No. 843,829. PATENTED FEB. 12, 1907.

E. LAMBERT.

SYSTEM OF MACHINERY FOR PRINTING IN SEVERAL COLORS.

APPLICATION FILED FEB. 15, 1905.

7 SHEETS—SHEET 1.

Fig. 1

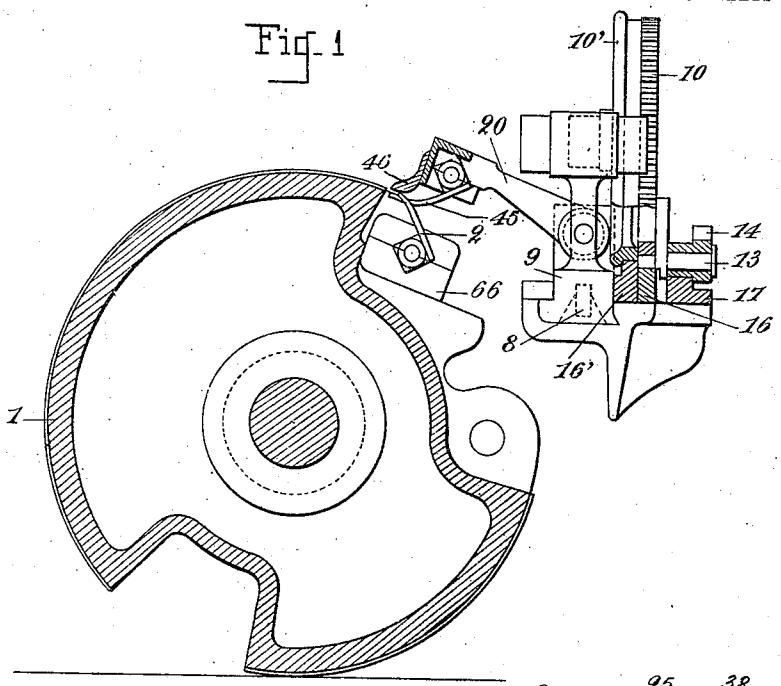
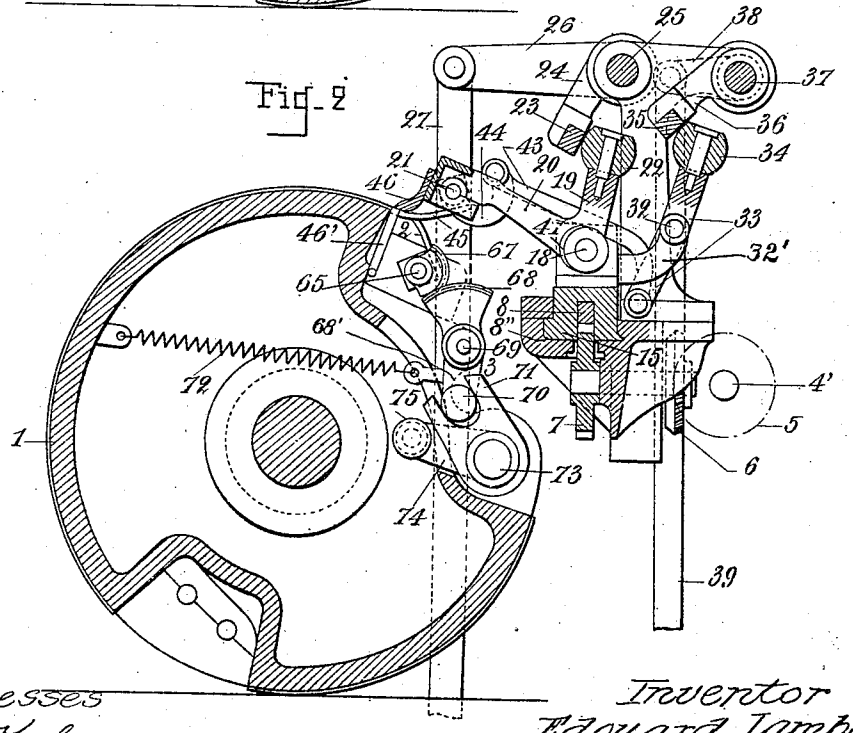


Fig. 2



Witnesses

M. M. Kuehne

John A. Percival.

Inventor

Edouard Lambert

By Richards & Co.

Attys

THE NORRIS PETERS CO., WASHINGTON, D. C.

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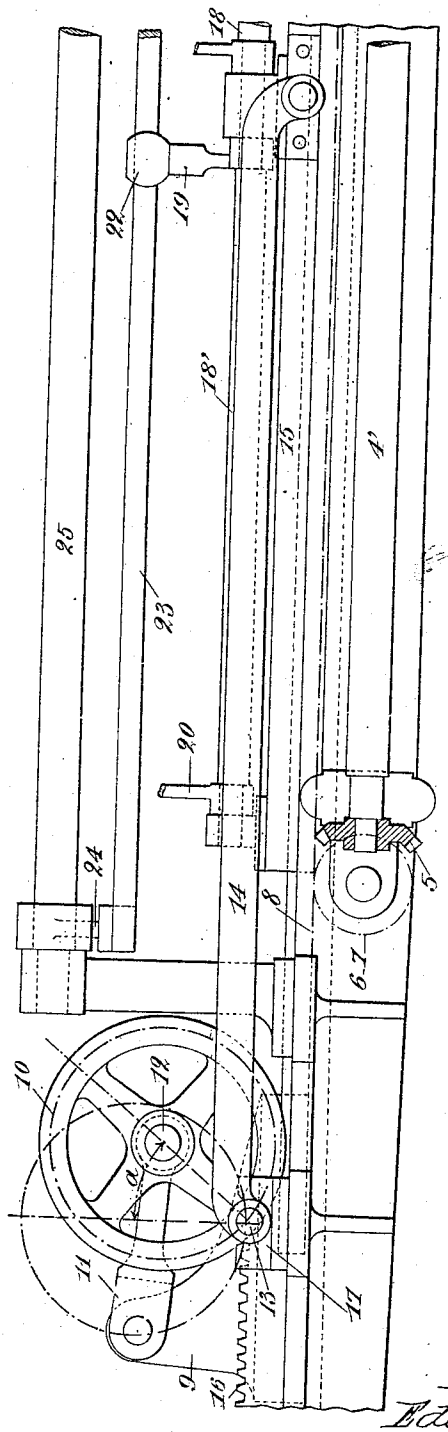
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7 SHEETS—SHEET 2.

