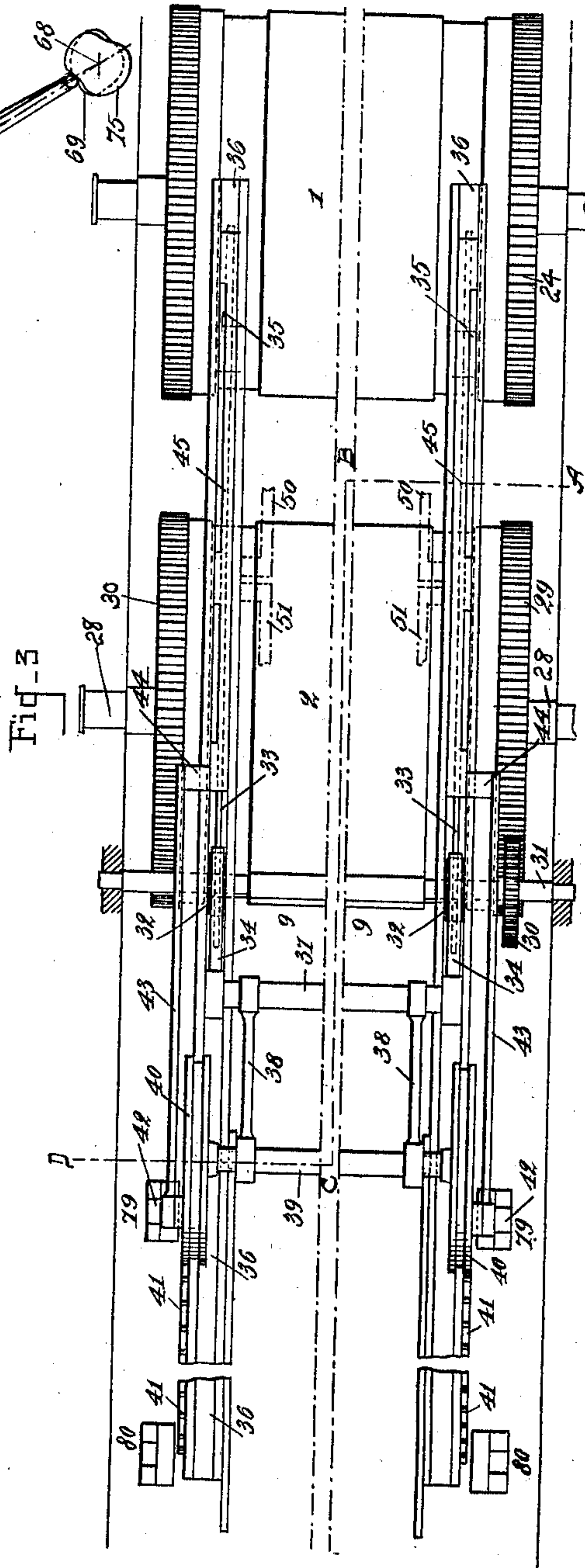
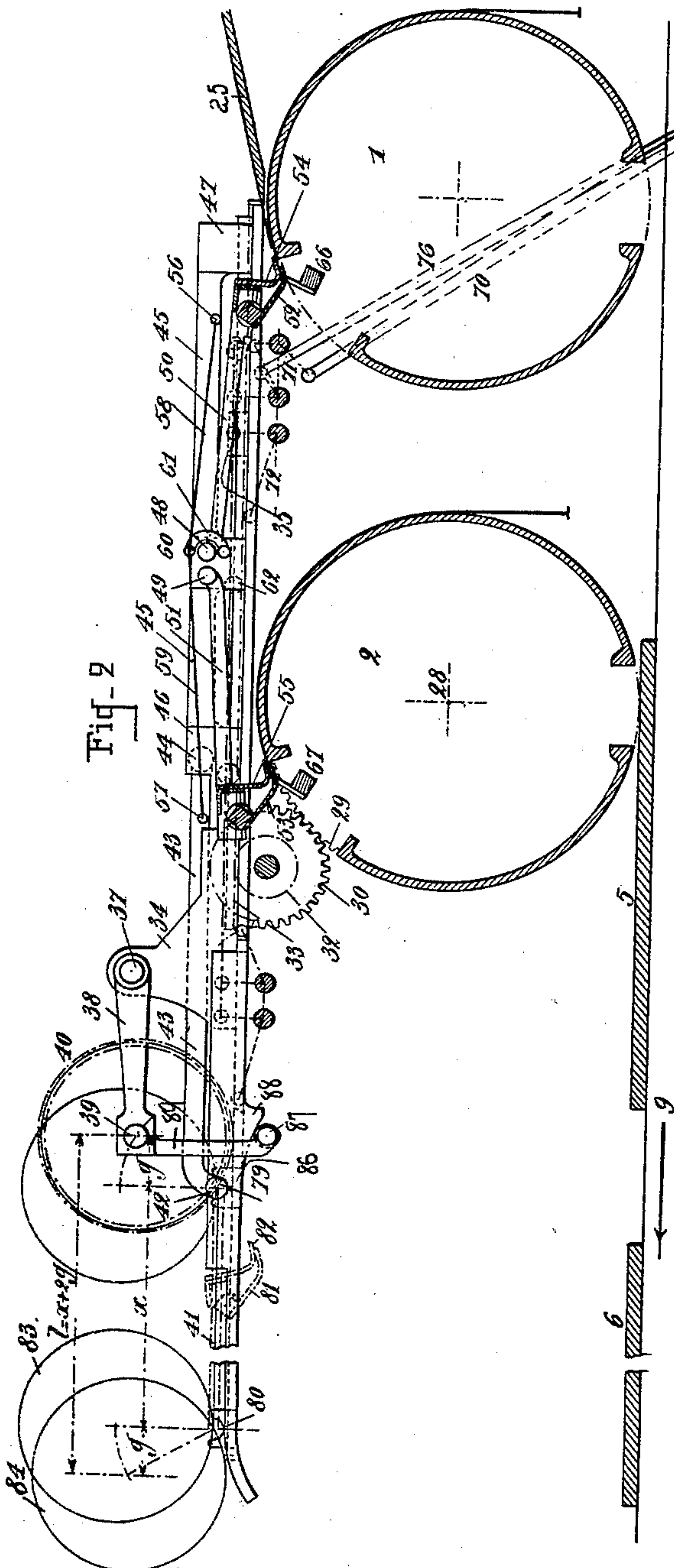
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8 Sheets—Sheet 2.



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8 Sheets—Sheet 3.

