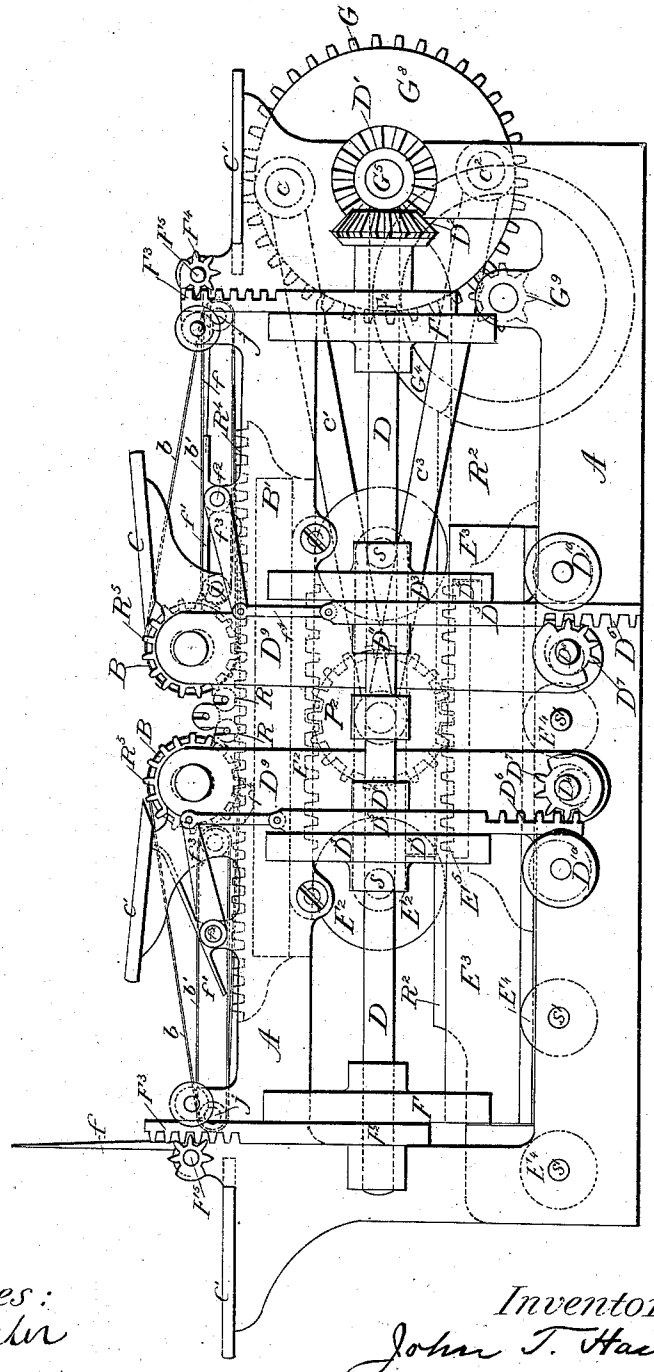
(No Model.) 4 Sheets—Sheet 1.

J. T. HAWKINS.

DOUBLE CYLINDER PRINTING PRESS.

No. 257,580. Patented May 9, 1882.

FIG. 1.



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Leo Rosenberg

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By R. R. Woodcock
Atty.

(No Model.) 4 Sheets—Sheet 2.

J. T. HAWKINS.

DOUBLE CYLINDER PRINTING PRESS.

No. 257,580. Patented May 9, 1882.

FIG. 2.