Fig. 3



Witnesses
H. M. Kuehne
John A. Percival.

Inventor
Edward Lambert
by Richards & Co.
Att'ys

THE NORRIS PETERS CO., WASHINGTON, D. C

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7 SHEETS—SHEET 3.

Fig. 4

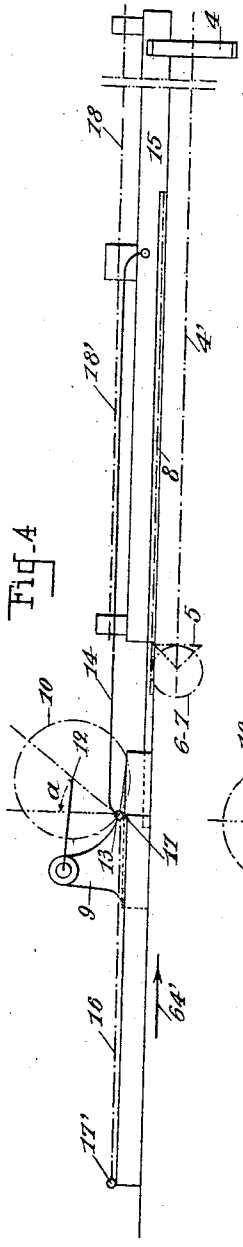


Fig. 5

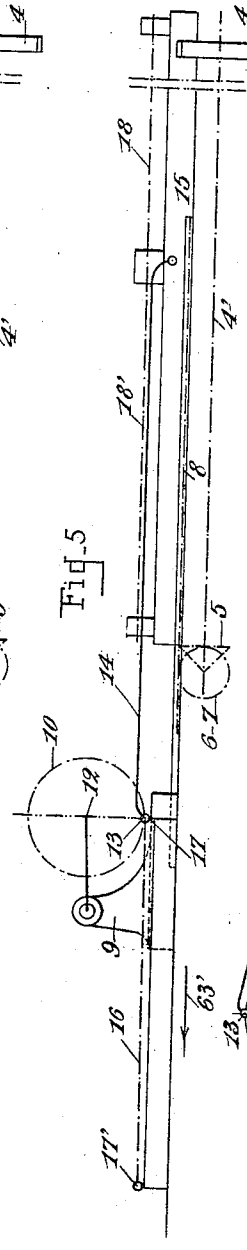


Fig. 6

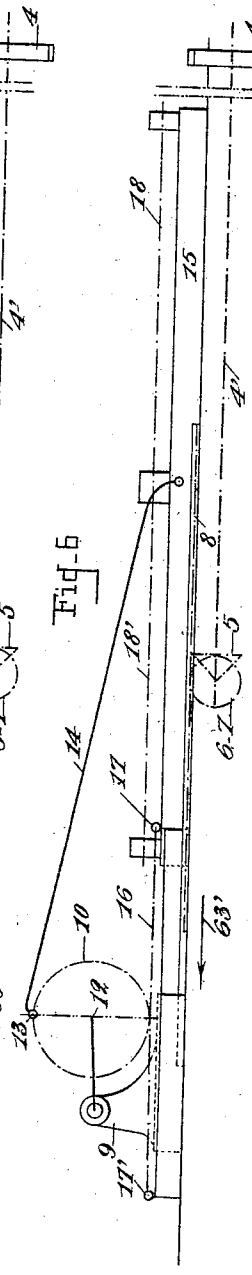
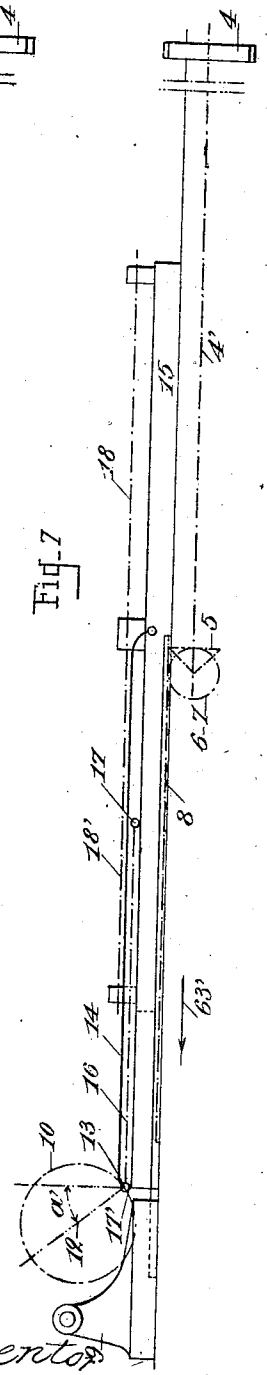


Fig. 7



Witnesses
H. M. Kuehne
John A. Percival

Inventor
Edouard Lambert
by Richards & Co.
Attorneys

THE NORRIS PETERS CO., WASHINGTON, D. C.

