

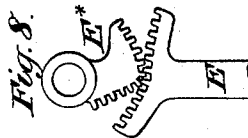
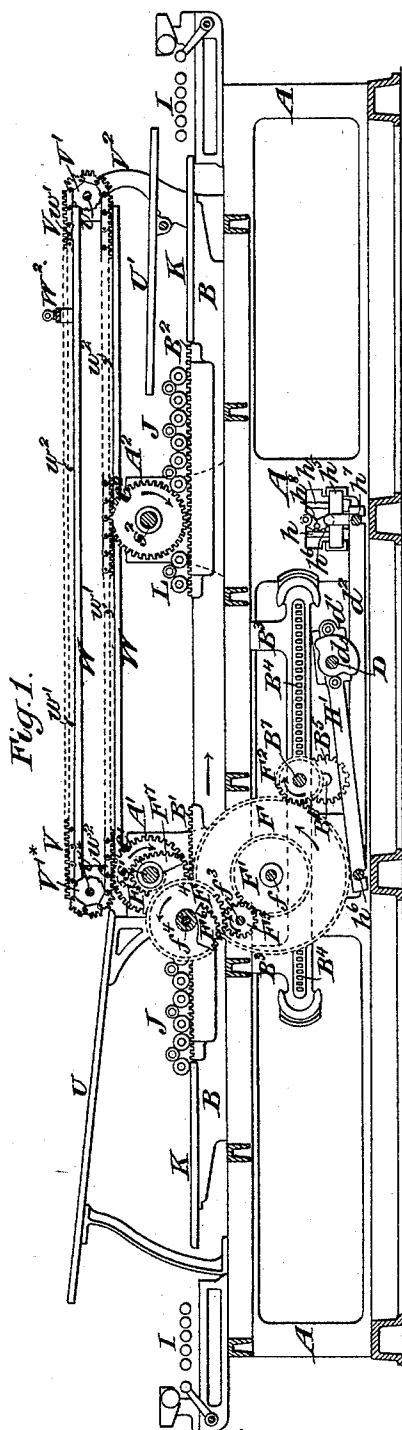
(No Model.)

5 Sheets—Sheet 1.

C. B. COTTRELL.
CHROMATIC PRINTING MACHINE.

No. 412,878.

Patented Oct. 15, 1889.



Witnesses.

Olundgren
P. Meissner

Inventor:

Calvert B. Cottrell
By attorneys
Rowntree & Griswold

(No Model.)

5 Sheets—Sheet 2.

C. B. COTTELL.
CHROMATIC PRINTING MACHINE.

No. 412,878.

Patented Oct. 15, 1889.