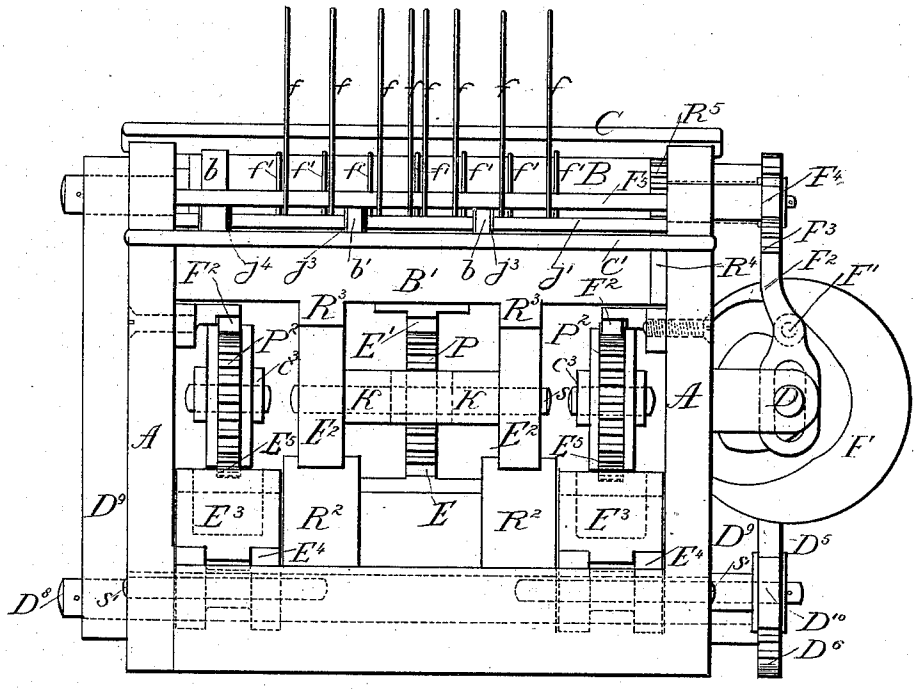
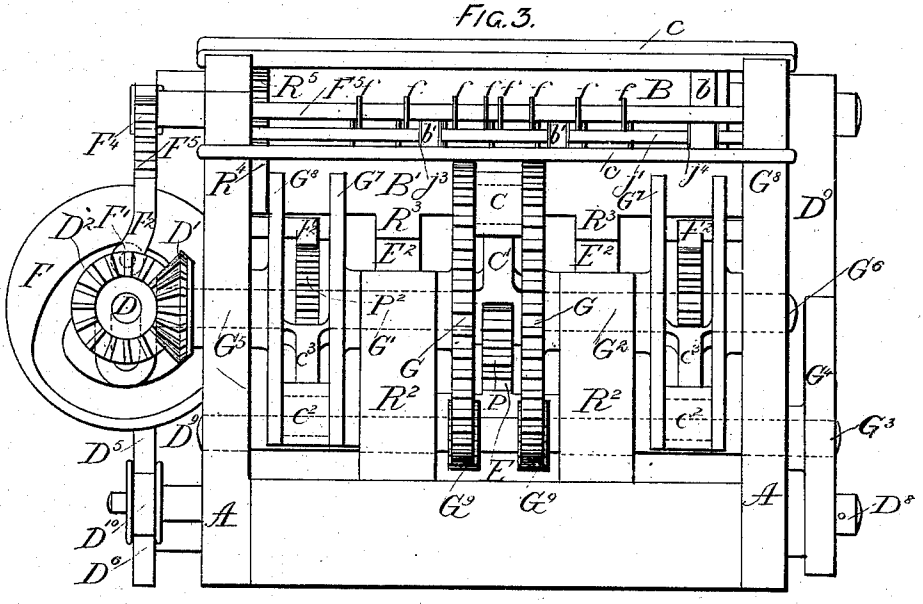


FIG. 3.



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(No Model.) 4 Sheets—Sheet 3.

J. T. HAWKINS.

DOUBLE CYLINDER PRINTING PRESS.

No. 257,580. Patented May 9, 1882.