Fig. 5

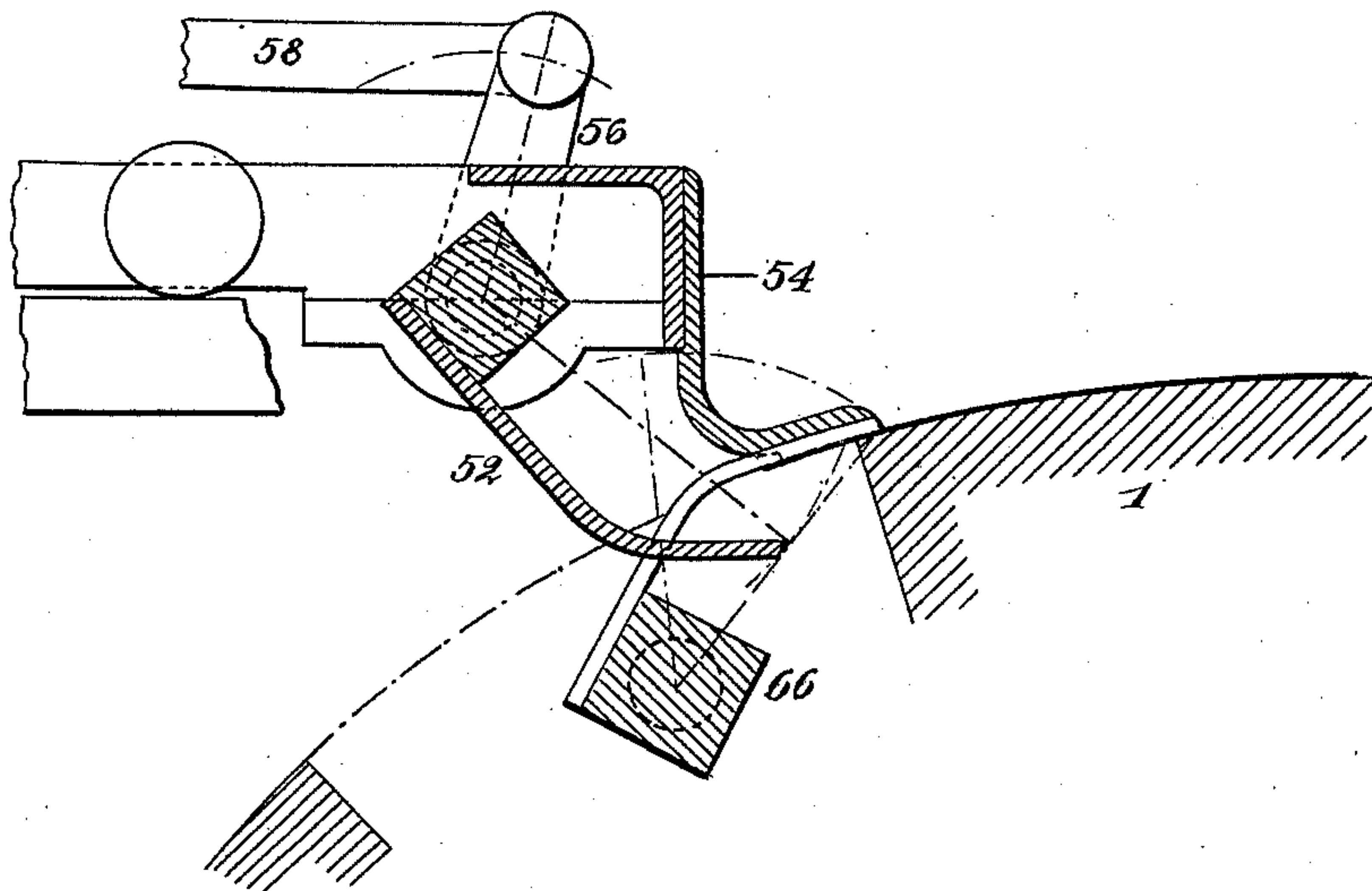
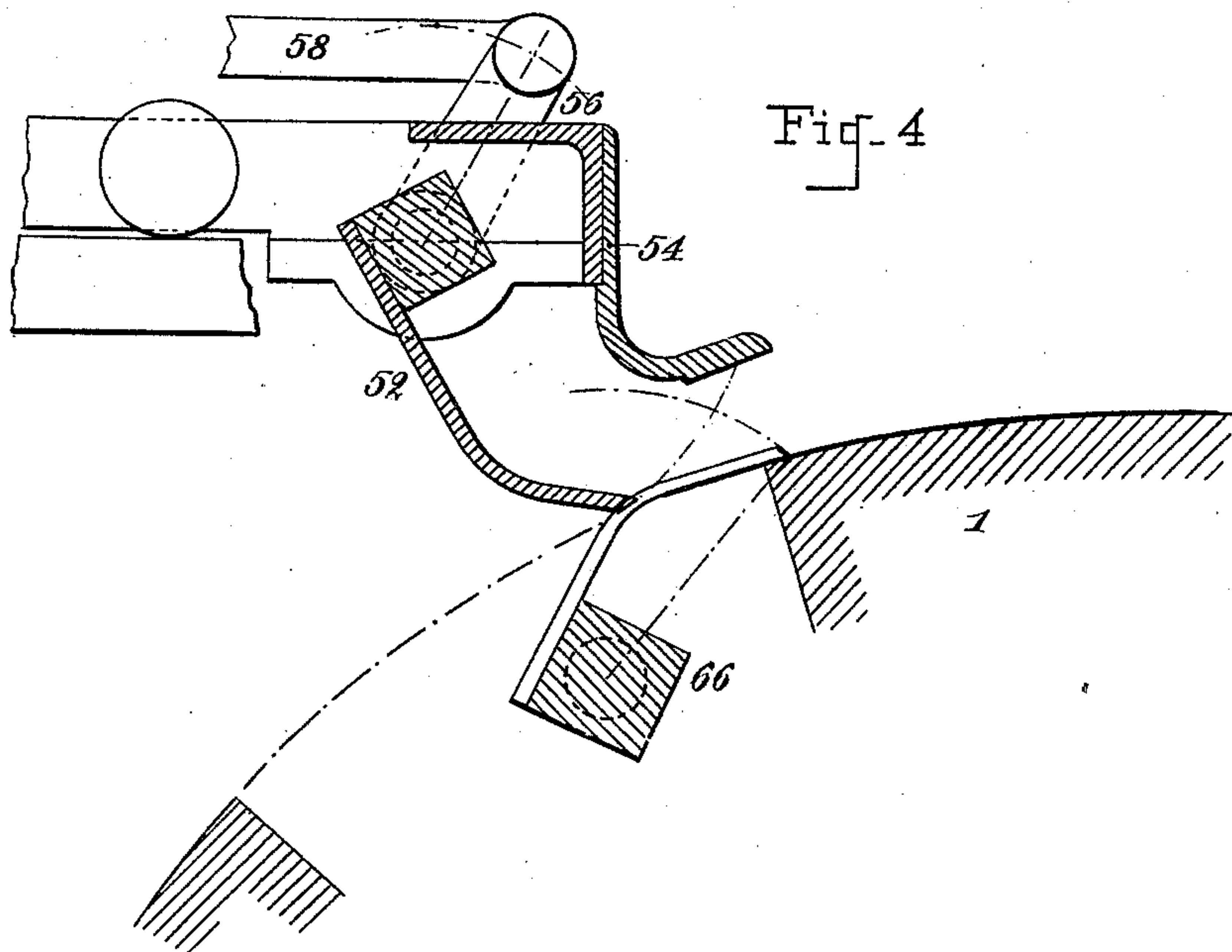