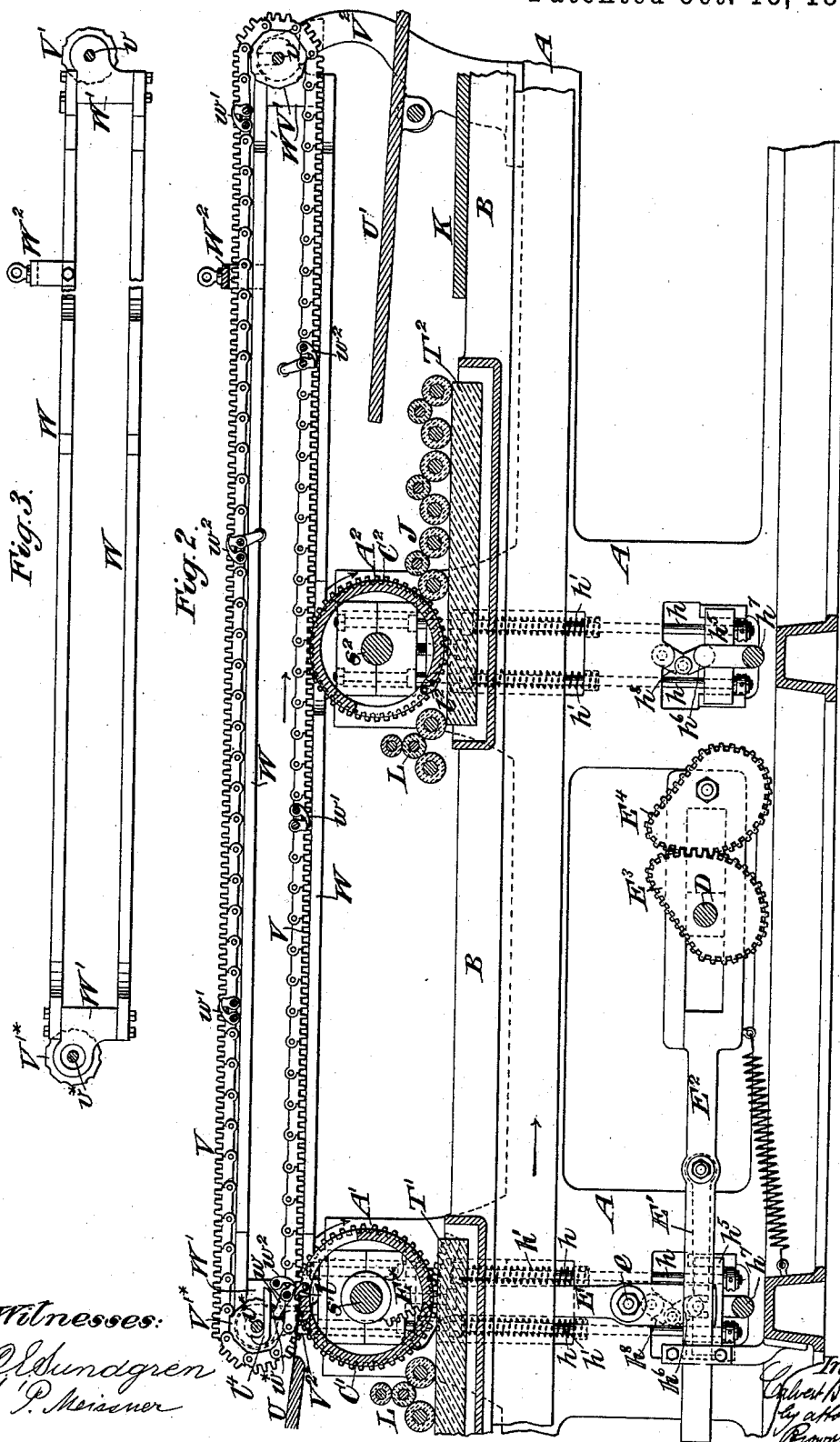


Fig. 2.

Witnesses:

O. Sundgren
P. Meisner

Inventor:
Calvert R. Cottrell
by attorneys
Brown & Grissold

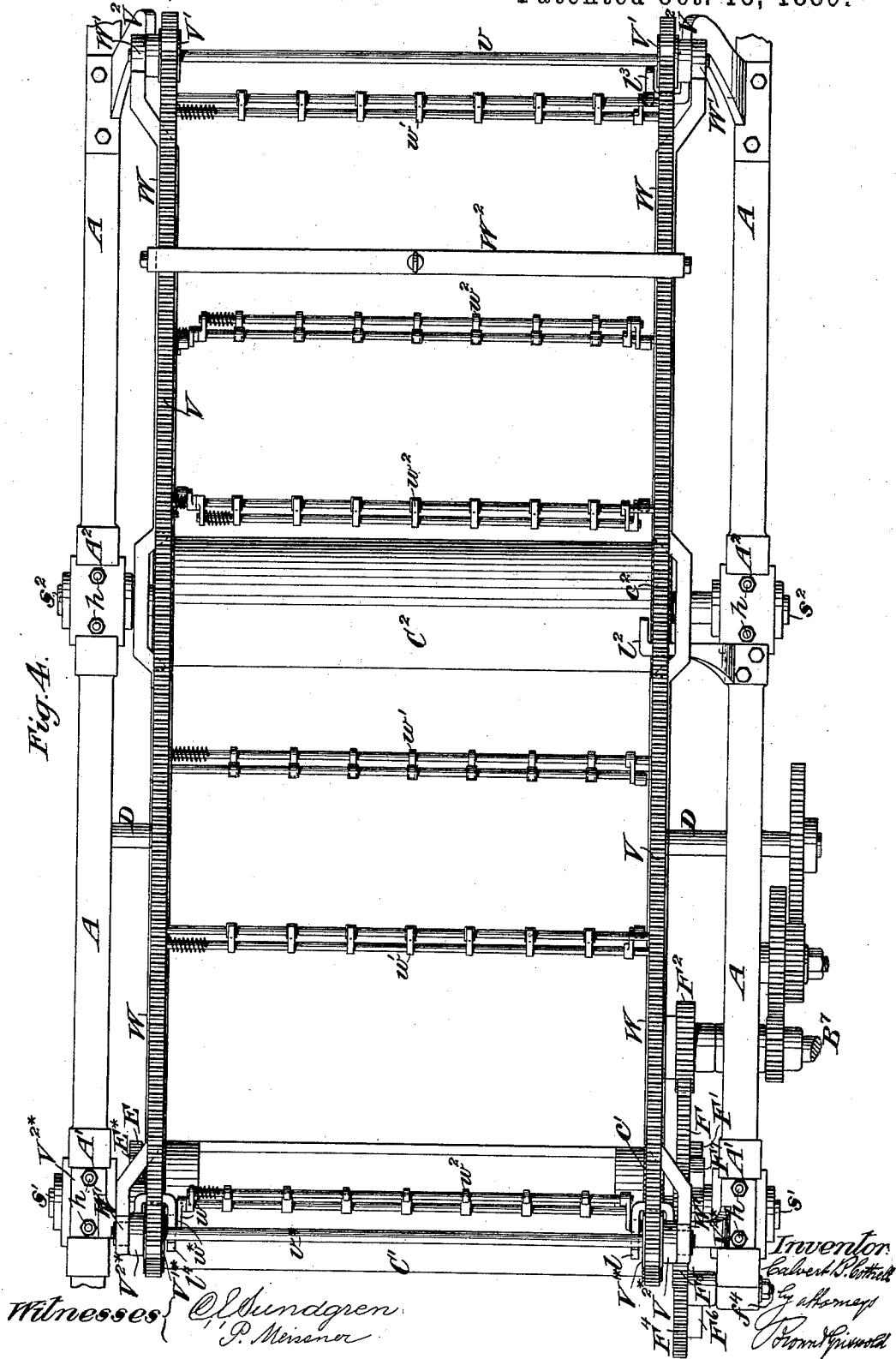
(No Model.)

5 Sheets—Sheet 3.

C. B. COTTRELL.
CHROMATIC PRINTING MACHINE.

No. 412,878.

Patented Oct. 15, 1889.



(No Model.)

5 Sheets—Sheet 4.

C. B. COTTRELL.
CHROMATIC PRINTING MACHINE.

No. 412,878.

Patented Oct. 15, 1889.

Fig. 5.

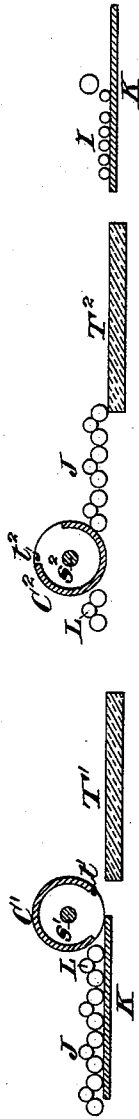
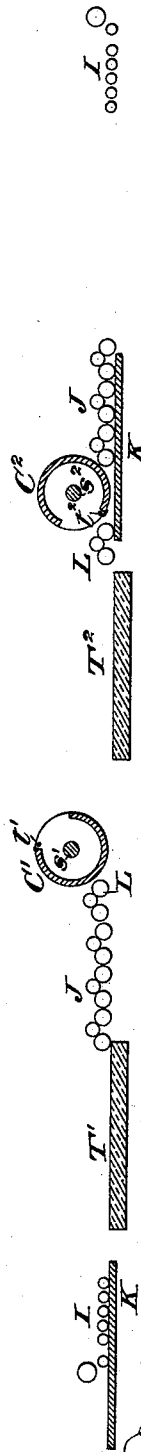


Fig. 6.