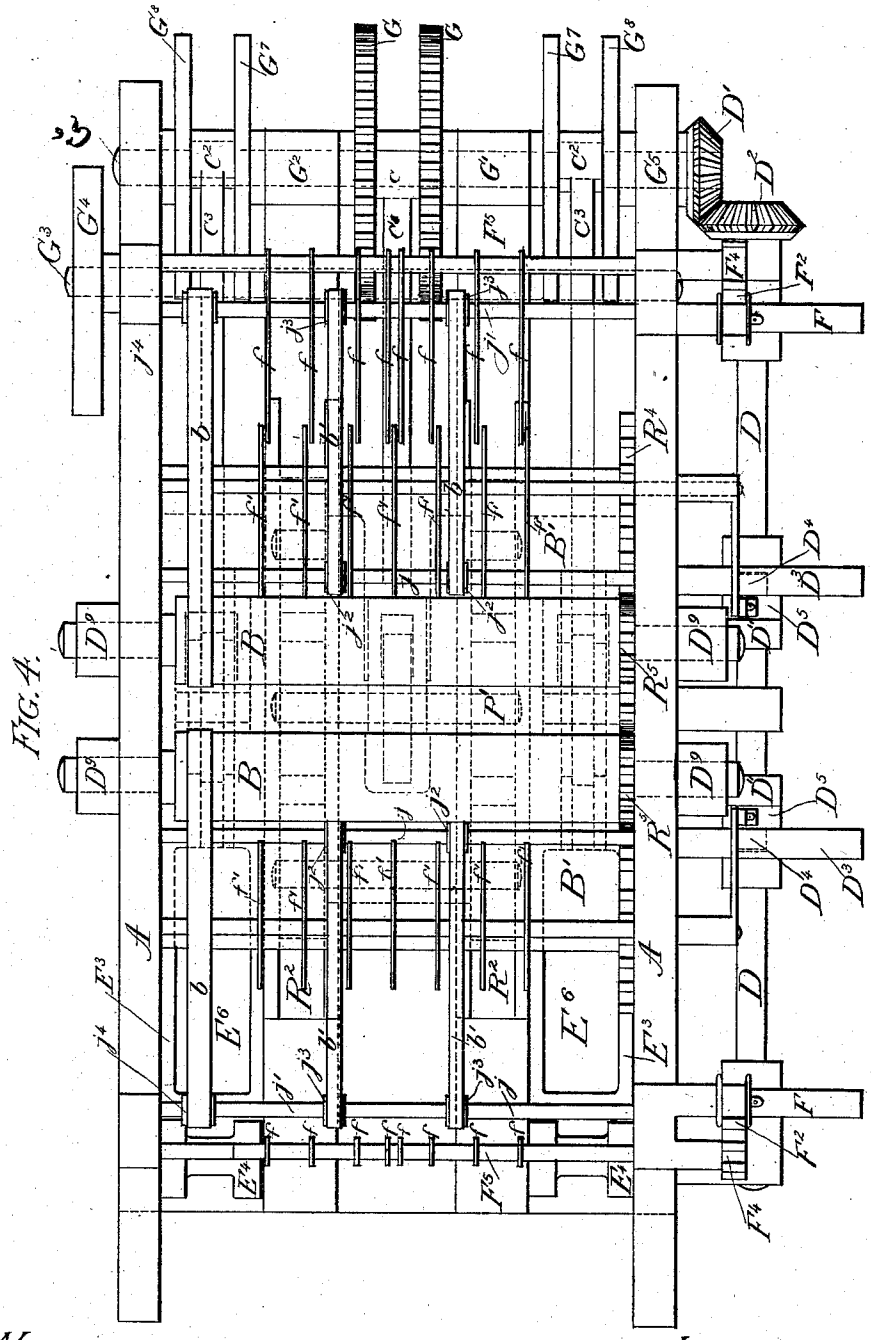

FIG. 4.

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(No Model.)

4 Sheets—Sheet 4.

J. T. HAWKINS.

DOUBLE CYLINDER PRINTING PRESS.

No. 257,580. Patented May 9, 1882.

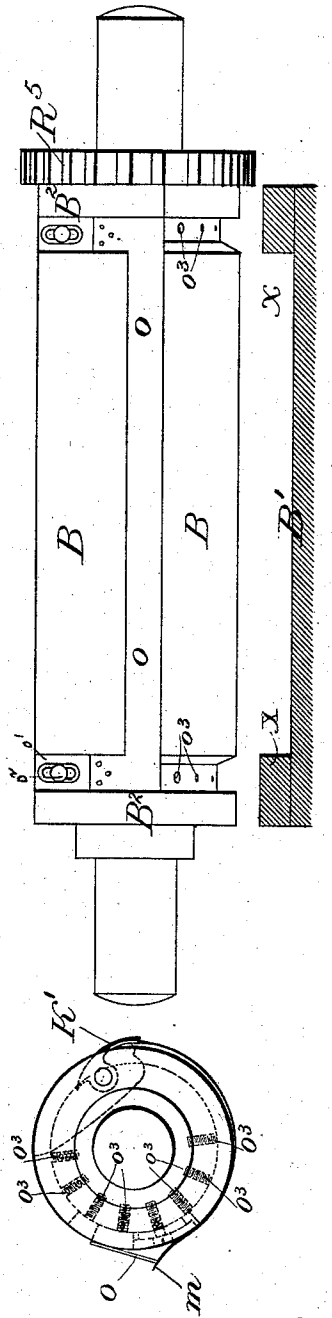

Fig. 5.

