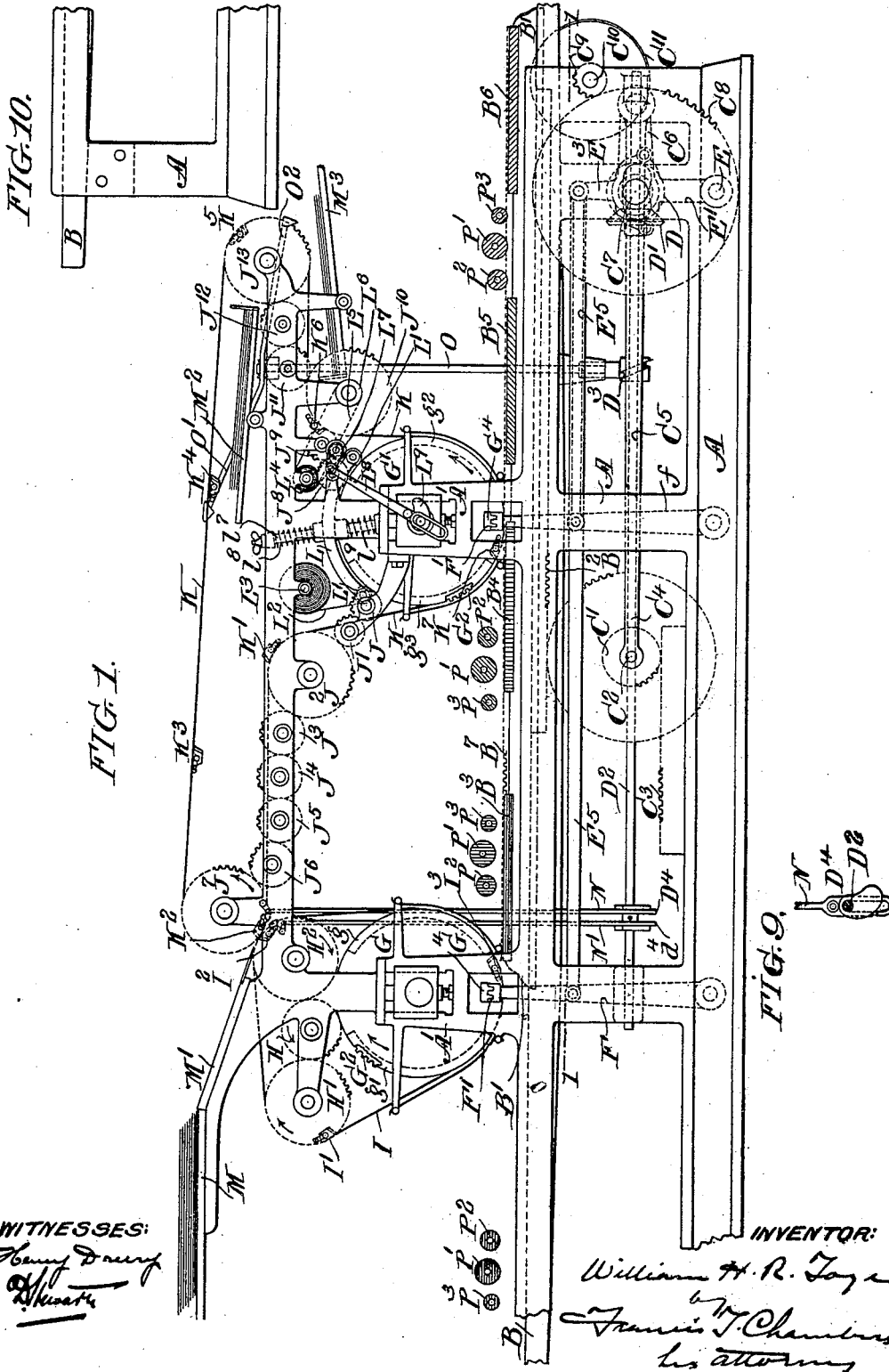


W. H. R. TOYE.
PRINTING PRESS.

(Application filed July 24, 1897.)

5 Sheets—Sheet 1.

(No Model.)



No. 676,453.