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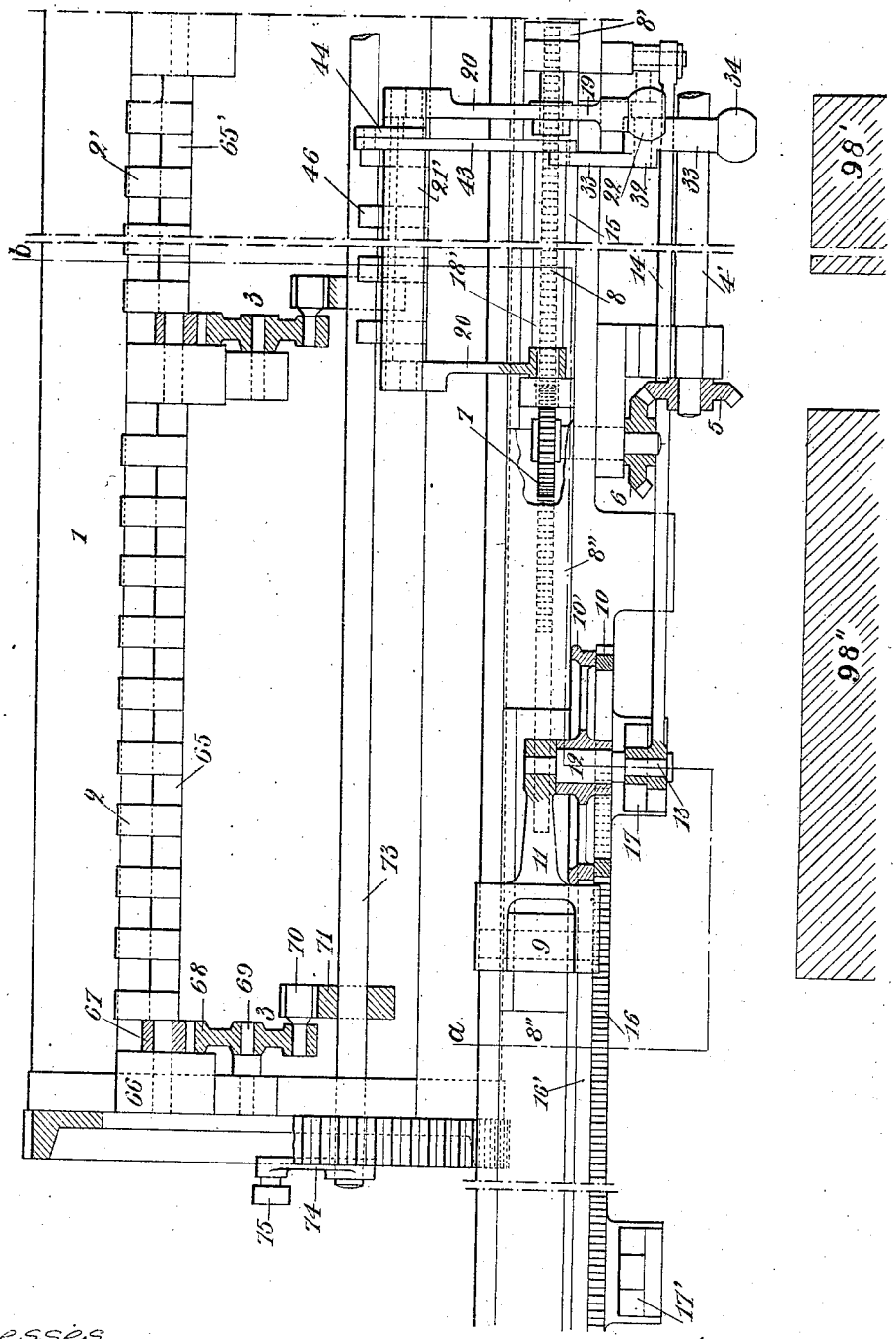
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7 SHEETS—SHEET 4.

Fig. 8



Witnesses
H. M. Kuehne
John A. Percival

Inventor
Edouard Lambert
By Richards & Co.
Attorneys

THE NORRIS PETERS CO., WASHINGTON, D. C.