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UNITED STATES PATENT OFFICE.

JOHN T. HAWKINS, OF TAUNTON, MASSACHUSETTS.

DOUBLE-CYLINDER PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 257,580, dated May 9, 1882.

Application filed April 18, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOHN T. HAWKINS, of Taunton, in the county of Bristol and State of Massachusetts, have invented a new and useful Improvement in Double-Cylinder Printing-Presses, which improvement is fully set forth and illustrated in the following specification and accompanying drawings.

The object of this invention is to construct a double-cylinder printing-press which shall print two sheets for each double stroke of the bed, and deliver the sheets from the two cylinders alternately at each end of the press at a much higher rate of speed and at the same time accomplish much more accurate work than can be effected upon the ordinary double-cylinder presses, either those having cylinders rotating continuously in one direction or those of the stop-cylinder variety, or any of those whose reciprocating parts are not equilibrated or counterbalanced. By this invention also each sheet is delivered without the contact of its last printed side with any part of the delivery apparatus, which is not the case with any double-cylinder press heretofore in use.

In order to carry out the above-mentioned desirable objects the invention consists of certain arrangements and combinations of devices hereinafter particularly described, and specificially set forth in the claims.

The present state of the art which this invention is desired to improve can best be understood by a short statement of the inherent defects which are obviated by the means employed and herein described.

The double-cylinder printing-presses heretofore and still used which print but one side of a sheet at a time from one flat form by means of two impression-cylinders fed from two feed-boards, and necessitating the employment of two feeders and the fitting of two sets of delivery apparatus, are necessarily much limited in speed and durability by reason of the methods employed to rotate the cylinders, each in one direction continuously, for purposes of sheet-delivery, while the bed reciprocates, and also by reason of the use of buffers or springs to overcome the momentum of the reciprocating bed, the jarring effect of which momentum is transmitted through said buffers or springs to the entire machine, causing it to shake or vibrate as a whole, more or less, and sometimes to too great an extent for good work.

As the double-cylinder flat type-bed machine now in use constitutes the nearest approach to the more rapid and much more expensive method of printing from a continuous web of paper from cylindrical rotating stereotype forms, or from an equally expensive and less desirable method of printing from cylindrical type-surfaces of large diameter, it is obvious that it is very desirable that a machine having the general form of a double-cylinder press should be made capable of running easily, quietly, and with durability at the highest speed, limited only by the capacity of the feeders to feed the sheets or enter them separately to the sheet-grippers.

The desirable objects above indicated are accomplished by means of this invention, illustrated in the figures of the accompanying drawings, which figures will now be described as follows:

Figure 1 illustrates in side elevation a double-cylinder press arranged and operating in accordance with this invention. Figs. 2 and 3 illustrate respectively front and rear elevations of the machine illustrated in Fig. 1. Fig. 4 shows said machine in plan; and Fig. 5 illustrates in two views one of the cylinders, in side view and cross-section, showing certain details of construction, hereinafter described, omitted for the sake of clearness of illustration from the other figures.

In the said figures, the letter A indicates the side frames of the press; B B, the impression-cylinders; C C, the feed-boards; C′ C′, the fly-boards; B′, the bed, and R the ink-rollers.

The letters G G indicate two spur-wheels, secured to the shafts G′ and G^2, carrying between them, secured to their opposite disk-faces, a crank-pin, *c*, the wheels G thus forming and acting as double disk-cranks. Said wheels are driven by a pair of pinions, G^9, secured to the driving-shaft G^3, journaled in the frames A and the base-piece of the machine. The shafts G′ G^2 G^5 G^6 are similarly journaled in said base-piece. The shaft G^3 carries a fly-wheel, G^4, and a suitable pulley. (Not shown.)

The connecting-rod *c′* is articulated at one end with the crank-pin *c*, at the other end with the shaft P′, which carries a rolling pinion, P.

Secured to the bed or roller-ways R^2 is a stationary rack, E, and attached to the under side of the bed B′ is a corresponding rack, E′, to and between both of which racks is geared the rolling pinion P.

On the shafts *s s* is a series of rollers, E^2, which shafts, as well as the shaft P′, are journaled in the carriage or roller-frame K.