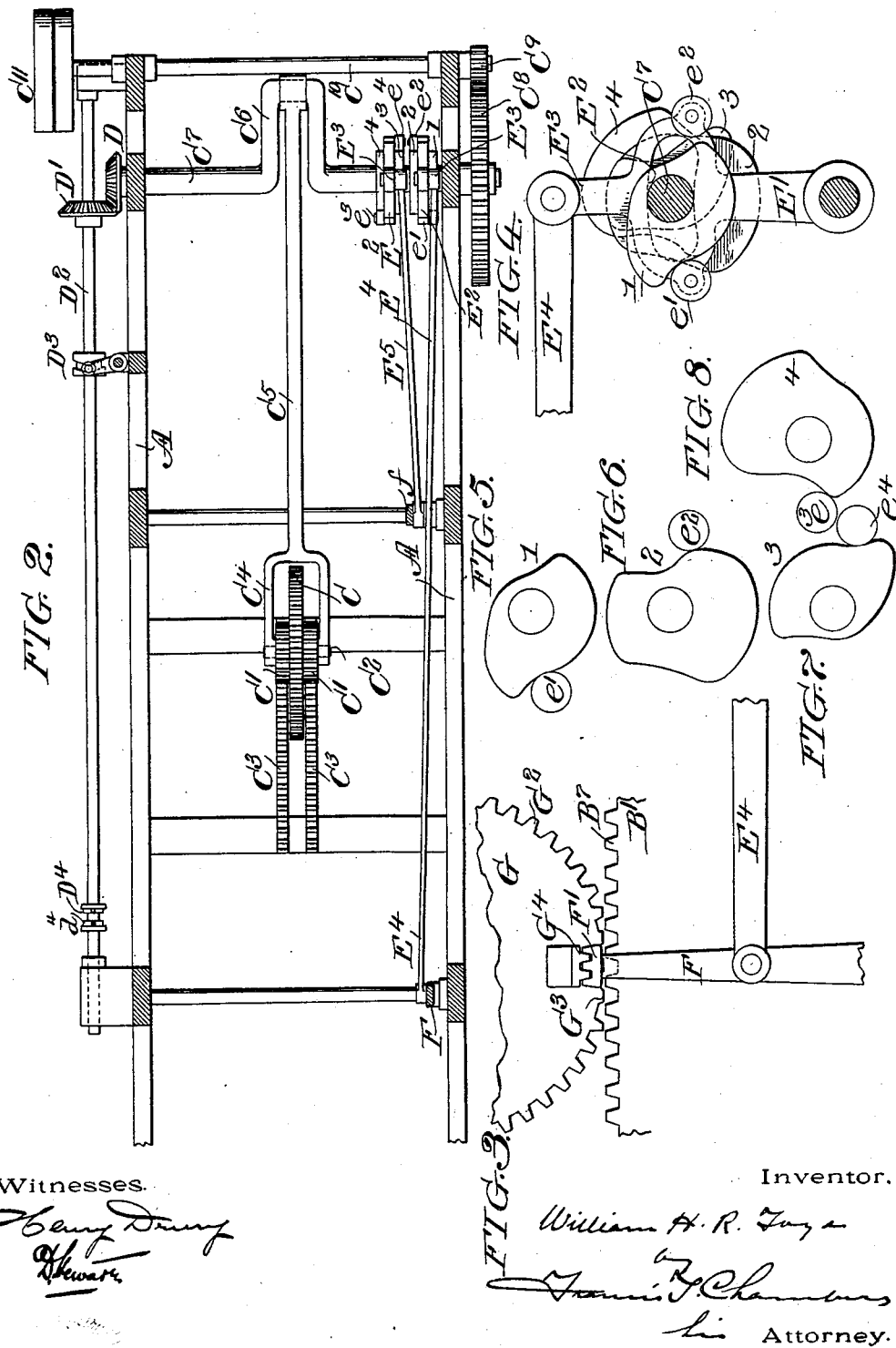
Patented June 18, 1901.

W. H. R. TOYE.
PRINTING PRESS.

(Application filed July 24, 1897.)

(No Model.)

5 Sheets—Sheet 2.



No. 676,453.