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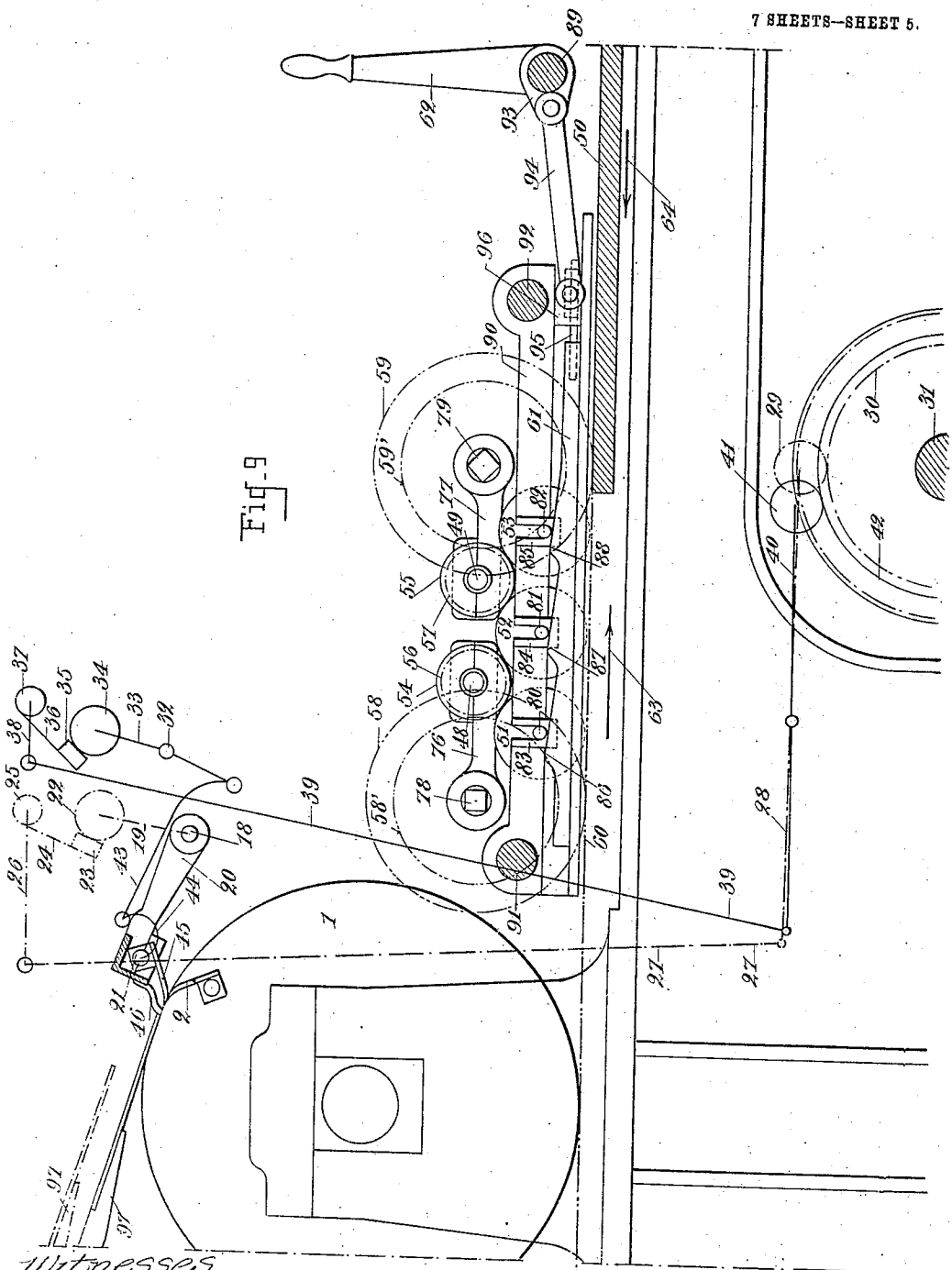
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7 SHEETS—SHEET 5.

Fig. 9



Witnesses
H. M. Kuehne
John A. Percival.

Inventor
Edouard Lambert
By Richards & Co.
Attorneys

THE NORRIS PETERS CO., WASHINGTON, D. C.

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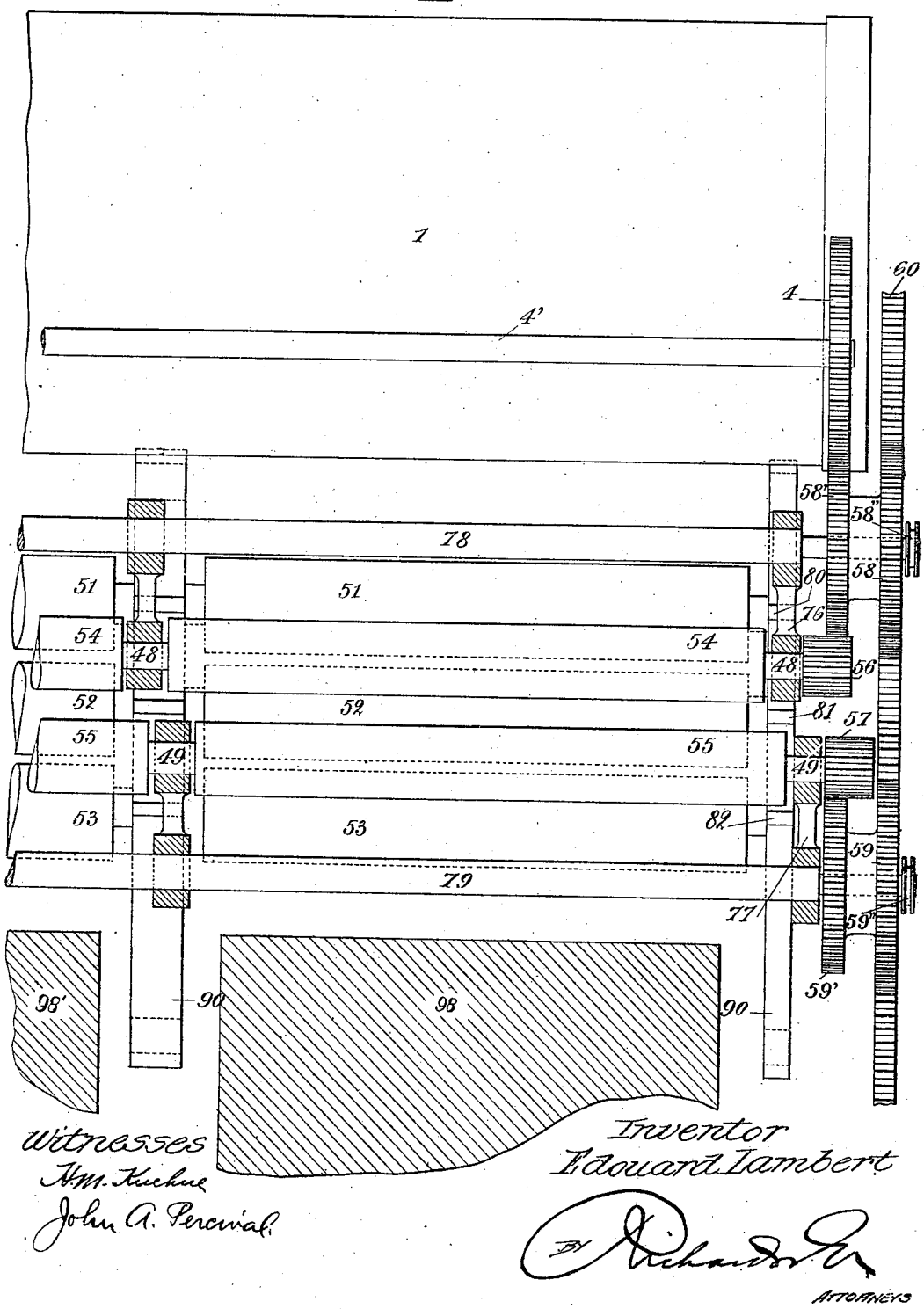
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7 SHEETS—SHEET 6.