Witnesses:
O. Sundgren
P. M. Mearns

Inventor:
Calvert B. Cottrell
by attorneys
Brown & Grewald

(No Model.)

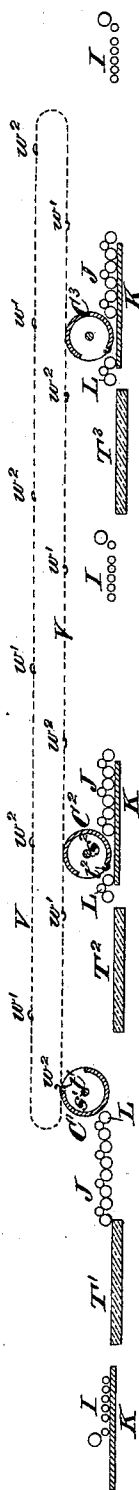
5 Sheets—Sheet 5.

C. B. COTTRELL.
CHROMATIC PRINTING MACHINE.

No. 412,878.

Patented Oct. 15, 1889.

Fig. 7.



Witnesses

C. Sundgren
P. Meiner

Inventor:

Calvert W. Cottrell
by attorneys
Horn & Griswold

UNITED STATES PATENT OFFICE.

CALVERT B. COTTRELL, OF WESTERLY, RHODE ISLAND.

CHROMATIC-PRINTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 412,878, dated October 15, 1889.

Application filed March 25, 1889. Serial No. 304,661. (No model.)

To all whom it may concern:

Be it known that I, CALVERT B. COTTRELL, a citizen of the United States, residing at Westerly, in the county of Washington and State of Rhode Island, have invented a new and useful Improvement in Chromatic-Printing Machines, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to presses in which there are employed two or more impression-cylinders and a reciprocating bed common to all of said cylinders and adapted to carry a number of printing-forms corresponding with the number of cylinders and the number of colors to be printed. Such a machine may be of what is known as the "stop-cylinder" type or of the two-revolution-cylinder type, or its cylinders may complete two revolutions and then stop for a time during each reciprocating movement of the bed back and forth. The bed may be driven by a crank or by the "Napier" or "mangle-rack" movement.

I will now proceed to describe the improvement with reference to the drawings, and afterward point out its novelty in claims.

The machines illustrated in the drawings are of the kind last hereinabove mentioned—that is to say, its cylinders have two revolutions and afterward stop for a time during each reciprocating movement of the bed back and forth.

Figure 1 is a side view of a machine with two cylinders for printing in two colors. Fig. 2 represents a central longitudinal vertical section of this machine, omitting a portion of the framing at each end and portions of the inking apparatus. Fig. 3 represents a longitudinal view of some of the details which are not so well shown in Fig. 2. Fig. 4 is a plan view corresponding with Fig. 2. Figs. 5 and 6 are diagrams of the cylinders, representing the bed at opposite ends of its stroke. Fig. 7 is a diagram representing the arrangement of three cylinders in one machine with a bed common to all. Fig. 8 is a detail view, which will be hereinafter explained.

Similar letters of reference designate corresponding parts in all the figures.

A, Figs. 1, 2, and 4, designates the fixed framing of the machine, upon which runs the reciprocating bed B, and upon which are erected

the standards A' A², containing the bearings for the shafts s' s² of the two impression-cylinders C' C², the said standards and their bearings being at such distances apart as to leave sufficient space between them to permit a sheet, which is received on the first of said cylinders C' by its grippers t' from a feed-board U and afterward transferred to the other cylinder C² to be printed first under the said cylinder C' with one color on one of two forms T' T² on the bed B and afterward under the other cylinder C² with another color on the other of the said forms.