The rollers E^2 run in the ways R^2, and support the bed by the corresponding ways, R^3, the object of this arrangement being to give to the bed a rectilinear motion twice as great in length as that imparted to the carriage or roller-frame K by the crank *c*, and thus to avoid the use of a crank of excessive length or radius.

R^4 indicates a rack secured to the upper side of the bed B′, and R^5 indicates gear-wheels operated thereby and secured to the cylinders B.

The shaft D, placed parallel with the frame A, is supported in suitable bearings secured thereto, and is actuated by the shaft G^5 by means of the bevel-gear wheels D′ D^2 thereon.

The two cams D^3 D^3, through the rollers D^4, (attached to the vertical sliding bars D^5, embracing the shaft D, and carrying in their lower ends short racks D^6, engaging sector-gears D^7, attached to eccentric rock-shafts D^8, journaled by their eccentric parts in the cylinder side rods D^9, in whose upper ends the cylinders are journaled,) operate to raise and lower the cylinders B at the proper times to make the printing-strokes and to clear the form for the retrograde strokes of the bed B′ for each cylinder alternately.

The racks D^6 on the lower ends of the sliding bars D^5 are held in gear with the sector-gears D^7 by the idler-rollers D^{10}, running upon studs in the side frames, A, and the sliding bars D^5 are held to the faces of the cams D^3 by the collars D^{11}, secured to the shaft D.

The two cams F are secured to the shaft D, and (through the rollers F′ secured to the sliding bars F^2, slotted to embrace the shaft D, and carrying on their upper ends short racks F^3, engaging the sector-gears F^4, secured to the rock-shafts F^5, which are journaled in the frames A and to which the fly-fingers are secured) operate to give the proper motion to the fly-fingers *f*, which fingers carry the sheets which are delivered tail first to and upon them from each cylinder over to the respective fly-boards C′, and there deposit them.

Two series of bridge fingers or strippers, *f′*, are secured to the rock-shafts f^2, journaled in the frames A. The rock-shafts f^2 carry on their outer ends lever-arms f^3, and by means of links f^4 the free ends of lever-arms f^3 are connected to the upper ends of the sliding bars D^5.

The two shafts *j j* and parallel and similar shafts, *j′ j′*, respectively carry the pulleys j^2 j^2 j^3 j^3 and tapes *b′*. The pulleys j^4 and the shafts *j′* receive motion from pulleys formed in the ends of the cylinders B by means of the belts *b*.

The last-described arrangement from *f* to f^4, and *j* to j^4, and *b* to *b′* is to receive or strip a sheet, tail first, from each of the cylinders B, and to deliver said sheets upon the fly-fingers *f*.

As the cylinders B (each during its retrograde rotation) deliver the sheets, each will perform its respective delivery while raised up, clear of the form, through the instrumentality of the cams D^3 and their connections already described.

In the raising and lowering of the cylinders B the sliding bars D^5, by the proper arrangement of the eccentric parts of the rock-shafts D^8, will descend as each cylinder rises, and this descent of said sliding bars brings the bridge fingers or strippers *f′* into such position that the ends of each series of said strippers nearest the cylinders B will just clear the tympan or covering of each cylinder, or the thin slip of steel or blade O, hereinafter described, as is shown at the right-hand cylinder B, Fig. 1.

The fingers or strippers *f′* enter under the tail M of each sheet, held away from each cylinder by its sheet-supporting blade O, and thus said fingers strip the sheets from the cylinders as they rotate backward. The tapes *b′* then convey the sheets to and upon the fly-fingers *f* during the latter part of the retrograde rotation of each cylinder.

As the cylinders are depressed for each respective forward or printing rotation, the sliding bars D^5 are elevated by the same means by which they were depressed, already described, and thus said bars raise the points of the strippers or bridge fingers *f′* away from each cylinder alternately, in order to allow the sheets to pass said fingers without obstruction during said rotation, as is shown at the left-hand cylinder B, Fig. 1.

The following is a description of the details of construction illustrated in the several views constituting Fig. 5.

Under the cylinder B is the bed B′, having the bearers X, attached to the sides of the bed, upon which bearers the corresponding bearing-surfaces, B^2, of the cylinder roll while making the impression.

The bearers X are made wider than the surface B^2 on the cylinder, in order to overhang the grooves adjoining the surfaces B^2 of the cylinder.