Fig. 4



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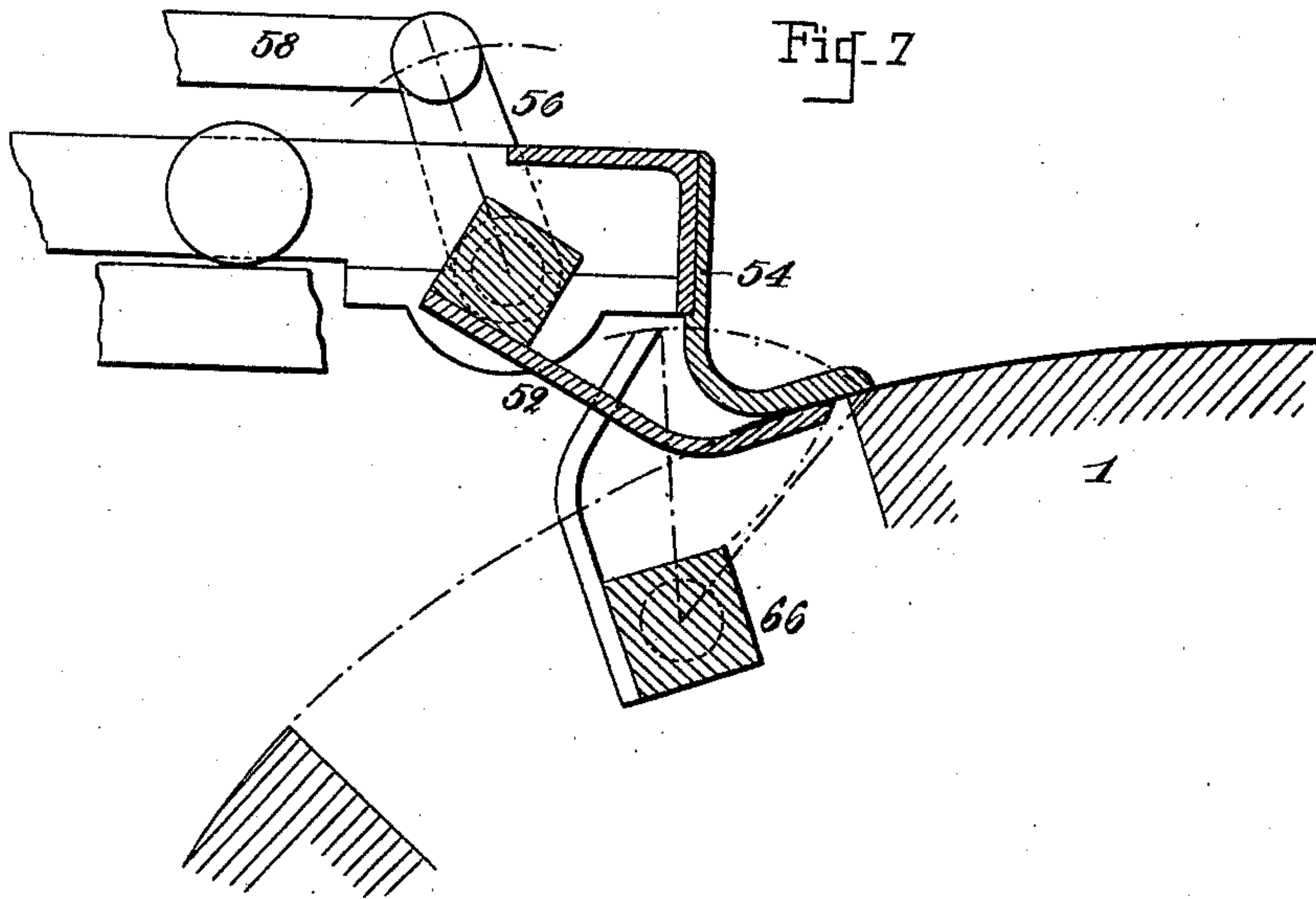
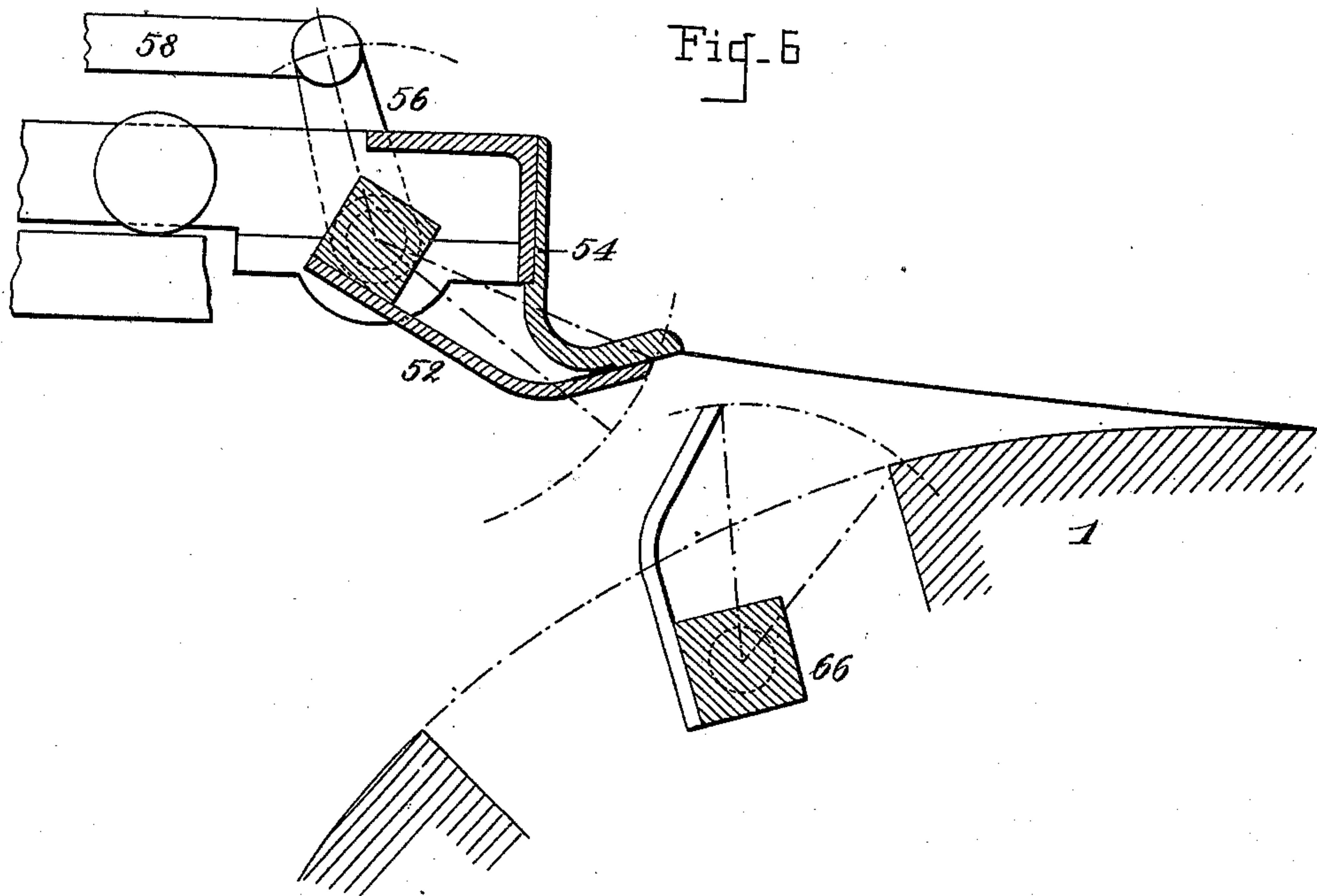
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MACHINE FOR PRINTING IN A PLURALITY OF COLORS.