Near the places provided on the bed B for the two forms T' T² racks B' B² are provided for the purpose of gearing with gears c' c² on the shafts of the cylinders during printing. There may be such racks on both sides of the bed and such gears at both ends of the cylinders. The racks B' B² and the gears c' c² insure the two cylinders being driven at a surface speed exactly corresponding with that of the bed during printing. The bed is represented as having imparted to it the necessary reciprocating motion by means of the common Napier or mangle-rack motion. The bed has depending from it hangers B³, upon which the rack B⁴ is carried, the said rack engaging with a mangle-pinion B⁵ on a knuckle-shaft B⁶, which is jointed to the main shaft B⁷ of the machine upon which is the pulley for driving the machine. The cylinders C' and C² must be so geared together independently of their gearing with the bed that they will have corresponding rotary movements when out of gear with the bed. The gearing by which the cylinders are so geared together may be of any suitable kind. I have represented it as consisting of two endless racks V, gearing with spur-gears on the cylinders. These endless racks are endless chains made of toothed links, and the said racks or chains serve the additional purpose of carrying grippers w' and w² for the purpose of taking the sheets from each of said cylinders and transferring them to another or to a receiving-board U', as will be hereinafter described. The said endless chains or racks are represented as supported on wheels V' and V², carried by shafts v' v², which work in bearings in standards V³ and V³², the standards V³ being erected on opposite side frames

of the main framing A, and those V^{2*} being erected on the cylinder journal-boxes, and the said racks gearing with spur-gears of equal size on the two cylinders. These gears
 5 may be and are represented as the same $c^2 c^2$, hereinbefore described as gearing with the bed-rack. The two cylinders being thus geared together, their rotary movements will be synchronous—that is to say, made to cor-
 10 respond—so that exactly such movements as may be given to the cylinder C' will also be given to the cylinder C^2 , and when the cylinder C' stops the cylinder C^2 will also stop. The two cylinders, besides being geared to-
 15 gether to have synchronous rotary movements, must have corresponding synchronous rising and falling movements, by which both are brought up to a position in which they will not gear with the bed-racks and re-
 20 turned to a position in which they will gear with the said racks. The mechanism applied to each of the cylinders C' C^2 for this purpose may be and is represented to be the same as that commonly employed in stop-
 25 cylinder printing-presses and known as the "lift" mechanism, consisting of rods h , (see Fig. 2,) connected at their upper ends with the journal-boxes of the cylinders extending downward through guides on the framing and
 30 connected at their lower ends by bearing-blocks h^5 , springs h' , applied around the said rods for the purpose of lifting the boxes and the cylinders, and toggles h^8 , applied between said bearing-blocks and the framing for the
 35 purpose of drawing down the cylinder-boxes and the cylinders. The toggles h^8 are connected with a cranked rock-shaft h^6 , which is supported in bearings in the blocks h^5 . The crank h^7 , belonging to the first cylinder C' , is
 40 connected by a hook-bar H' with a cam-yoke d' , which embraces a cam d upon the cam-shaft D. The cam d and the hook-bar H' serve to operate the toggles belonging to the first cylinder C' , as in an ordinary stop-cyl-
 45 nder machine, and the toggles belonging to the second cylinder C^2 are operated at the same time in the same manner through a bar d^2 , which connects the crank portions h^7 of the rock-shaft h^6 .
 50 The means of giving motion to the first cylinder C' while out of gear with the bed constitutes no part of the present invention. For the purpose of this invention any suitable means may be employed for giving such mo-
 55 tion to the said cylinder—as, for instance, those ordinarily employed in the two-revolution cylinder presses or those employed in the stop-cylinder presses in common use; but I have represented for that purpose a starting-
 60 lever and sector on one side of the machine and a train of gearing on the other side of the machine, which constitute part of the subject-matter of my application for United States Patent, Serial No. 294,596, filed December 26,
 65 1888, and which I will now briefly describe. The starting-lever E is shown partly in full and partly in dotted outline in Fig. 2, in which

figure also is shown the mechanism for operating the said lever; but I have also shown more plainly in Fig. 8 the upper end of the
 70 said lever and the toothed sector E^* on the cylinder with which it gears. The other gearing is shown in Fig. 1. The starting-lever is represented as working on a fixed stud e and
 75 as driven through a horizontally-moving bar E^2 by means of two cam-shaped gear-wheels E^3 E^4 , of which E^3 is fast upon the cam-shaft D, and E^4 is pivoted to a yoke on the said bar, the said bar being connected by a gab-
 80 hook E' with the lower end of the starting-lever. This means of imparting motion to the starting-lever constitutes part of the subject-matter of my application for Letters Patent, Serial No. 242,233, filed June 23, 1887.