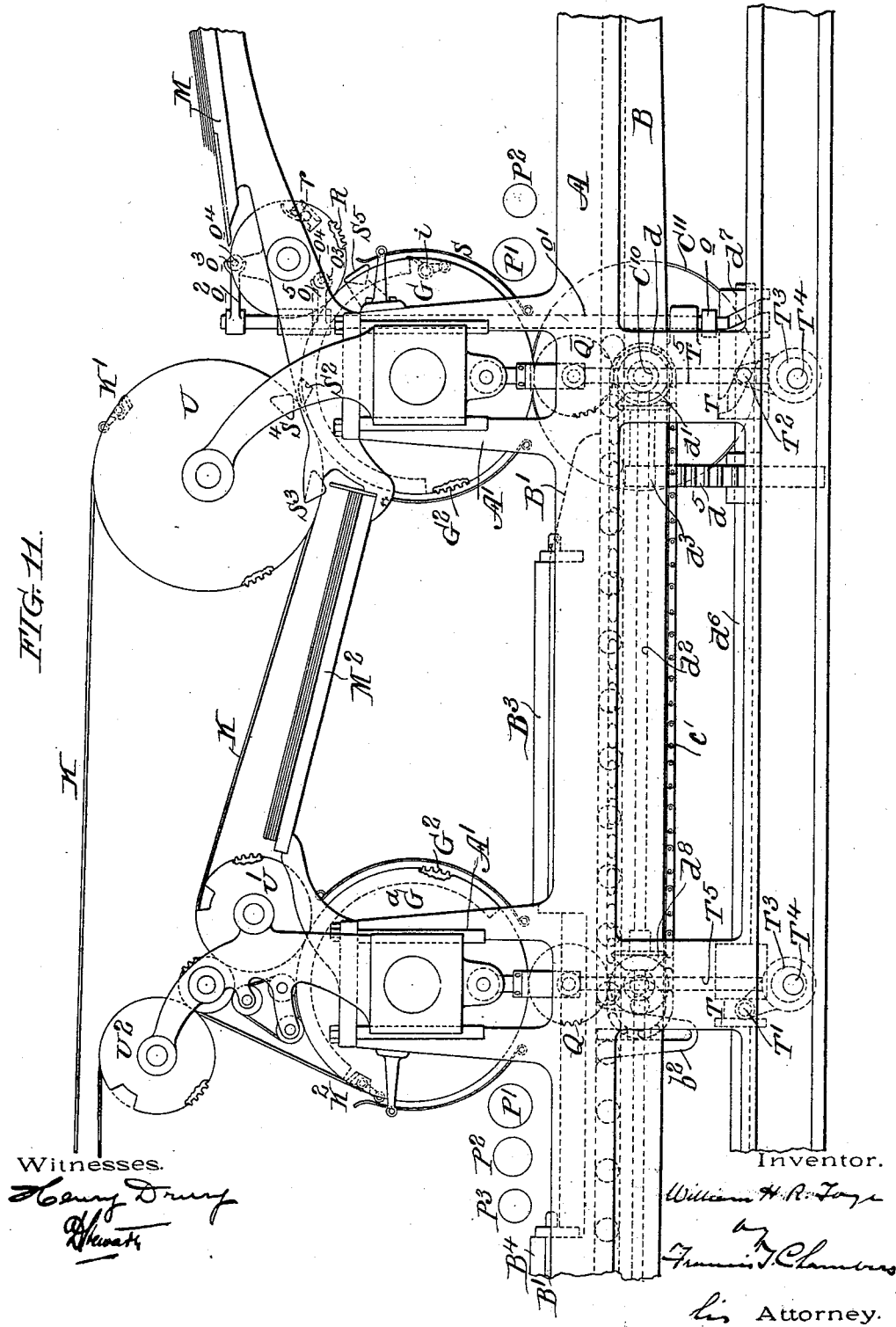
Patented June 18, 1901.

W. H. R. TOYE.
PRINTING PRESS.

(Application filed July 24, 1897.)

(No Model.)

5 Sheets—Sheet 3.



Witnesses.