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8 Sheets—Sheet 4.



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MACHINE FOR PRINTING IN A PLURALITY OF COLORS.

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8 Sheets—Sheet 5.

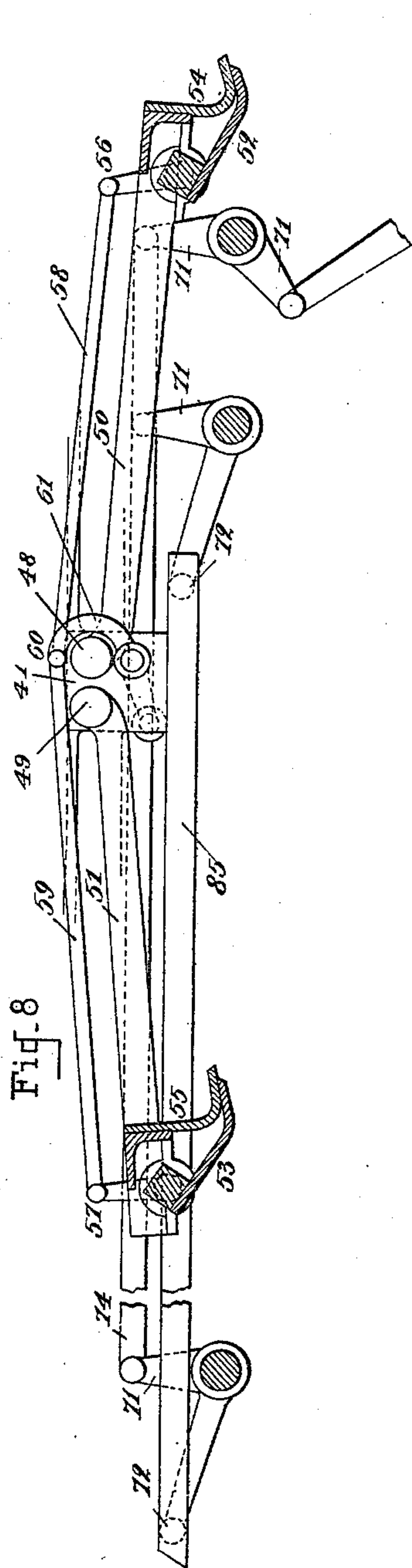


Fig. 8

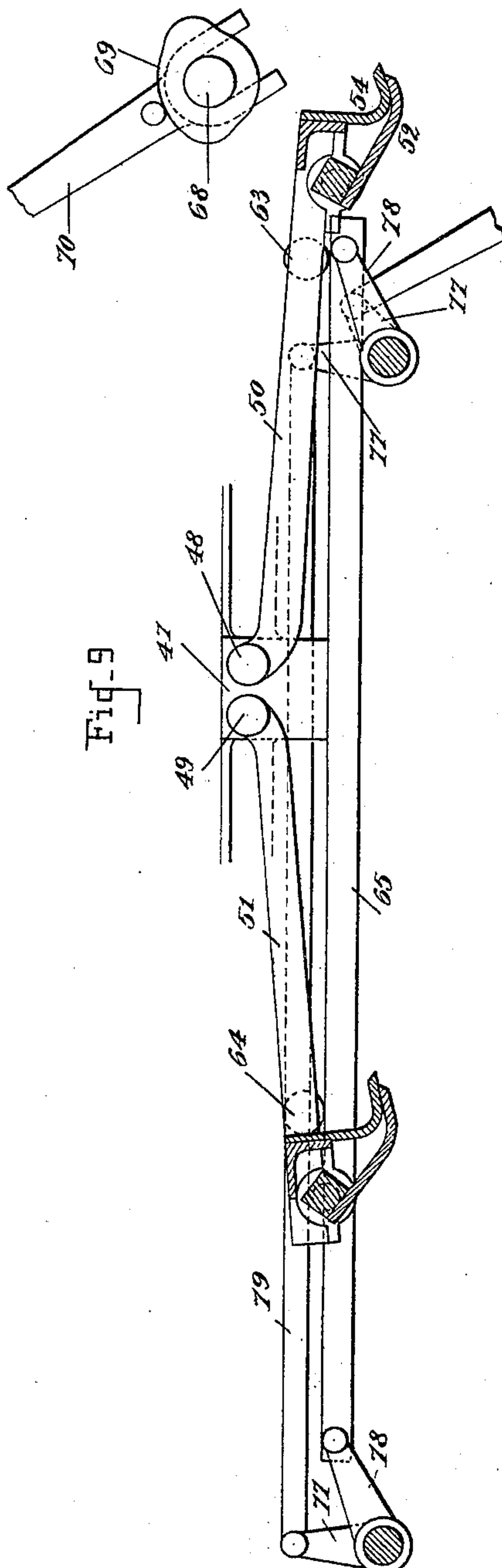
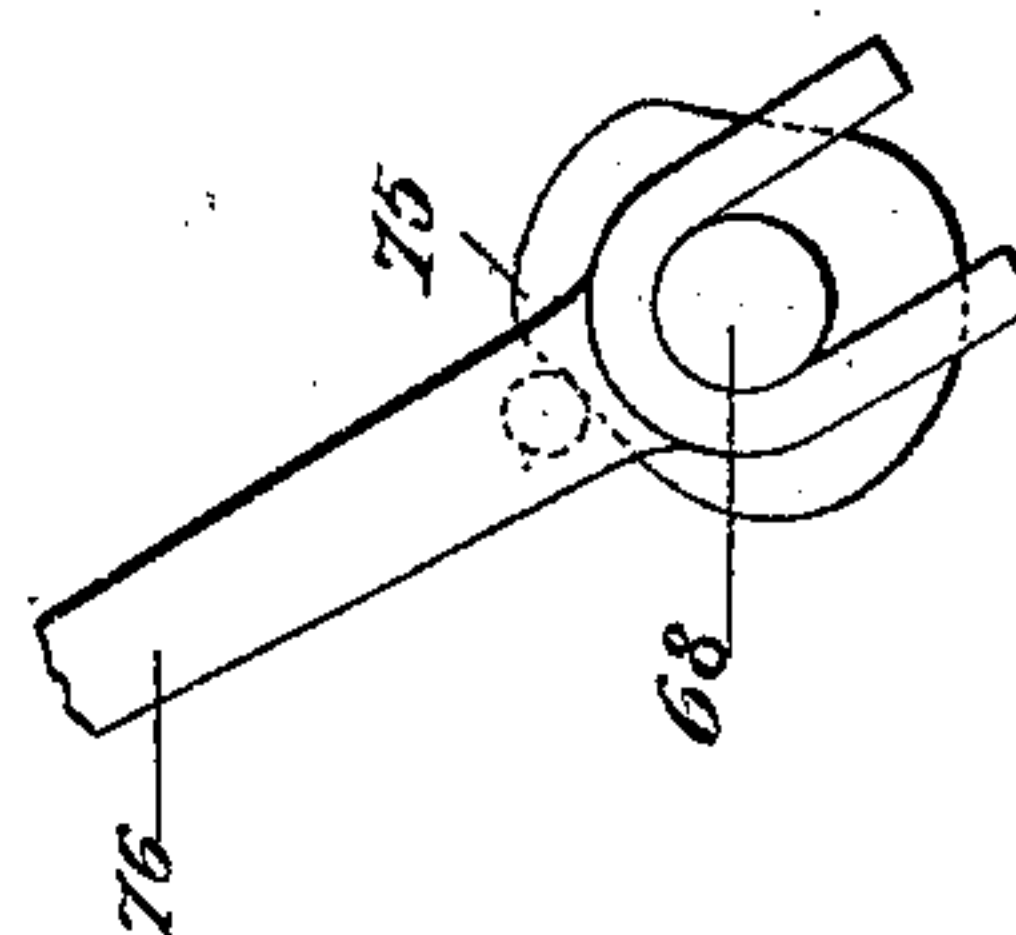