Fig. 10



Witnesses
Wm. Kuehne
John A. Percival

Inventor
Edouard Lambert

By Richards & Co.
Attorneys

THE NORRIS PETERS CO., WASHINGTON, D. C.

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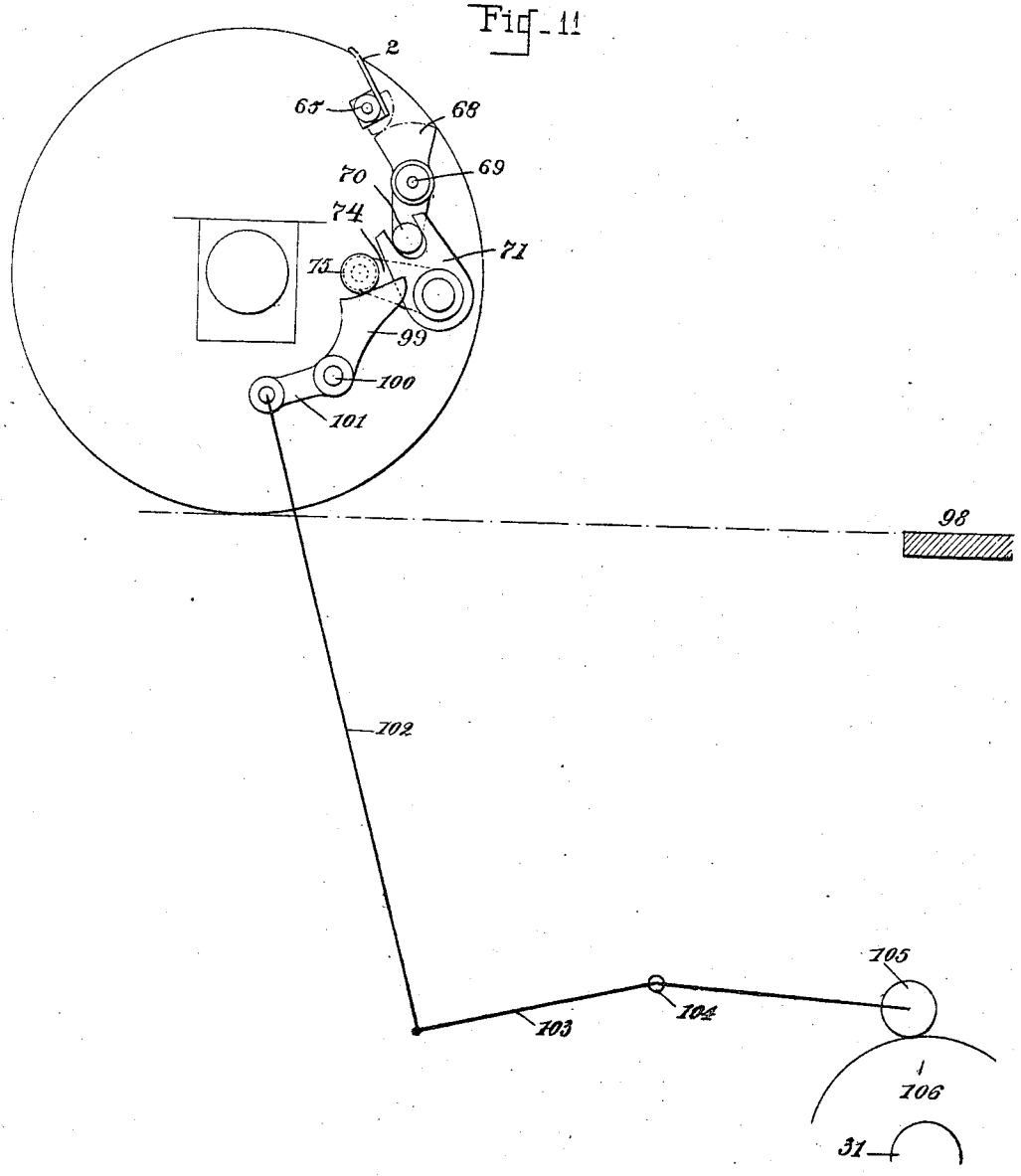
E. LAMBERT.

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7 SHEETS—SHEET 7.

Fig. 11



Witnesses
Jno. Kuhne
John A. Percival.

Inventor
Edouard Lambert
By Richardson & Co.
Attorneys.

THE NORRIS PETERS CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EDOUARD LAMBERT, OF PARIS, FRANCE.

SYSTEM OF MACHINERY FOR PRINTING IN SEVERAL COLORS.

No. 843,829. Specification of Letters Patent. Patented Feb. 12, 1907.

Application filed February 15, 1905. Serial No. 245,746.

To all whom it may concern:

Be it known that I, EDOUARD LAMBERT, a citizen of France, residing at Paris, in the said Republic, have invented new and useful Improvements in System of Machinery for Printing in Several Colors, (for which I have obtained a patent in France, No. 346,639, bearing date September 28, 1904,) of which the following is a specification.

My said invention relates to a multicolor-printing machine in which is employed a bed carrying a plurality of printing-forms arranged side by side and corresponding in number to the number of colors to be printed and a single-impression cylinder extending over and including as many portions arranged in its length as there are forms on the bed, the sheets being shifted lengthwise of the impression-cylinder to bring them successively in line with the printing-forms.

The said improved machine insures, on the one hand, perfectly regular distribution of proper colors to proper forms and, on the other hand, the shifting above specified in an exact and automatical manner.