The train of gearing hereinbefore referred
 85 to as on the other side of the machine, and which is represented in Fig. 1, consists as follows: Mounted upon a fixed stud or pin f , secured in the side framing, there is a large gear-wheel F, which engages with a pinion F^2
 90 on the main shaft B' of the machine. This pinion is of the same pitch diameter as the knuckle-gear or mangle-pinion B^5 ; hence its pitch-line and the pitch-line of the large wheel F both have the same speed as the
 95 bed or the speed which the cylinder must have during printing. Fast to the gear-wheel F is a gear-wheel F' of half the diameter of the said wheel F. This gear-wheel F' gears with a smaller gear-wheel F^3 , turning
 100 loosely on a fixed stud f^3 , and the said gear-wheel F^3 gears with another gear-wheel F^4 , turning on a fixed stud f^4 . Opposite this gear-wheel F^4 there is fast to the cylinder a concentric toothed sector F^5 , which is capa-
 105 ble of gearing with the said gear-wheel F^4 . This concentric sector F^5 has a pitch radius one-half that of the cylinder-gear c' . Secured to the gear-wheel F^4 is an eccentric sector F^6 , and secured to the concentric sector F^5 , or oth-
 110 erwise secured to the cylinder, is an eccentric sector F^7 , which is the counterpart of that F^6 . These eccentric sectors are so arranged that they may work in gear with each other. The position of the parts shown in Figs. 1 and 2
 115 is that in which the cylinders are raised out of gear from the bed-rack, the first cylinder C' being in the position for taking a sheet from the feed-board U and the bed moving toward the right, which is the direction of the
 120 return movement after printing. The starting-lever E is in its central position and in gear with the sector E^* of the cylinder, and the cams E^3 E^4 are about to move the start-
 125 ing-lever to the left, and thus turn the cylinder C' in the direction of the arrow shown near it in Fig. 2, with a speed which is gradually accelerated by the form of the cams E^3 E^4 . The eccentric sectors F^6 and F^7 of the train of gearing on the other side of the ma-
 130 chine remain out of gear with each other until just as the starting-lever is passing out of gear with the sector E^* and the movement of the cylinder is continued through the said

sectors, the velocity being gradually accelerated by reason of the eccentric form of the said sectors until the concentric sector F^5 comes into gear with the gear-wheel F^4 , which constantly rotates in the direction of the arrow shown upon it, and the cylinder is thus brought to the same surface speed as the movement of the bed. The cylinders having now been depressed by the toggles and the movement of the bed having been reversed, the rack on the bed runs into gear with it, and during the movements of the two cylinders thus produced the two printings take place, one on the sheet which has just been taken to the first cylinder C' by its grippers t' from the feed-board and the other on a sheet which has been previously printed on the first cylinder and brought by the grippers on the endless chains from the first cylinder and taken from the chain-grippers to the second cylinder C^2 by its grippers t^2 . The grippers t' of the first cylinder take the sheet while the cylinder is stationary, as in an ordinary stop-cylinder press; but the grippers t^2 of the second cylinder take the sheets while the said cylinder and the gripper-carrying chains are in motion.

The grippers $t't^2$ of the two cylinders may be like those commonly used on the impression-cylinders of cylinder printing-machines, and, as the said grippers may be opened by similar cams to those employed for the purpose in ordinary cylinder printing-machines, I have not thought it necessary to represent means for opening said grippers.

The grippers carried by the endless chains or racks V are in two sets, those w' of the one set which are for taking the sheets from the first cylinder and carrying them to the second intervening between those w^2 of the other set, which take the sheets from the second cylinder and deposit them on the receiving-board. The bars of the said grippers are supported in the endless chains or racks in the same manner as those described in my United States Patent No. 319,400, dated June 9, 1885.