Fig. 9



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MACHINE FOR PRINTING IN A PLURALITY OF COLORS.

(Application filed Jan. 22, 1901.)

(No Model.)

8 Sheets—Sheet 6.

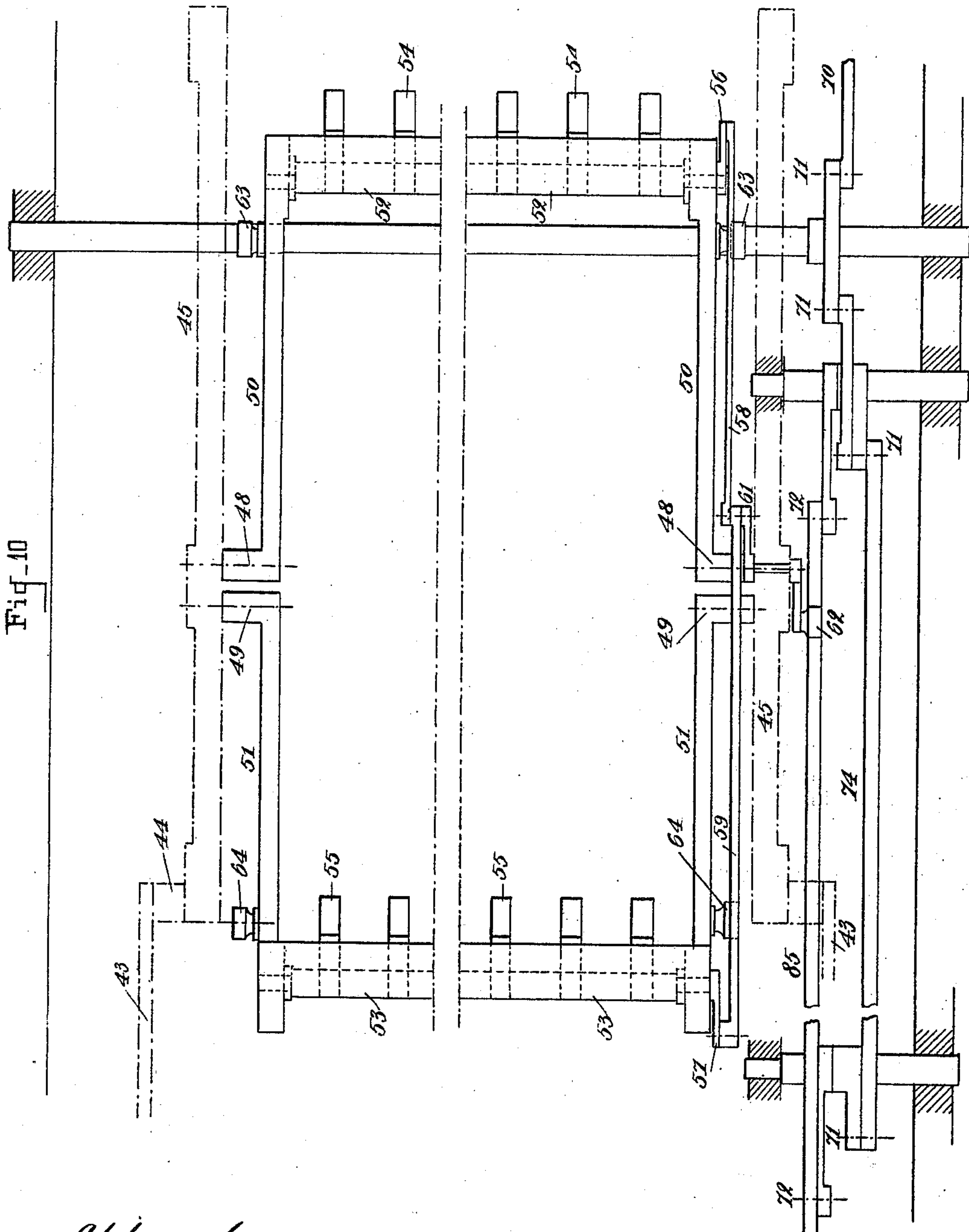


Fig. 10

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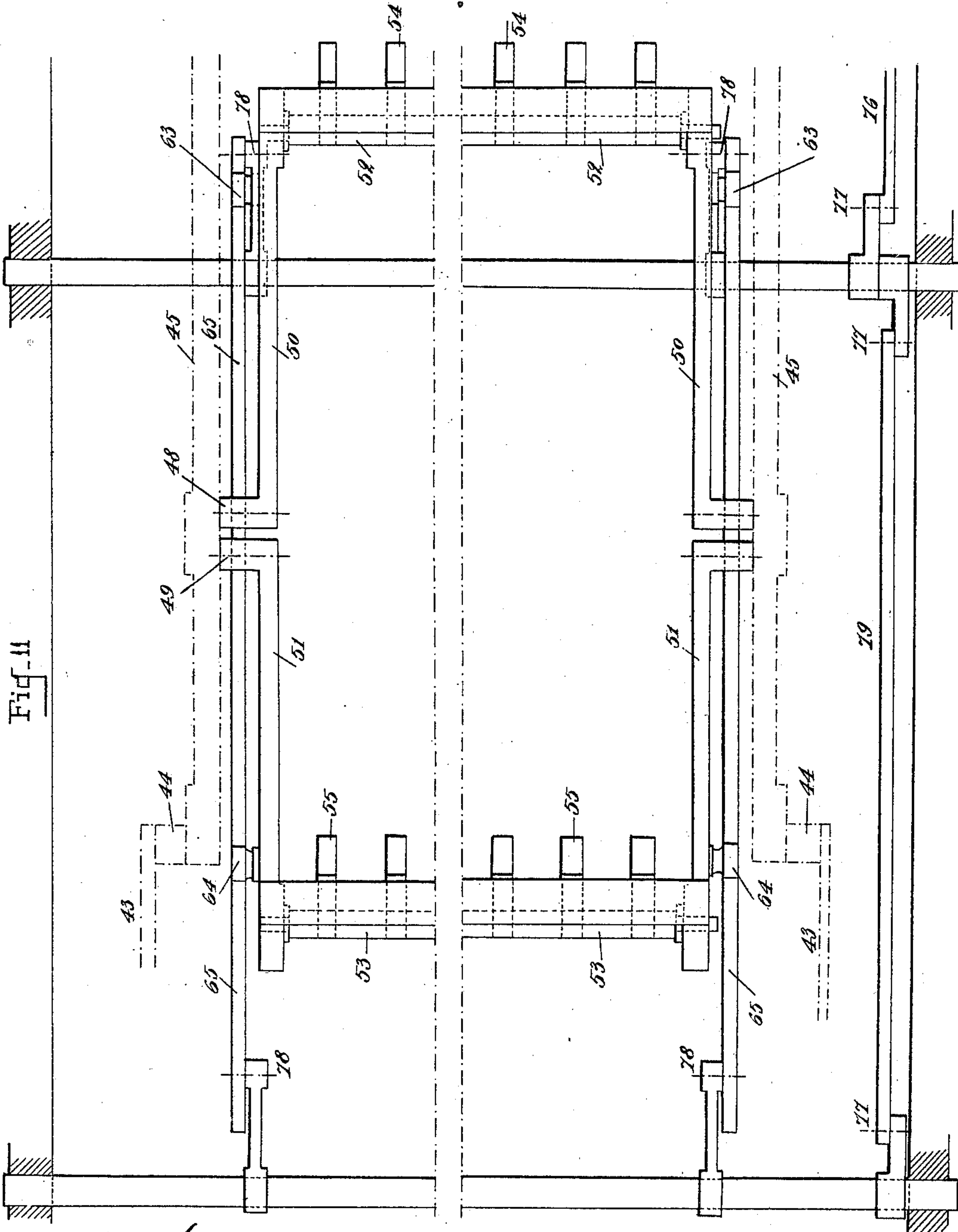
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MACHINE FOR PRINTING IN A PLURALITY OF COLORS.

(Application filed Jan. 22, 1901.)

(No Model.)

8 Sheets—Sheet 7.



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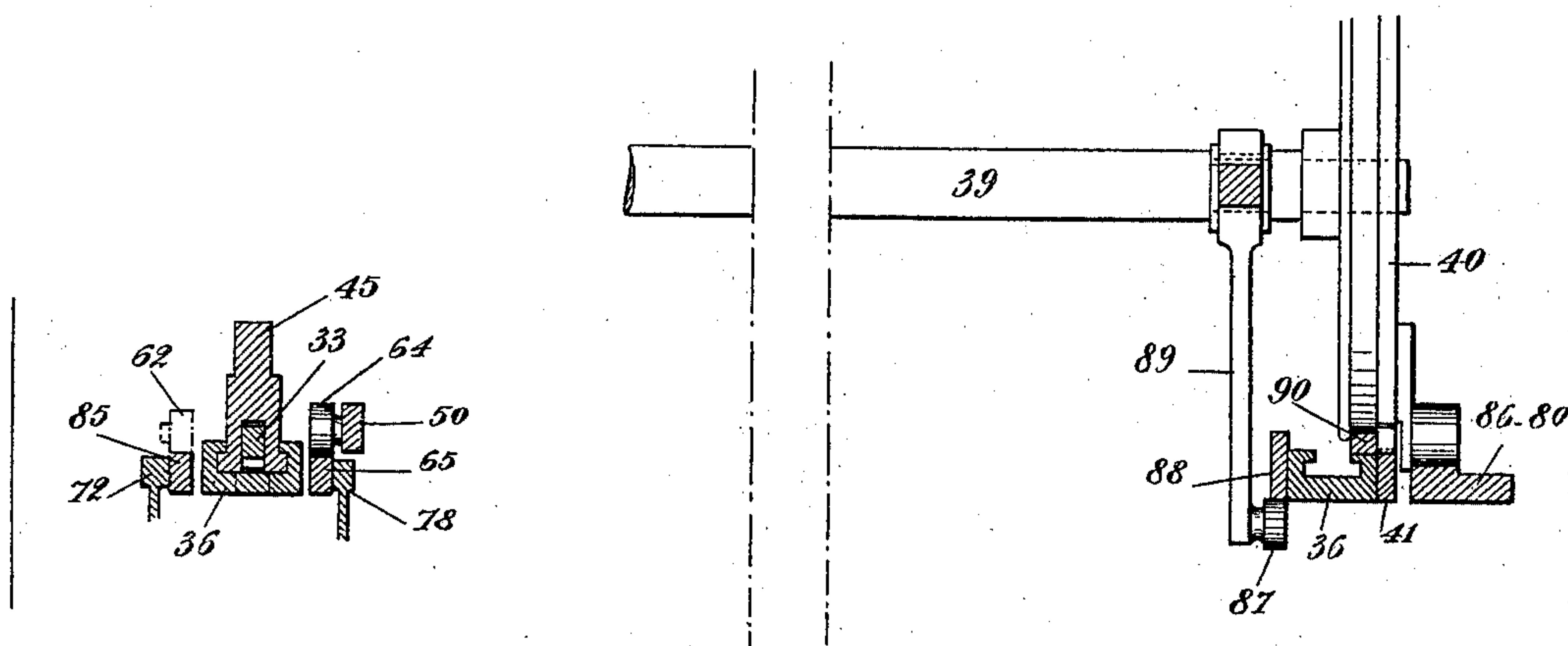
MACHINE FOR PRINTING IN A PLURALITY OF COLORS.

(Application filed Jan. 22, 1901.)

(No Model.)

8 Sheets—Sheet 8.

Fig. 12



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UNITED STATES PATENT OFFICE.

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MACHINE FOR PRINTING IN A PLURALITY OF COLORS.

SPECIFICATION forming part of Letters Patent No. 695,816, dated March 18, 1902.

Application filed January 22, 1901. Serial No. 44,316. (No model.)

To all whom it may concern:

Be it known that I, EDOUARD LAMBERT, a citizen of the French Republic, residing at 18 Rue Mogador, Paris, in the department of the Seine, France, have invented certain Improvements in Machines for Printing in a Plurality of Colors, of which the following is a specification.

I have described before, in Letters Patent of the United States No. 634,145, granted me October 3, 1899, an improved construction of machinery for printing in several colors, which is characterized by the combination, with two or more single machines placed with their cylinders parallel, of a mechanism which effects the transport of the sheets from one cylinder to another, the uniform travel of which is determined by stops fixed on the cylinders. In this machine pins are used to transport the sheets. When the paper is not thick enough, it can be torn by the pins, so that the register is varied. In this case it is better to have grippers to hold the sheets and transport them from one cylinder to the next.