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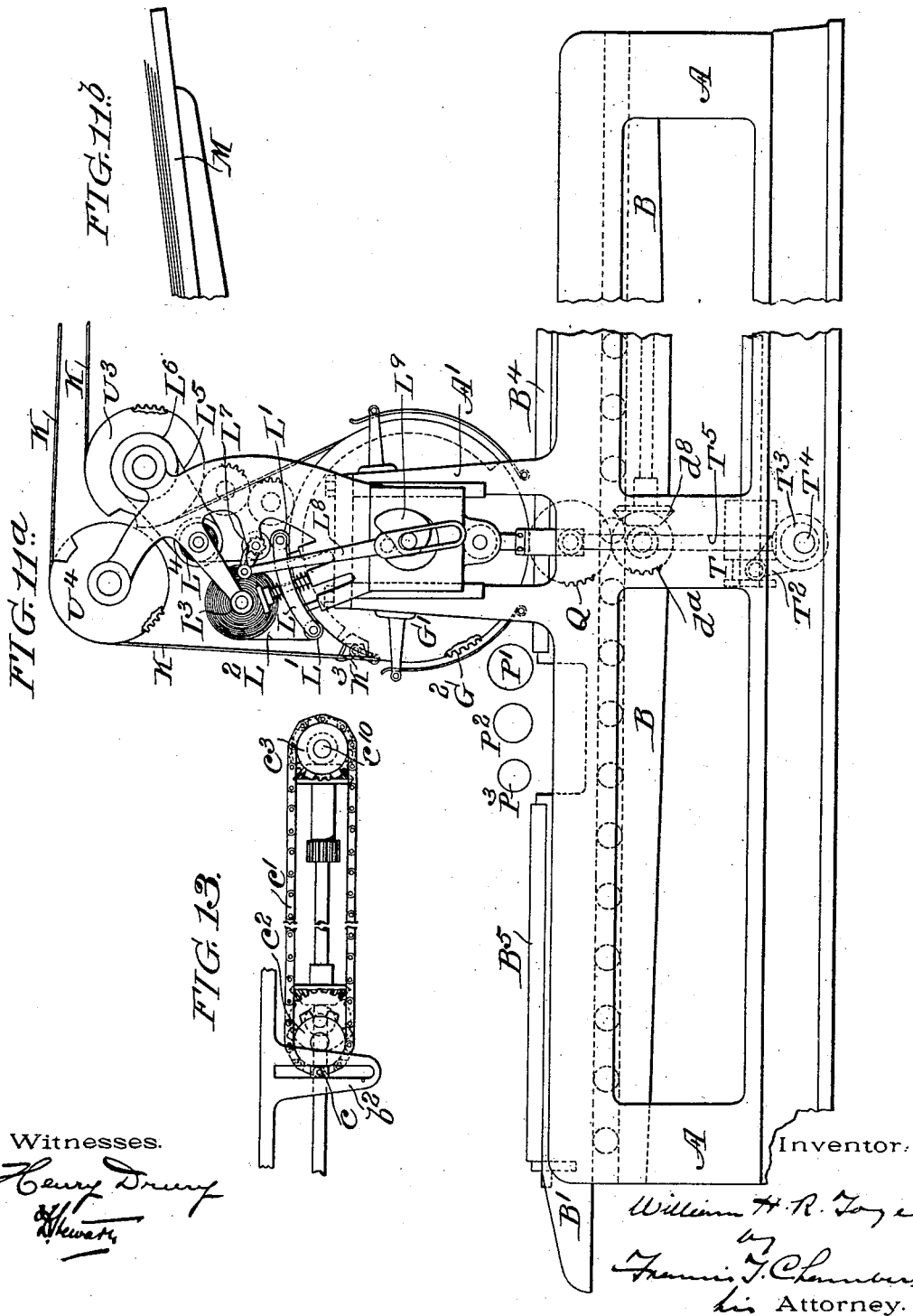
Patented June 18, 1901.

W. H. R. TOYE.
PRINTING PRESS.

(No Model.)

(Application filed July 24, 1897.)

