(No Model.) 2 Sheets—Sheet 1.

J. T. HAWKINS.

OSCILLATING CYLINDER PRINTING MACHINE.

No. 359,442. Patented Mar. 15, 1887.

Fig. 3.

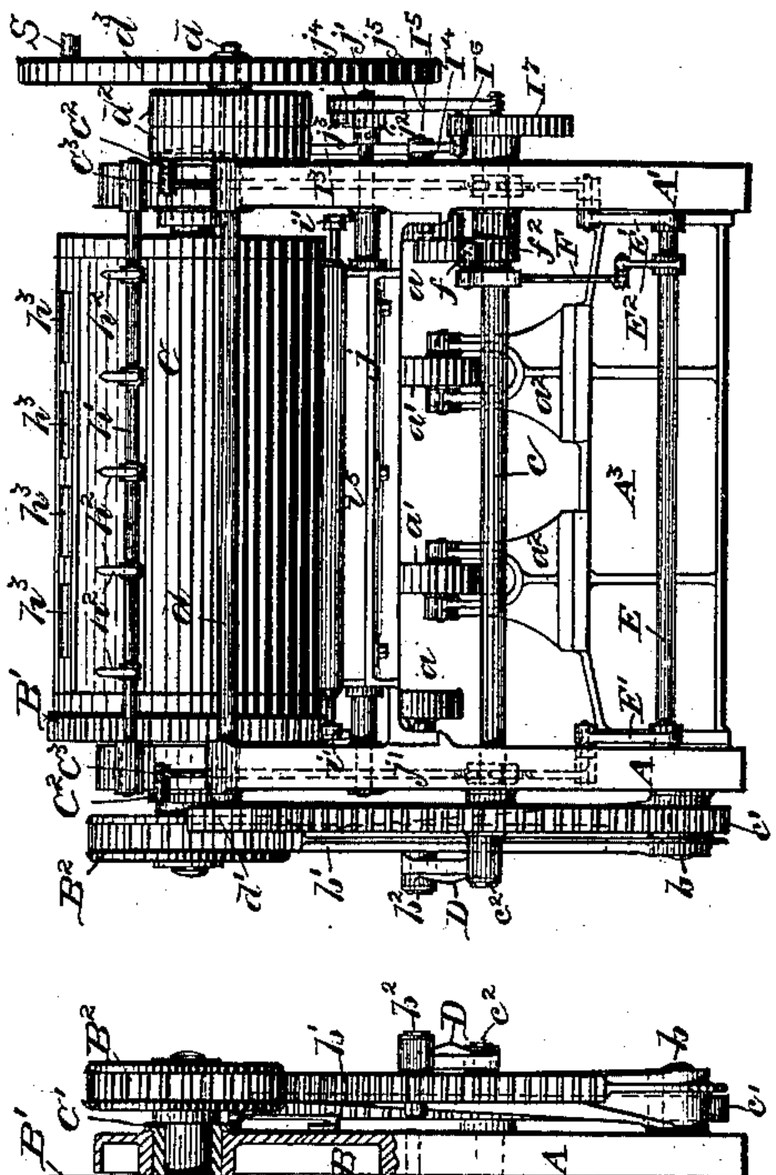


Fig. 2.