The thin strip or blade of metal O has L-formed ends, which are riveted to the adjusting-blocks O′. Said blocks are adjustably secured by the screws O^2 in the grooves adjoining the bearing-surfaces B^2 of the cylinder, in any position suitable to any required length of sheet, by means of the slots in the adjoining blocks O′ and the screw-holes O^3 in the cylinder. Said grooves are beveled on their inner edges, as shown, for the purpose of tightly stretching the blade O crosswise of the cylinder by screwing down the screws O^2.

The blade O is given such a set that normally its unbroken edge will be raised from contact with the cylinder, as shown in end view

in Fig. 5, entirely to the outer sides of the adjusting-blocks O′; but when said blade in passing through the arc or circle during which the impression is made comes in contact with the bearers X it is pressed by such contact up into close contact also with the cylinder, and thus is prevented from coming in contact with the chase, furniture, or other objects surrounding the actual form-surface. After passing the bearers the blade O again assumes its normal position or permanent set, clear of the cylinder's surface.

The blade O is made adjustable upon the cylinder by means of the blocks O′, as just described, in order that the tail M of each sheet shall always lie upon the blade, and be by it sufficiently elevated from the cylinder's surface to insure its entrance upon the points of the bridge or stripper fingers f', when the cylinder commences to retrograde, as before described.

Upon the shafts G' G^2 are secured two disks, G^7 G^7.

Similar disks, G^8, are secured to two short shafts, G^5 G^6, journaled in the frames A.

The two pairs of disks G^7 G^8 are connected by crank-pins c^2, set in opposition to the crank-pin c in the wheels G.

The crank-pins c^2 connect each at one end to the connecting-rods c^3, and the opposite ends of said connecting-rods are united to the rolling pinions P^2.

The two racks F^2, secured to the inside of the frames A, are engaged by the upper sides of the rolling pinion P^2.

The two long heavy weights E^3 run upon grooved rollers E^4, each weight being provided with a rib on its lower side, which runs in the grooves of the rollers E^4 to serve as a guide for its weight.

The grooved rollers E^4 run upon shafts s', journaled in the frames A and in the roller-ways R^2.

Upon the upper sides of the weights E^3 are secured or formed racks E^5, with which the under side of the rolling pinions P^2 engage.

The weights E^3 have pockets E^6 for the purpose of loading them at pleasure.

The object of this last-described arrangement of reciprocating counter-weights is to equilibrate the momenta of both the reciprocating and main rotating parts of the press by causing said weights of equal momenta to move in directions opposite to the reciprocating strokes of the bed B′. Thus the rotatory efforts or momenta of the cylinders B are transmitted to the bed B′, and the total momentum of these parts in each direction is equilibrated by the loaded reciprocating weights E^3. The crank-pins c and c^2 and the connecting-rods c' and c^3 are also so proportioned to the work required of them that the crank-pins c^2 and the connecting-rods c^3 shall together equal in weight crank-pin c and the connecting-rod c', and thus said parts, being placed exactly in opposition, exactly equilibrate each other, for their momenta must always be equal at all speeds of the press.

In all the drawings there have been omitted the feed-guides, and all mechanism for opening and closing the cylinder-grippers, and for operating the inking apparatus, as all these form no part of this invention, and may be of any desired form or character.

From all the figures except Fig. 1 the form-rollers R have been omitted. In Fig. 2 the crank-wheel G and crank-disks G^7 and G^8 are not shown. In Fig. 3 the weights E^3 and grooved rollers E^4 and their shafts s' are not shown. In Fig. 4 the feed-boards C and fly-boards C′ have been omitted. All of these said omissions have been made for the sake of greater clearness of illustration, and to save the confusion of a multiplicity of lines.