5 Sheets—Sheet 4.



Witnesses.
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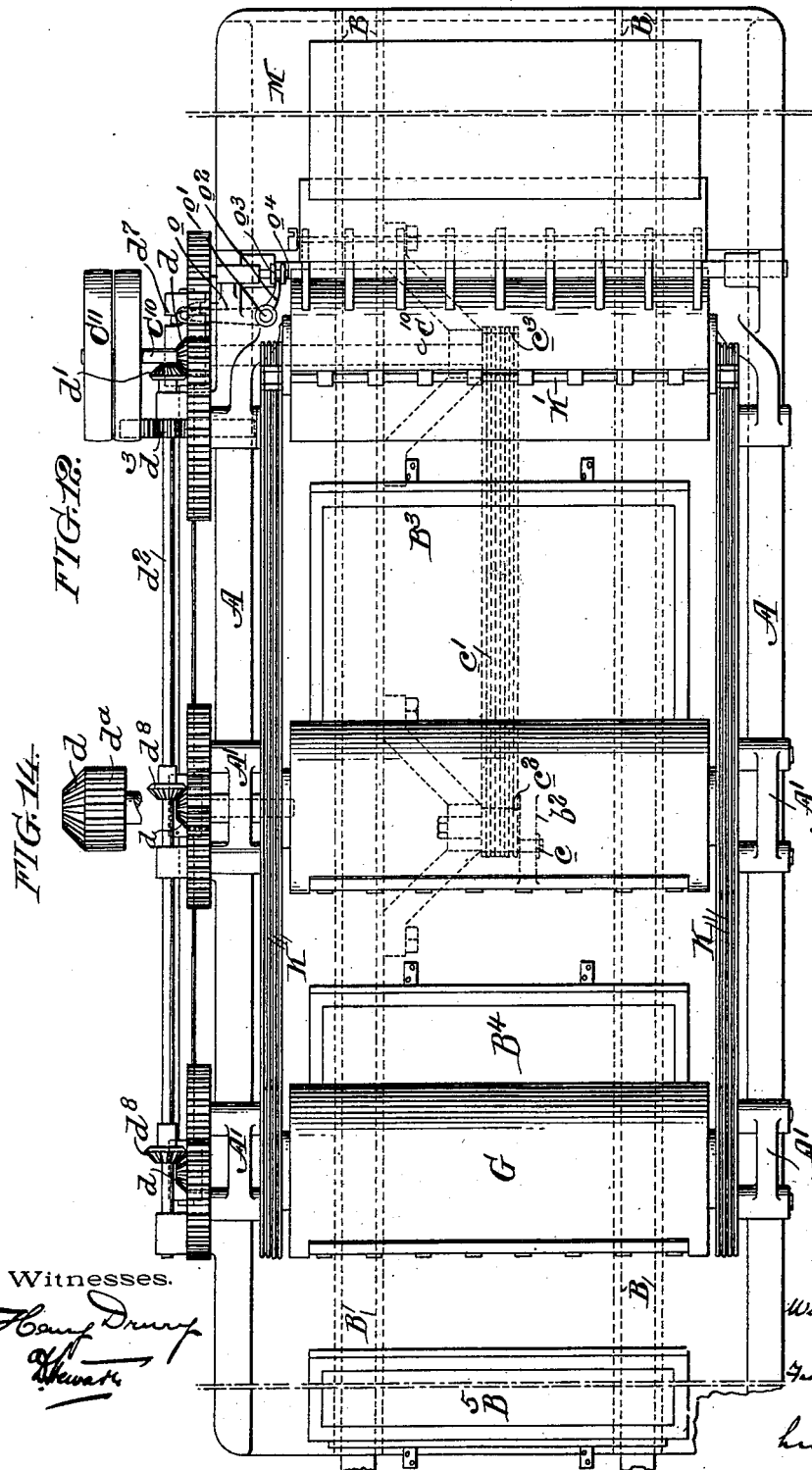
Patented June 18, 1901.

W. H. R. TOYE.
PRINTING PRESS.

(Application filed July 24, 1897.)

(No Model.)

5 Sheets—Sheet 5.



UNITED STATES PATENT OFFICE.

WILLIAM H. R. TOYE, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO
THE MULTI-COLOUR PRINTING COMPANY, LIMITED, OF LONDON,
ENGLAND.

PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 676,453, dated June 18, 1901.

Application filed July 24, 1897. Serial No. 645,767. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. R. TOYE, a citizen of the United States of America, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Printing-Presses, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to printing-presses, and particularly to presses intended for color printing on separated sheets of paper, and has for its chief object to provide improved means for printing (preferably in colors) upon both sides of the sheets of paper or other material, and by means which will preserve an accurate registry and alinement of the paper during its entire passage through the press.

Generally speaking, my invention consists in combining in a single machine two couples or two sets of couples for printing, each set running in the opposite direction to the other, and in providing carrier mechanism, including grippers for the sheets, and transfer mechanism, including gripper-actuating devices, by which the sheet after its passage through the first printing-couple is removed therefrom and transferred to the other set of couples, through which it is carried in the opposite direction to that in which it passed through the first set. Preferably I make the transfer directly from the carrier which transports the paper through the first set to the carrier which transports the paper through the second set, effecting this transfer by making one or both of the carriers of the flexible type and arranging and guiding them so that I bring the two carriers together at a point where they both travel in the same linear direction, while, of course, in passing between their respective printing-couples they move in diametrically opposite directions.

Reference being now had to the drawings in which my invention is illustrated, Figure 1 is a side elevation of a printing-press provided with my improvements, Fig. 2 being a plan view of the lower part of the machine, the upper part being removed, as on the section-line 1 1. Fig. 3 is a fragmentary view,

illustrating the stop-cylinder mechanism; Fig. 4, a fragmentary view, on a larger scale, illustrating certain cam mechanism for actuating the mechanism shown in Fig. 3. Figs. 5, 6, 7, and 8 are views of the cams shown in Fig. 4. Fig. 9 is a detail of a cam indicated in Fig. 1. Fig. 10 shows the end of the frame which is omitted for want of room at the left-hand end of Fig. 1. Fig. 11 is a side elevation of another form of printing-press provided with my improvement, Fig. 11^a indicating a continuation of Fig. 11 to the left hand, and Fig. 11^b a continuation to the right hand. Fig. 12 is a plan view of the machine shown in Figs. 11, 11^a, and 11^b. Fig. 13 is an elevation of a detail of mechanism; and Fig. 14 is a detached view, on a larger scale, of the combined miter and plane gear-wheel indicated at *d* in the drawings.