My invention relates, then, to an improved construction of machinery for printing in several colors which is characterized by the combination, with two or more single machines placed with their cylinders parallel and with a mechanism which effects the transport of the sheets from one cylinder to another, of grippers on a traveling carriage, devices to impart motion to said carriage and to hold it at each end of the stroke in an exact position assured by notches during the time necessary to take the sheets from the cylinders or to lay them on the cylinders, means for raising and lowering the grippers for opening and closing the same.

In the accompanying drawings, Figure 1 is a diagrammatic elevation of a machine for printing in four colors constructed according to this invention. Some of the operating-levers are shown in this view in dotted lines in the several positions assumed by them, the structure and arrangement of these levers being the same as that shown by my previous patent above referred to. Fig. 2 is a sectional elevation, and Fig. 3 is a plan, of a machine for two colors in accordance with the invention. Figs. 4, 5, 6, and 7 are detail views of the grippers on the cylinders and

the conveyer in different positions. Figs. 8 and 9 are detail views of the mechanism for producing the different movements of the grippers of the conveyer, and Fig. 10 is a plan thereof. Fig. 11 is a plan of the mechanism for raising the conveyer. Fig. 12 shows a transverse section A B C D, Fig. 3, of the transporting mechanism.

The same reference-figures represent the same parts in the various figures.

Referring to the machine for printing in four colors, Fig. 1, this consists of a frame supporting the four cylinders 1 2 3 4, which are all of the same diameter and print, respectively, on the forms 5 6 7 8, held in place on the common table 9, which also carries the inking-slabs 10 11. Rollers 12 ink form 8 from an ink-distributing cylinder 91, and rollers 13 ink form 6 from an ink-distributing cylinder 92. Rollers 14 and distributing-rollers 15 ink form 7 from the slab 11, while rollers 16 and distributing-rollers 17 ink form 5 from the slab 10. The inking-rollers are raised when they pass over another form. Then the right one and rollers 12 and 13 are raised when they pass over distributing-plates 11 and 10. Shaft 18 controls, by means of the ordinary cams, the stop-levers 19 20 of the cylinders 1 and 2, while shaft 21 performs the same function for cylinders 3 and 4 through levers 22 23. The travel of the printing-table is equal to the developed circumference of one of the cylinders 1 2 3 4 and is produced by the means usually employed in stop-cylinder machines. When the table travels in the one direction, it puts in motion the cylinders 1 2 3 4, and when it returns these are stopped by their stopping-levers. If x is the distance between cylinders 1 and 2, it is also the distance between cylinders 3 and 4; but between cylinders 2 and 3 the distance is double this—namely, $2x$. This arrangement is useful for putting forms 6 and 7 in the press. The conveyer is reciprocated in unison with the table through the same distance (x) as there is between cylinders 3 and 4 and slides in the grooves 24. It consists of as many mechanisms for gripping sheets as there are sheets passing through the machine—in this instance, five. A sheet duly registered on table 25 is seized by cylinder 1, as in ordinary stop-cylinder machines. The grippers on the

cylinder close, the cylinder starts, and the sheet is printed on form 5, thus receiving the first color. The cylinder is stopped, and its grippers open only when the sheet has been seized by the conveyer mechanism, which had previously stopped in the right position. The conveyer then returns from cylinder 1 to cylinder 2, carrying the sheet to the grippers of the latter cylinder. During this time a new sheet has been registered on table 25. The grippers of cylinders 1 and 2 close, and the sheet on cylinder 2 receives a second impression while that on cylinder 1 is receiving the first. Both cylinders then stop. The conveyer seizes both sheets and carries that from cylinder 1 to the grippers of cylinder 2 and that from cylinder 2 to the grippers of the bar 26. Said grippers are exactly the same as the cylinder-grippers shown in Figs. 4, 5, 6, 7 and are moved by the same mechanism as the ordinary gripper mechanism of stop-cylinder machines. A new sheet has been registered on table 25. The grippers close. The sheet on the bar 26 does not move, but those on cylinders 1 and 2 receive an impression. The conveyer seizes the sheets and conveys that from cylinder 1 to the grippers of cylinder 2, that from cylinder 2 to the grippers of the bar 26, and that from the bar 26 to the grippers of cylinder 3. Thus the sheets pass successively after each impression received from cylinder 1 to cylinder 2, from cylinder 2 to bar 26, from bar 26 to cylinder 3, and from cylinder 3 to cylinder 4.

Referring to Figs. 2 and 3, the action of the conveyer is as follows: As already stated, the operations of the machine are repeated as many times as there are colors, so that however many colors there may be the mechanism can be fully described in considering only two colors. 1 and 2 are the two impression-cylinders, printing on forms 5 and 6, respectively, which are held in place on table 9 and are reciprocated in the manner common to stop-cylinder machines. Also similarly to these machines cylinders 1 and 2 are rotated by the travel of the table in the one direction and stopped during its return. On the axis 28 of cylinder 2 is mounted free the toothed wheel 29, which is constantly engaged with a rack on the edge of the table 9. In consequence this wheel 29 has a reciprocating rotary movement. The wheel 29 also engages with the toothed wheel 30, keyed to the shaft 31, to which are also keyed two other toothed wheels 32, engaging with two racks 33. These two racks are attached, on the one hand, to the sliding pieces 34 and, on the other hand, to the sliding pieces 35, which pieces slide in the grooves 36 on the sides of the machine. In pieces 34 is journaled a shaft 37, carrying two lever-arms 38, which constitute bearings for shaft 39. The toothed wheels 40 on this shaft 39 roll on bar 90, Fig. 12, and engage with racks 41, fixed in grooves 36. On the circumference of wheels 40 there are pins 42, connected by links 43 with pins 44 on sliding