The grippers w' , which take the sheets from the first cylinder, are opened to take a sheet by means of a stationary cam l , (see Fig. 4,) secured to one of the standards V^{2*} , which supports the shaft v^* and its wheels V'^* for carrying the endless chains or racks, and are closed by springs, as in grippers commonly employed to take sheets from cylinders. These grippers and their operating mechanism may be the same as those represented in my Letters Patent aforesaid for taking the sheets from the cylinder. The said grippers are opened again to release the sheet when it arrives in proper relation with the second cylinder C^2 by passing a stationary cam l^2 , (see Fig. 4,) secured upon the standard A^2 . The grippers w^2 , which take the sheet from the second cylinder, are opened for the purpose by passing the same cam l^2 as is employed to open the grippers w' , and they are opened

again to release the sheet and deposit it on the receiving-board by means of a stationary cam l^3 , (see Fig. 4,) secured to one of the standards V^3 , in which is supported the shaft v of the wheels V' for carrying the endless chains or racks.

In order to provide for throwing up the grippers w^2 entirely out of the way of the cylinder C' and its grippers as they pass the said cylinder, the main bar of the grippers is provided with an arm w , furnished with an anti-friction roller w^* , which in passing under a stationary cam l^4 causes the said grippers w^2 to be thrown upward, as illustrated in Fig. 2, where the one pair of grippers w^2 is shown passing the cylinder and operated by said cam l^4 .

The endless chains or racks V are supported between the wheels V' and V'^* on rigid ways $W W$, constructed on frames W' —one on each side of the machine. One of these frames, with the chain-carrying shafts, and one of the wheels on each shaft are separately represented in a side view, Fig. 3. The shaft v at the delivery end of the machine—that is to say, at the right-hand end of Figs. 2 and 3—is capable of being lifted out of its bearings. The two frames W' , containing the ways W , are connected near the shaft v , at the delivery end of the machine, by a cross-bar W^2 . By applying a tackle or other hoisting device to the said bar with the end of the frames W' , and with them the corresponding shaft v , the wheels V' and the portions of the chains or racks on said wheels may be raised, the frames turning on the shaft v^* at the receiving end of the machine, which is at the left hand of Figs. 2 and 3 as a pivot. By this raising the ways and the gripper-carrying chains or racks and attached grippers access may be had to the cylinders and parts of the machine below. In proper relation to each cylinder there are arranged inking-rollers I and distributing-rollers $J J$, and in proper relation to the place provided on the bed for each form there are arranged distributing-tables K . For a lithographic press water-rollers L may also be provided. As these rollers and tables need not differ from those in single-cylinder printing-machines, no particular description of them is necessary. In case of a third cylinder C^3 being provided for printing from a third form T^3 , as shown in Fig. 7, additional inking-rollers, distributing-rollers, and tables will have to be provided.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of a plurality of impression-cylinders provided with receiving-grippers and geared together to rotate synchronously, a reciprocating form-bed common to all of said cylinders and adapted to carry a number of forms corresponding with the number of said cylinders, a rack on the bed for each cylinder, gears upon said cylinders gearing with said rack, and endless chains and grippers thereon arranged to run between

said cylinders for the purpose of taking sheets from one of said cylinders and transferring them to another, substantially as and for the purpose herein set forth.

- 5 2. The combination, with a plurality of impression-cylinders provided with receiving-grippers, a reciprocating form-bed common to all of said cylinders and adapted to carry a number of forms corresponding with the
10 number of cylinders, a rack on said bed for each cylinder, and gears on said cylinders for engaging with said rack for driving said cylinders during printing, of endless racks and gears upon said cylinders gearing with said
15 endless racks for the purpose of transmitting motion from one cylinder to another while out of gear with the bed-rack and grippers on said endless racks for taking sheets from

one cylinder and transferring them to another, substantially as and for the purpose 20 herein set forth.

3. The combination, in a printing-machine, with a plurality of impression-cylinders having gears upon them, endless chains engaging with said gears above the said cylinders, 25 and carrying grippers for taking sheets from said cylinders, of tracks upon which said endless chains run, pivotal supports for said tracks at one end, and upwardly-movable supports for the other end of said tracks, substantially 30 as and for the purpose herein set forth.

CALVERT B. COTTRELL.

Witnesses:

FREDK. HAYNES,
JOHN BICKET.