Referring first to the form of the machine illustrated in Figs. 1 to 10, A indicates the frame of the machine; B, the guide upon which reciprocates the carriage or slide B', having a rack B² on its under side and type-forms B³, B⁴, B⁵, and B⁶ upon its upper face, a rack B⁷ being also provided, running continuously along one side of the carriage or slide in position to engage the gears G², connected with the rollers G and G'.

C is a gear-wheel supported on a stud C² and attached to similar gears C' C', seated upon each side of it and engaging and resting upon racks C³, the gear-wheel C engaging with the rack B², as shown in Fig. 1. The stud C² is engaged by a yoke C⁴, connected with a rod C⁵, which in turn is connected with the crank C⁶ on a shaft C⁷, motion being imparted to said shaft through a gear C⁸, secured to one end of it and engaged with the gear C⁹ on the driving-shaft C¹⁰ C¹¹, indicating fast and loose pulleys on said shaft. It is obvious that the rotation of the shaft C⁷ will cause a simultaneous reciprocation and rotation of the gear-wheel C, the motion of which will be imparted through the rack B² to the carriage B'.

D is a miter-gear secured on the shaft C⁷ and engaged with a similar gear D' on a shaft D², said shaft having secured to it a cam D³

and also cams D^4 d^4 , the function of which is to operate mechanism for engaging and disengaging grippers, as will be hereinafter described.

5 E indicates a shaft upon which are pivotally secured two rock-levers E' , (for the construction of which see Fig. 4,) said rock-levers being formed with a slotted extension E^2 to give passage to the shaft C^7 and connected at
10 their upper ends E^3 with connecting-rods E^4 and E^5 , one of which connects with the lever F and the other with the lever f . Secured to each of the levers E' are cam-rollers, those secured to one lever being indicated at e' e^2 ,
15 (see Figs. 4, 5, and 6,) while the corresponding rollers on the other lever E' are indicated at e^3 e^4 , Figs. 7 and 8. These cam-rollers work in connection with the cams 1, 2, 3, and 4, as indicated in Figs. 4 to 8.

20 G and G' indicate rotary impression-cylinders each carrying two impression-surfaces (indicated at g , g' , g^2 , and g^3) and each connected, as before stated, with a gear-wheel G^2 , which is engaged by the rack B^7 , so that as
25 the carriage B' moves the impression-surfaces are rotated. As, however, the one impression-roller— G' , for instance, which is to operate in connection with the type-forms B^3 and B^6 —is to rotate to the right, while the
30 other impression-roller, G, which operates in connection with the forms B^3 and B^4 , rotates to the left, it is necessary to provide some means for engaging and disengaging the gears G^2 with the rack B^7 at proper times, and I
35 provide for the disengagement by cutting off a portion of the teeth of the gear G^2 , as indicated at G^3 , so that when the said gear-wheel assumes the position shown in Fig. 3 it will lose engagement with the actuating-rack.
40 The stoppage of the impression-cylinder in position to insure its disengagement and the starting of the said gear-wheel at a proper time to insure its reengagement are secured by the engagement of the teeth F' on the end of
45 the levers F and f with the teeth G^4 , secured to the gear-wheel or an attached part of the mechanism, the cams, as shown in Figs. 4 to 8, causing the levers to move at the proper time to cause these sets of teeth to engage to
50 come to a full stop at the proper time for arresting the motion of the impression-cylinder and to continue their movement to reengage the gear-wheel and rack when the proper time for such reengagement has come.

55 H, Fig. 1, is a gear-wheel actuated by the gear-wheel G^2 and actuating turn-gears connected with the guide-wheels H' and H^2 , over which and around the cylinder moves a flexible carrier (indicated at I) and having three
60 sets of paper-grippers, (indicated at I' , I^2 , and I^3 .)

J is a gear-wheel engaged with the gear G^2 of the roller G' , actuating through the gear J' the guide-wheel J^2 and through the gears
65 lettered J^3 to J^6 , inclusive, to guide-wheel J^7 . Another gear-wheel J^8 operates through a gear J^9 a guide-wheel J^{10} and through gears

J^{11} and J^{12} to another guide-wheel J^{13} a flexible carrier (indicated at K) traveling over
said guide-wheels, as shown in Fig. 1, and around the impression-cylinder G' , the guid-
70 ing and arrangement of the two flexible carriers being such that whereas they move in opposite directions in passing around their
75 respective impression-cylinders they move in the same linear direction at the point where they are brought together—that is to say, as shown, where they pass over the guide-wheels
80 J^2 and J^7 . The grippers on the carrier K are indicated at K' , K^2 , K^3 , K^4 , K^5 , K^6 , and K^7 .