The complete operation of this invention is as follows: The sheets, being fed from the feed-boards C by two feeders to the usual guides, are seized by the cylinder-grippers K′, (when at about the highest point in their described circle and when practically at rest,) and for either cylinder B a sheet is printed while the cylinder rotates, with its top side moving toward the opposite cylinder. As each cylinder is driven directly by the bed B′ the bed prints a paper at each single stroke, as is the case with the ordinary double-cylinder press now in use. At the beginning of the direct or printing stroke of the bed for either cylinder, the cylinder then to make the impression is, through its cam D^3 and its connections, already described, lowered into contact with the form, and the opposite cylinder, through its cam D^3 and connections, is simultaneously raised to clear the form. Simultaneously, also, with the respective raising and lowering of the cylinders the points of the bridge fingers or strippers f', through their connections to the sliding bar D^5, already described, will for the cylinder about to print be raised away from that cylinder to allow the grippers and the head of the sheet to pass unobstructed through the revolution, and for the non-printing cylinder, or the one about to deliver the sheet already printed, the points of the fingers or strippers f' will be lowered to such a position as to just clear the thin steel strip or blade O as its cylinder begins to retrograde. At the completion of the printing-stroke of either cylinder such cylinder will have made a sufficiently greater rotation than one complete revolution to bring the tail M of the sheet above the points of the bridge or stripper fingers f', which at that time have just been lowered into position, as above explained, to enter under the tail of the sheet resting upon the sheet-supporting blade O. During the retrograde or non-printing rotation of either cylinder, the cylinder-grippers K′ being made to open at any part of the retrograde rotation, the sheet is stripped from such cylinder by the fingers or strippers f' and conveyed by the tapes b' to and upon the fly-fingers f, which at this time, by means of the cams F and their connections, already described, oscillate over to the

fly-board C′, and deposit the sheet thereon. The form is inked by one set of rollers R, (shown only in Fig. 1,) the ink-fountain and other mechanism for operating the inking apparatus being omitted for reasons already given.

The operation of the parts for equilibrating the momenta of all the principal moving parts of the machine has already been sufficiently described in the description of the parts themselves, and need not therefore be repeated here.

By means of the system and arrangement of parts herein described, a press is produced obviously capable of accomplishing all the objects of the invention hereinabove set forth.

I do not confine myself to the methods shown of operating the fly-fingers *f* or the stripper or bridge fingers *f′*, or of raising and lowering the cylinders B, or of equilibrating the momenta of the rotary and reciprocating parts of the machine, as all such movements may be effected in many well-known ways to meet the requirements of special cases; but,

As of my invention, I claim—

1. In a double-cylinder printing-press constructed to print one side of a sheet for each single stroke of a reciprocating type-bed, two impression-cylinders geared continuously to and alternately rotated in the same direction by said bed, in combination with means, substantially as described, for delivering the sheets from each cylinder, whereby each sheet is delivered from its respective cylinder tail first as the cylinder retrogrades, and without contact of its last-printed side with any part of the delivery mechanism, substantially as and for the purposes set forth.

2. In a printing-press provided with a reciprocating type-bed, the combination, with said bed, of a reciprocating counter-balance or counter-weights and means, substantially as described, for causing said counter-balance to move in opposition to said bed and attached parts, said counter-balance being thus caused to equilibrate the momentum of the type-bed and other reciprocating parts of the machine, all substantially as set forth.

3. In a printing-press provided with a reciprocating type-bed, the combination, with said bed, of a reciprocating counter-balance provided with a pocket or pockets for holding an additional weight or weights, and means, substantially as described, for causing said counter-balance to move in opposition to said bed, whereby the momentum of the bed is equilibrated and the inertia and momentum of the counter-balance varied at will, substantially as and for the purposes set forth.

4. In a double-cylinder printing-press constructed to print one side of a sheet for each single stroke of a reciprocating type-bed, two impression-cylinders geared to and alternately rotated in the same direction by said bed, and a reciprocating counter-balance, in combination with pinions rolling between fixed racks, and racks upon the bed and counter-balance, and connected to opposite cranks for actuating said pinions, bed, and counter-balance, whereby a higher speed of press is obtained than in presses otherwise constructed, as hereinbefore described, all substantially as and for the purposes set forth.

5. In a cylinder printing-press, an impression-cylinder provided with a flexible or yielding sheet-supporting blade and bearing-surfaces, as described, in combination with a type-bed provided with a pair of bearers corresponding to but wider than said bearing-surfaces on the cylinder, and engaging said sheet-supporting blade at the moment the cylinder makes the impression at that point, thereby bringing the blade in close contact with the cylinder, whereby said blade is caused to support the tail of the sheet and keep it raised from the surface of the cylinder for purposes of delivery, except at the point of contact indicated, when the blade is pressed close to the cylinder, clear of the type-surface and chase or furniture of the bed, substantially as set forth.

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