The essential features of said improved machine consist in special disposition of the grippers on the impression-cylinder and in special mode of actuating the said grippers; in special disposition of the transporting device for the sheets, in order to move the said device lengthwise of the impression-cylinder in a suitable manner; and in special disposition of the inking apparatus, in order to support and adjust the rollers of these well-known devices and to put them side by side, this disposition being necessary in the machine in question, because there is not space enough to put the inking devices according to the usual disposition.

For convenience of illustration I have shown in the accompanying drawings a machine for printing in three colors, though it will be readily understood that by merely duplicating or multiplying parts the printing may be done in any number or colors.

In the drawings, Figure 1 is a cross-section taken along line *a b* of Fig. 8 through impression-cylinder and transporting device. Fig. 2 is a similar section taken along line *c d* of Fig. 8 and showing partially the systems for operating the gripper-bars on the transporting device and the said grippers themselves. Fig. 3 is a front elevation of the transporting device, and Figs. 4, 5, 6, and 7 are diagrammatic views showing the same in its successive positions. Fig. 8 is a plan, partially broken away, showing a portion of the impression-cylinder and of the transporting device. Fig. 9 is an elevation showing diagrammatically the complete device for operating the gripper-bars on the transporting device and the said grippers themselves and showing also the device for distributing colors to the forms, and Fig. 10 is a plan showing a portion of the latter, partially broken away. Fig. 11 is a detail, partially diagrammatic, showing the manner of operating the grippers which hold the sheets to the impression-cylinder.

The impression-cylinder 1 includes in its length as many portions as there are colors to be printed, each portion being used for printing a determined color. Two of said portions are shown in Fig. 8. Each portion is provided with grippers 2 2′ of the kind usually employed in printing-presses and which are opened and closed by means of suitable devices. The bed 50 carries forms 98, 98′, and 98″, Figs. 8 and 10, which are adapted to receive the colors from the above-mentioned portions.

The grippers 2 2′, Figs. 1, 2, and 8, are fixed on bars 65 65′, respectively, independent one from another and oscillating in bearers, such as 66. Each bar is acted by means of toothed sector 67, keyed on it, and engaged with a corresponding sector 68, formed at the one end of a lever pivoted on a stud 69. The other end 68′ of the said lever bears a friction-roller 70, engaging freely in a fork 71, so that the spring 72 can move lever and sector 68, and therefore close grippers of the cylinder 1. The said spring is secured at one end to the cylinder 1 and at the other end to part 68′. There are as many forks 71 and spring 72 as printing-forms, and all the forks are keyed on a longitudinal shaft 73, on which is keyed a lever 74, bearing at its free end a friction-roller 75. This roller is acted by a cam 99, pivoted on the axis 100. A cam 106 on the shaft 31 operates lever 103–105, pivoted on the axis 104, which by the means of the connecting-rod 102 moves the lever 101, fixed the cam 99. When lever 103–105, connecting-rod 102, lever 101, and

cam 99, are moved, cylinder-grippers 2 2′ are opened.

Reciprocating motion is imparted to the bed, which drives the impression-cylinder as it travels in a given direction, whereas the said cylinder rests stopped as the bed comes backward.

The transporting device, including carriage 15 and the other parts hereinafter described for carrying the sheets from one of the above-mentioned portions to the next, may receive a reciprocating motion along the cylinder 1—that is to say, in a direction parallel with the axis of the latter. The stroke of the said motion is exactly limited in the manner already described in my United States Patent No. 695,816—that is to say, by means of engaging notches at each end of the said stroke during a sufficient time, in order to permit either taking out from one portion of the cylinder and transporting to the next portion the printed sheets or lying on the said next portion of the impression-cylinder the transported sheets.

In the machine for printing in three colors the transporting device includes two gripper-bars, the grippers of the one taking out from the first portion of the impression-cylinder the sheet printed with the first color, in order to transport the said sheets to the portion of said cylinder corresponding to the second color, while the grippers of the second bar take the sheet already printed with two colors, in order to transport the same to the portion corresponding to the third color. The transport of the sheet is effected while the impression-cylinder is stopped, as in the well-known stop-cylinder printing-presses.

While the impression-cylinder is driven, the transporting device, free from sheets, comes back to its initial position, said motion being imparted to it as follows: The bed is provided with a rack 60, Fig. 10, working a first toothed wheel 58, fixed on a second toothed wheel 58′, both wheels being keyed on a shaft 78, and the wheel 58′ gearing with a pinion 4, Figs. 4, 7, on a shaft 4′, Figs. 2, 3, and driving a pinion 7 through gear 5 6. The pinion 7 coacts with a rack 8, attached at the one of its extremities, the left extremity in the example shown, Fig. 8, to a sliding piece 9 and, on the other hand, to a sliding piece 8′ (shown at the right side of the Fig. 8) and movable in a groove 8″. A toothed wheel 10, fast on a flanged wheel 10′, Fig. 3, and borne at the end of an oscillating lever 11, provided with a stud 12, is hinged on the sliding piece 9. The wheel 10 is itself provided with a stud 13, on which is linked a connecting-rod 14, acting the carriage 15 of the transporting device. The wheel 10′ runs on a bar 16′, Figs. 1 and 8, and the wheel 10 runs on a rack 16, fast on the frame of the machine and whose length is exactly equal to the development of the pitch-circle of the wheel 10, and also to the desired stroke for the transporting device. Notched pieces 17 17′, Fig. 8, are secured at each end of the rack 16, in order to lock the stud 13 at exactly-determined points, whereby the wheel 10, pushed by sliding piece 9, turns upon the stud 13 in such a manner that the stud 12 turns itself around the stud 13 of angle $a\,a'$, Figs. 4 and 7, at each end of the stroke of the bed, while the carriage 15 is stopped during a space of time permitting the transporting-device grippers to effect either taking out the sheets from the impression-cylinder or laying the sheets on the latter. The several positions of the transporting device are shown diagrammatically in accompanying drawings, Figs. 4 to 7.