As in my machine the impression-cylinder of the second set of printing-couples is brought into direct contact with an already-printed surface, it is very necessary that it should be kept perfectly clean and at once
85 freed from any adhering ink or color which would deface subsequent sheets. This may be accomplished in any convenient way. As shown in Fig. 1, I provide an arm L, elastically and adjustably held on a spindle L' be-
90 tween springs L^8 and L^9 and having at each of its ends a roller L' . Beneath these rollers passes a web of some fabric suitable for cleaning the face of the roll, which, as shown, is indicated at L^2 and is drawn from a roll L^3
95 and wound up on a roll L^4 , a yielding rotative force being applied to the latter roller by a belt L^5 , actuated by a pulley L^6 ; but this force I make so light that it will not of
100 itself cause the cleansing fabric to be moved over the roll, and for moving the fabric I depend upon a roller L^7 , having a ratchet secured to it which is intermittently actuated by a pawl-lever L^8 , acted on by a cam L^9 .
105 Any convenient device for cleansing the face of the rolls may be used in lieu of this one.

M indicates the feed-board, upon which the sheets of paper to be printed are laid and from which they are delivered over the extension M' to one of the nippers I^2 on the flexible
110 carrier I. The said carrier then makes two rotations, so as to present the same face of the sheet first to the type-form B^3 and then to the type-form B^4 , and then coming into
115 registry with a nipper on the flexible carrier K the edge of the paper is simultaneously, or practically so, released by the nippers of the first carrier and seized by the nippers of the second carrier, this operation of the nippers
120 being effected by the cams D^4 and d^4 or by any of the many well-known devices for actuating the gripping-fingers of paper-carrier. The paper still moving forward in the same direction is then carried through two complete
125 revolutions of the carrier K, printing first on the type-form B^6 and then on the type-form B^5 , and is then delivered onto the receiving-boards M^2 and M^3 , the grippers being opened in position to deliver alternately on one board
130 or the other by the action of swinging arms O' O^2 , which are operated by a shaft O, given a swinging or reciprocating movement by the cam D^3 on the shaft D^2 .

P' , P^2 , and P^3 indicate the inking-rolls, four

sets being provided, one for each type-form. I prefer to use three, or even more, and to make each roll of different diameter from the others in each set, although of course good results can be obtained by having rollers of differing diameters, even though two or more are of the same diameter. The result of this construction is that the one roller moves more frequently over the face of the type-form than the others, and the result is to smooth out the ink applied to the face of the type and insure a more perfect distribution of the ink or color.

In the modification of the machine shown in Figs. 11 to 13, A, as before, indicates the frame of the machine; B, the slide or support for the reciprocating carriage, which is indicated at B'. In this machine three type-forms are shown and indicated at B³ B⁴ B⁵. In place of having a rack on the under side of the carriage this machine has a downwardly-extending slotted portion, (indicated at b²), in which moves the slide c, attached to a chain c', which runs over the sprocket-wheels c² c³, the sprocket c³ being attached to the main driving-shaft C¹⁰ and the carriage being carried forward and backward with the motion of the chain as the main shaft revolves. Also attached to the shaft C¹⁰ is a combined miter and plane gear-wheel, (indicated at d), the plane face being indicated at d^a, Fig. 14, this construction of gear-wheel being used at two other points, as shown in Fig. 12, and similarly lettered. The miter-gear on the shaft C¹⁰ actuates a similar gear d', connected to the shaft d², which through miter-gear d³ actuates the other two gears indicated at d, and each of the plane gears d engages and drives a gear Q, which in turn engages a drive-gear G², connected with and actuating the three cylinders indicated at G, G', and G^a. In this construction of machine the rotation of the impression-cylinders is continuous instead of intermittent; but the rollers are elevated in turn to a height which clears the type-form without clearing the teeth of the gear-wheels G² and Q. This lifting and lowering of the impression-cylinder is accomplished through rods T⁵, attached to sliding bearings supporting the rollers and at their lower ends connected with eccentrics T⁸, which push them up or down at proper times, the said eccentrics being secured to shafts T⁴, which are moved by lever-arms T' and T², engaged by cams T T. (See Fig. 11.) The said cams T T are secured to a shaft d⁶, which is driven through a gear-wheel d⁵ by a similar gear-wheel d³ on the shaft d². The shaft d³ also carries a cam d⁷, which operates to give a reciprocating motion to the lever-arm o of the rock-shaft o', which has an arm o² at its upper end acting on a collar o³ to press out and in at times governed by the shape of the cam the tumbling-bolt o⁴. Below the arm o² is a similar arm o⁵, acting on another tumbling-bolt, as indicated, and acting to open the