piece 45, the ends 46 47 of which piece slide in grooves 36 without play. The racks 33 pass freely through the pieces 45 and 46 and the pieces 35 move in the grooves between the pieces 45 and 47. Pieces 45 carry pins 48 49, on which the lever-arms 50 51 turn. These lever-arms carry the gripping-bars 52 53 and gripping-surfaces 54 55. The former turn on an axis moved by levers 56 57, which are operated by links 58 59, united at 60 by the curved crank 61. To the axis of this crank, which is loose in piece 45, is attached a straight crank carrying a roller 62, which is constantly in contact with the connecting-rod 85, Figs. 8 and 9. The lever-arms 50 51 carry rollers 63 64, which roll on bars 65, Figs. 10 and 11. On cylinders 1 and 2 are mounted the gripping-bars 66 67, actuated in the usual manner by the cams. The shaft 68, which is rotated once in every revolution of the machine, carries the cam 69, which by bar 70 actuates the bell-cranks 71 71 and the lever 72 through levers 71, linked by bar 74. The axis of the levers 71 71 are journaled in the fixed frames. The ends of the two levers 72 are connected by the link 85. The shaft 68 also carries the cam 75, which by bar 76 actuates bell-cranks 77 77 and the lever 78, through levers 77, connected by the bar 79. The end of the two levers 78 are connected by bar 65. Thus the two connecting-bars 85 and 65 have a rising-and-falling movement following the form of the two cams 69 and 75, respectively. From this movement result the following effects: first, the raising and lowering of the grippers and gripping-surfaces 52 54 53 55; second, the opening or closing of the grippers 52 53. The ratio of the gear 30 and 32 is such that for any given journey of the printing-table the distance l traversed by the rack 33 is $l = x + 2g$, x being the distance between the axes of cylinders 1 and 2 and also that between notches 79 and 80, fixed to the frame of the machine, and g an additional distance determined by the necessities of the case. The path of the pin 42 on wheel 40, and therefore that of the end of the connecting-rod 43, is a cycloid. The pins 42 being in the inferior part of this path lie in the notch 86. When the wheel 40 runs on the bar 90 and the racks 41, the pins 42 go up to the middle of the stroke and then come down till they reach the notches 80. The distance between the notches 80 and 86 is exactly equal to the developed circumference of the wheel 40 and to the distance x between two impression-cylinders. The distance l moved through by sliding pieces 34 being greater than x the axis of the wheels 40 moves farther than the notches; but the racks 41 are not longer than the distance x between the notches 80 86. The last teeth of these racks are placed in the middle of notches 80 and notches 86, so that the pins 42 stay in the notches when the axes of the wheels 40 move farther, and these axes move through an arc struck from the notches 80 86 as centers. So a little before

each end of the journey of the pieces 34 the ends of the connecting-rods 43 are fixed either in notches 80 or 86, not moving appreciably, for the radius of the pins 42 corresponds exactly with that of the semicircular notches 80 86, which are fixed immovably to the frame of the machine at a distance x apart. This mechanism allows to stop the conveyer and the carriage and grippers before the end of each stroke of the bed and after the beginning of the next stroke and to keep it in a fixed and definite position during all the time necessary for taking sheets from the cylinder-grippers to the conveyer-grippers or reverse. 87, Fig. 2 is a security-roller fixed on a part 89 of arm 38. It runs under a cam 88, fixed on grooves 36, and prevents the wheel 40 from coming out of the racks 41.

The machine operates as follows: A sheet to be printed having been registered on table 25 in the manner usual in stop-cylinder machines and cylinder 1 being at rest, the table returns in the direction indicated by the arrow, Fig. 2, and the grippers 52 54 arrive at cylinder 2 in the place formerly occupied by grippers 53 55, while these latter arrive at 81 82 in the same time that wheel 40 arrives at the positions 83 84. At the end of this journey of the table 9 the grippers 66 close and seize the sheet, which is thus held by the margin and is printed as in an ordinary stop-cylinder machine while the table and the conveyer travel in the direction the opposite of that indicated by the arrow. A little before the end of this journey and before the cylinders stop the pin 42 on the wheel 40 arrives in the notch 86 and fixes immovably the connecting-rod 43, and therefore also the carriage composed of the bars 45, carrying the grippers 52 54 53 55. During the rest of the journey the axis on wheel 40 continues to turn around the notch 86, but without displacing the connecting-rod 43. At this moment the grippers 52 and 53 are opened by the action of the cam 69 on bar 85, which in turn actuates the levers through roller 62, Fig. 4. At the same moment the same grippers mounted on levers 50 51, rolling on bars 65 through rollers 63 64, have a descending movement toward the cylinders 1 and 2 imparted to them by the cam 75. The cylinders stop and the downward motion of the gripping-surfaces 54 55 continues until they rest on the cylinders on which the grippers 66 67 are still closed, Fig. 5. The printed sheet on cylinder 1 is thus held at this moment by the grippers 66 on the one hand and the gripping-surfaces 54 on the other hand. The grippers 66 and 52 and the gripping-surfaces 54 are moved alternately like the gripping devices commonly used in transferring a sheet from one cylinder to another. Accordingly the grippers 66 open while the grippers 52 close on the gripping-surfaces 54 by the action of cam 69. The registered sheet is now ready to be transferred, being firmly held between grippers 52 54. The cam 75 next raises the

grippers 52 54, and the end of the printed sheet is raised up from cylinder 1, Fig. 6. During these operations the conveyer is at rest and the direction of motion of the table has been changed to that indicated by the arrow. The sliding piece 34 also moves in the same direction pushing wheel 40, the axis of which turns around the notch 86 until the line 86 89 is vertical. From this moment the pin 42 of the connecting-rod 43 describes a cycloid, with the result that grippers 52 54 are drawn with the sheet toward cylinder 2, Fig. 6. When pin 42 arrives at notch 80 the conveyer stops, the grippers 67 of cylinder 2 are opened, grippers 52 54 descend to cylinder 2, and the gripper-surfaces 54 rest thereon. Grippers 52 open while grippers 67 close, and the sheet is transferred from the grippers of the conveyer to those of cylinder 2, Fig. 7. Meanwhile the axis of wheel 40 has turned around notch 80, the connecting-rod, and therefore the conveyer, remaining stationary. The table now changes its direction, and the cylinders again rotate, a new sheet having been seized by cylinder 1. There is thus a sheet being now printed on each cylinder. Cam 75 comes into action again, and the conveyer returns free to grip the sheet printed on cylinder 1, as before, Fig. 4. When the sheet on cylinder 2 has been printed, it is transferred by the grippers 53 55 to cylinder 3 or to be discharged from the machine, the action being similar to that already described.

Having thus described the nature of this invention and the best means I know of carrying the same into practical effect, I claim—

1. In a machine for printing in a plurality of colors and having a plurality of stop-cylinders, printing-forms, and inking devices all arranged in succession, a traveling frame above the cylinders which takes sheets from one cylinder and carries them to the next and rests at each end of the stroke during the time necessary to take the sheets from the cylinders or to lay them on the cylinders, devices for effecting said motion, wheels geared with the bed and racks having a to-and-fro motion, toothed wheels moved by said racks and geared with fixed racks and pins on said wheels having a cycloidal motion and connected with the traveling frame, fixed notches which hold these pins during the end and the beginning of each stroke of the bed and determine the exact position of the traveling carriage till the sheet has been taken from the cylinder to the conveyer or reciprocally substantially as described.

2. In combination a traveling frame above the cylinders, wheels and racks for reciprocating said carriage and notches to hold it fixed, clamping-grippers carried by said cylinders, a carriage traveling above the said cylinders, clamping-grippers carried by said carriage, means for raising and lowering the said clamping-grippers in relation to the cylinder, grippers and means for opening and closing said clamping-grippers, said means

comprising the bar 65 for raising and lowering the clamping-grippers and the bar 85 for opening and closing the same, substantially as described.

5 3. In combination, the cylinders having grippers, the carriage movable above the said cylinders, the pivoted levers 50, 51, carried by the carriage, the clamping-grippers carried by the said levers, means for raising and

lowering the said levers in relation to the cylinders and means for opening and closing the grippers, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

EDOUARD LAMBERT.

Witnesses:

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JULES FAYOLLET.