During the strokes of the transporting device the gripper-bars are cleared from the impression-cylinder and its grippers, as follows: The carriage 15 is provided with horizontal shafts 18 18′, Figs. 2, 8, and 9, corresponding, respectively, to the gripper-bars on the transporting device, which are two in number in case of machinery for printing in three colors, the said bars, such as 21, being hinged on levers 20, keyed on the shafts, such as 18. On the shaft 18 is keyed a lever 19, at the end of which is borne a friction-roller 22, which rests against a suitable bar 23 during the whole stroke of the transporting device. The bar 23 is provided with a lever 24, pivoted on a shaft 25, in order to permit the bar 23 to act the roller 22, and therefore the corresponding gripper-bars, such as 21.

The gripper-bars are respectively provided with corresponding friction-rollers, in order to make the same completely independent one from another.

The bar 23 is operated by a crank 26, Figs. 2 and 9, and a connecting-rod 27, acted by a pivoted lever 28, whose free end bears a friction-roller 29, resting against a suitable cam 30, keyed on a shaft 31, accomplishing a complete revolution during a complete stroke of the bed.

Opening and closing the grippers, in order to effect laying on and taking out the sheets with respect to the portions of the impression-cylinder, is effected as follows: The carriage 15 bears a shaft 32. (Shown at the right side of the Fig. 8 and fixed on a projecting arm 32′, Fig. 2, of said carriage.) On the shaft 32, Figs. 2 and 9, is pivoted a lever 33, bearing at its end a friction-roller 34, resting against a bar 35. The latter is operated in the same manner as the bar above specified—that is to say, through a crank 38, a connecting-rod 39, a pivoted lever 40, a friction-roller 41, and a cam 42, keyed on the shaft 31. One end of the lever 33 is linked on a connecting-rod 43, working a crank 44, keyed on the transport-

ing-device gripper-bars, such as 21. For opening, grippers 45 are cleared from counter-grippers 46 under suitable action of cam 42 on devices acting the driving-bar, such as 21, and, for closing, the same devices are acted by a suitable worm-spring 47 around the shaft 18.

The gripper-bars are respectively provided with corresponding and above-specified devices for opening and closing the grippers in order to make the said bars completely independent one from another.

As stated in the preamble of the specification, it is necessary in the present machine to provide special disposition for supporting and adjusting the rollers of the well-known inking devices, said rollers having for their purpose to distribute proper colors to proper forms. Said special disposition is shown in Figs. 9, 10 of the accompanying drawings. For each color are established sets of inking-rollers—three, for instance, 51 52 53—on which rest metallic cylinders 54 55. In such a machine it is, in fact, very difficult to adjust inking-rollers on the forms and inking-cylinders, specially in the middle of the machine, owing to the fact that no space is free under the rollers for screws or other mechanism for adjusting the latter. In order to avoid this inconvenience with the system forming the object of the present invention, each set of rollers 51 52 53, Fig. 9, is individually adjustable in height by raising or lowering their studs 80 81 82 in their bearings 83 84 85, which are formed in pieces 90, supported by two bars 91 92. The said adjustability is obtained by means of piece, much as 61, provided with wedges 86 87 88 and suitably operated by screw 95, turning in a bar 96. Further, all the sets of inking-rollers may be raised all together by means of a control-lever 62, pivoted at 89 and acting a crank 93, fixed on a connecting-rod 94, linked on the bar 96.

The rollers 51 52 53 are inked in the usual and well-known manner, and rotative motion is imparted to them by friction against cylinders 54 55, receiving a rotative motion by means of pinions 56 57, Figs. 9 and 10, respectively, keyed on driving-shafts 48 49 and worked by double pinions 58 58′ 59 59′, gearing with the rack 60 on the bed 50. The sets of the cylinders 54 55 are respectively supported by corresponding single shaft 48 49, turning in the bearing-pieces 76 77, which are keyed on corresponding shafts 78 79, and suitable to-and-fro motion is imparted to the cylinders 54 55 in the ordinary manner by means of rings 58″ 59″, fixed on the extremity of the shafts 78 and 79. The metallic cylinders can be raised for inspection and cleaning by means of the bearing-pieces 76 77 and of suitable hand-levers working them.

The working of the whole machinery is as follows: The bed coming back to the inking-rollers (direction indicated by the arrow 63) the impression-cylinder 1 is stopped, the feeding-table 97 is lowered, and a sheet to be printed being laid on the latter is taken out by impression-cylinder grippers as the bed has reached the end of its stroke, Fig. 9, while the gripper-bars corresponding to the shafts 18 18′ have been respectively carried toward impression-cylinder portions affected, respectively, to the second and to the third color, Fig. 7. The bed traveling in the direction indicated by the arrow 64 impression-cylinder is worked and the sheet above specified is printed with the first color on the first form 98. The sliding piece 9 traveling in the direction indicated by the arrow 64′ the stud 13 falls into the notch 17 a little before the end of this stroke, whereby the transporting device is stopped. The gripper-bars corresponding to the shaft 18 are now exactly in front of the impresion-cylinder portion which corresponds to the first color, while the shaft 18′ is exactly in front of the impression-cylinder portion which corresponds to the second color on the second form 98′, Fig. 4. The wheel 10 runs then upon the stud 13, (angle *a*, Fig. 4,) while cams 42 and 30 actuate the gripper-bars and the grippers themselves, as hereinbefore described. Impression-cylinder 1 is then stopped, the counter grippers 46 come down on the bar 46′, Fig. 2, fixed in the impression-cylinder 1, and the grippers 45 are closed on them. The impression-cylinder grippers are then opened and the transporting device gripper-bar is raised. The printed sheet is thus taken out from the first portion of the impression-cylinder. The bed coming back again in the direction indicated by the arrow 63 and the sliding piece 9 in the direction indicated by the arrow 63′, studs 13 and 12 are first carried in vertical line, Fig. 5, and the carriage 15 is moved, Fig. 6, carrying the shafts 18 and 18′, respectively, in front of the second and third color. The stud 13 falls then in the notch 17′, cams 30 and 42 act the gripper-bars and the grippers themselves, whereby the sheet printed with the first color is laid on the impression-cylinder portion corresponding to the second color, (gripper 2′,) the cylinder being first stopped, its grippers closed, and then the transporting device grippers opened. During this operation the wheel 10 has run upon the stud 13, (angle *a*′, Fig. 7.) The bed traveling again in the direction indicated by the arrow 64 and the sliding piece 9 in the direction indicated by the arrow 64′, the sheet is printed with the second color on the second form 98′. Then the grippers corresponding to the shaft 18′ take out from the impression-cylinder a new sheet printed with the first two colors.