grippers, which are closed by the action of the first bolt. K indicates a flexible carrier moving over the impression-cylinders G^a and G', and brought, as shown, over the guide-wheel U into such relation with the roller G that the said carrier will move in the same direction as the said roller at the point of approach. The paper is in this machine first fed to the nipper r on the roller R, carried by the said roller until it registers with the nipper i, moving with and directly connected to the roller G. The nipper r is opened by the action of the lower bolt o⁴, and simultaneously the nipper i is caused to close upon it by the action of the engaging device S⁵, S, and S', indicating guides which prevent all risk of the nipper i, opening while it is carrying the paper between the impression surface on the roller G and the type-form in connection with which said impression-surface operates. On reaching the opening device (indicated at S²) the nipper i is opened and the paper simultaneously engaged by a nipper on the carrier K, which is first opened by the opening device (indicated at S³) and then closed by the closing device, (indicated at S⁴.) The sheet is then carried through a single revolution of the carrier K beneath the impression-rollers G^a and G' and is finally deposited on the receiving-board M².

I do not in this application desire to claim the details of mechanism of either of the two machines shown. I have illustrated two machines of materially-different character, but of familiar type, to show the applicability of my invention to printing-machines of varying character and do not wish to be understood as limiting my invention to any of the mechanism except so far as the same is definitely referred to in the claims.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a color-printing press having a series of printing-couples, some moving in one and the others in an opposite direction and each couple comprising as one member a rotary impression-surface, the combination of means whereby said impression-surfaces are caused to rotate and to coact with their type-forms some in one and the rest in the opposite direction, with means, including sheet-grippers, for engaging and carrying the sheets between and in the same direction and speed of movement as the printing-couples with which they operate, and transfer mechanism, including gripper-actuating devices for disengaging the printed sheets from the carrying devices belonging to the printing-couple which has acted upon them and engaging said sheets with the carrying devices of the next successively-operating printing-couple.

2. In a color-printing press having a series of printing-couples, some moving in one and the others in an opposite direction and each couple comprising as one member a rotary impression-surface, the combination of means

whereby said impression-surfaces are caused to rotate and to coact with their type-forms, some in one and the rest in the opposite direction, means, including sheet-grippers, for engaging and carrying the sheets between one set of printing-couples, and a flexible carrier provided with sheet-grippers for the other set of printing-couples arranged as described to travel in the same direction as the couples with which it operates at the points where it feeds the sheets through said couples and in the same linear direction as the other carrying means at a point where the two carrying devices are brought together and gripper-actuating mechanism arranged at said point for releasing the sheets from the first set of grippers and engaging them with the second set of grippers attached to the flexible carrier.

3. In a color-printing press having a series of flat reciprocating type-forms the combination of one or more rotary impression-surfaces arranged to coact with corresponding type-forms during their forward motion and to clear them during their return motion with one or more rotary impression-surfaces arranged to coact with the other type-forms during their backward motion and to clear them during their forward motion, two sets of moving sheet-grippers, one appertaining to each set of printing-couples and each moving in a different direction, and means for actuating the grippers whereby a sheet after being printed in one set of printing-couples is released by the grippers of the first set and engaged by a gripper of the oppositely-moving set of grippers working with the other couples.

4. In a color-printing press having a series of flat reciprocating type-forms, the combina-

tion of one or more rotary impression-surfaces arranged to coact with corresponding type-forms during their forward motion and to clear them during their return motion with one or more rotary impression-surfaces arranged to coact with the other type-forms during their backward motion and to clear them during their forward motion, two sets of moving sheet-grippers one adapted to carry sheets through each set of couples and one set at least being attached to a flexible carrier and guided as described so as to move at one point in the direction of its printing-couples and at another point in the direction of and in close proximity to the other carrier and gripper-actuating devices for transferring sheets from one set of grippers to the other.

5. In a color-printing press having a series of flat reciprocating type-forms the combination of one or more rotary impression-surfaces arranged to coact with corresponding type-forms during their forward motion and to clear them during their return motion with one or more rotary impression-surfaces arranged to coact with the other type-forms during their backward motion and to clear them during their forward motion, two sets of flexible carriers one adapted to feed sheets through each set of couples each guided as described so as to move at one point in the direction of its printing-couples and at another point in the direction of and in close proximity to the other carrier and means for transferring sheets from one carrier to the other where the carriers approach.

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Witnesses:

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