Therefore as the transporting device comes again in the direction indicated by the arrow 63′ the first sheet is carried to the third color and the second sheet to the second-color, (grippers 2′.)

It will be easily seen that after three sheets laid on the feeding-table 97 one sheet will be printed on each impression-cylinder portion, and, lastly, when a sheet has been successively printed with the three colors it is given up by the impression-cylinder grippers 2 and received by suitable devices, laying the said sheet on the receiving-table. The working of the whole machinery is then continued in an uninterrupted manner.

Having thus fully described and ascertained the nature of my said invention, what I do claim, and desire to secure by Letters Patent, is—

1. An improved system of machinery for printing in several colors, including the combination with a single impression-cylinder having a plurality of portions disposed side by side and provided respectively with sets of grippers, of a bed having a plurality of printing-forms corresponding respectively to the several portions of the impression-cylinder, of a transporting device having a reciprocating motion in a direction parallel with the axis of the impression-cylinder, and provided with a plurality of sets of grippers and counter grippers, of suitable means for imparting suitable reciprocating motion to the carriage carrying the said transporting device and for exactly limiting the stroke of the motion of the transporting device proper, of suitable means for raising or lowering the bars on which are keyed the sets of grippers on the transporting device, and for closing or opening the grippers themselves, and of suitable means for adjusting the inking-rollers with respect to the bed, and for raising or lowering the inking-cylinders as regards the inking-rollers, substantially as described.

2. In an improved system of machinery for printing in several colors, including a single impression-cylinder having a plurality of portions disposed side by side and provided respectively with sets of grippers; a bed having a plurality of printing-forms corresponding respectively to the several portions of the impression-cylinder, a transporting device having a reciprocating motion in a direction parallel with the axis of the impression-cylinder, and provided with a plurality of sets of grippers and counter grippers; several sets of grippers on the impression-cylinder, mounted on independent bars, each bar being operated by independent sector-levers and each lever being operated, in order to close the grippers, by a separate spring, and, in order to open the grippers, by a friction-roller on said lever, each friction-roller being engaged free in a separate fork or cam, and all the forks or cams being keyed on the same longitudinal shaft, the latter being operated by means of a lever, friction-roller and cam, so that this shaft turns all the cams or forks in order to open all the sets of grippers simultaneously, whereas a separate spring closes each separate set of grippers.

3. In an improved system of machinery for printing in several colors, including the combination with a single impression-cylinder having a plurality of portions disposed side by side and respectively provided with sets of grippers, of a bed having a plurality of printing-forms corresponding respectively to the several portions of the impression-cylinder, of a transporting device having a reciprocating motion in a direction parallel with the axis of the impression-cylinder and provided with a plurality of sets of grippers and counter grippers; a sliding piece traveling in a direction parallel with axis of the impression-cylinder under action of a toothed wheel gearing with a rack on the said sliding device, the said toothed wheel being driven by the bed through suitable transmission; a carriage bearing the transporting device gripper-bars, the said carriage being moved by a connecting-rod linked on a toothed wheel hinged on the sliding piece and the said toothed wheel running on a fixed rack provided at its end with two notches engaging a stud lying on the periphery of the said toothed wheel, in order to permit pivoting on the said stud during the end of the stroke of the sliding piece, while the carriage of the transporting device and the grippers of the latter are stopped exactly in longitudinal position, the said system including further suitable means for raising or lowering the bars on which are keyed the sets of the grippers on the transporting device, and for closing or opening the grippers themselves, substantially as described.

4. In an improved system of machinery for printing in several colors, including the combination with a single impression-cylinder having a plurality of portions disposed side by side and respectively provided with sets of grippers, of a bed having a plurality of printing-forms corresponding respectively to the several portions of the impression-cylinder, of a transporting device having a reciprocating motion in a direction parallel with the axis of the impression-cylinder, and provided with a plurality of sets of grippers and counter grippers, and of suitable means for adjusting the inking-rollers with respect to the bed and for raising or lowering the inking-cylinder with respect to the inking-rollers, the means consisting in establishing a frame receiving three or more sets of inking-rollers, the sets of the rollers lying in bearing adjust-

able separately, by means of a screw working a bar provided with proper wedges in order to move the studs of the rollers in their bearings, the said rollers being raised all together, by means of a control-lever working all the bars provided with wedges; the frame above specified receiving two or more sets of metallic cylinders, each set being keyed on a single shaft and resting against the inking-rollers in order to give motion to the latter, the bearing-shafts of the metallic cylinders having a rotative and a to-and-fro motion imparted to them and being hinged on a pivoted lever in order to be raised from or lowered on the inking-rollers; substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDOUARD LAMBERT.

Witnesses:

JULES FAYOLLET,

EUGÉNE PICHON.