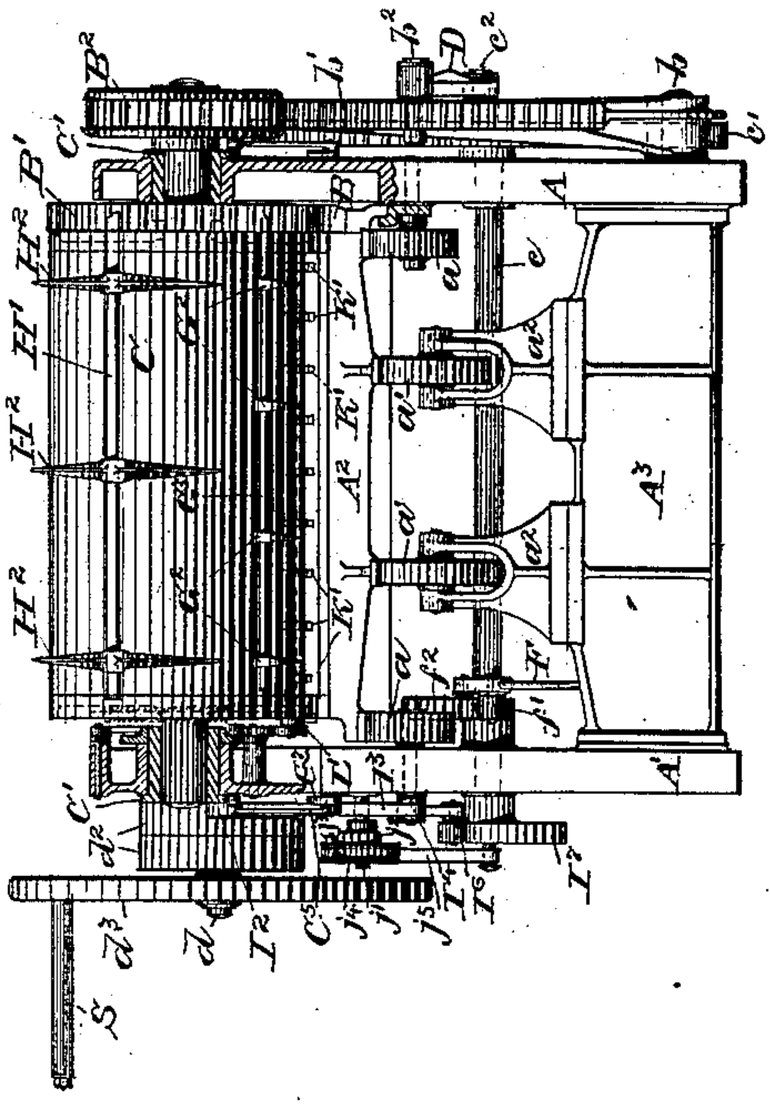
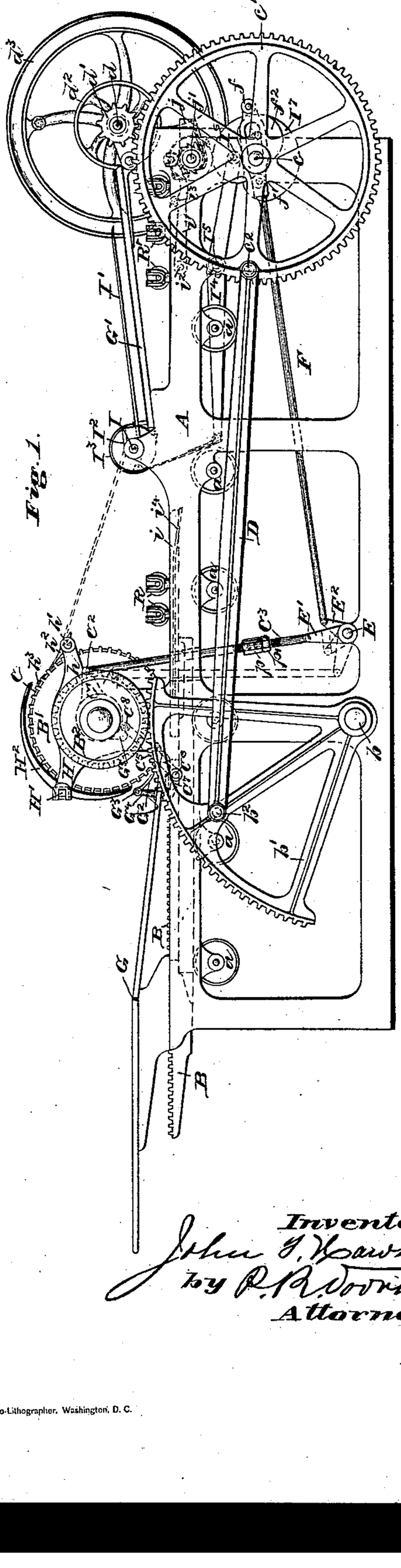


Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

J. T. HAWKINS.

OSCILLATING CYLINDER PRINTING MACHINE.

No. 359,442. Patented Mar. 15, 1887.

Fig. 7.

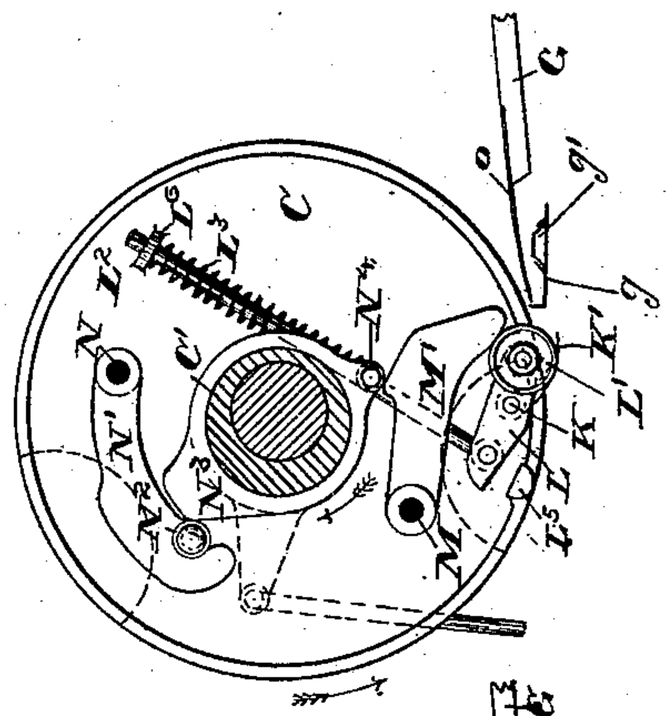


Fig. 6.

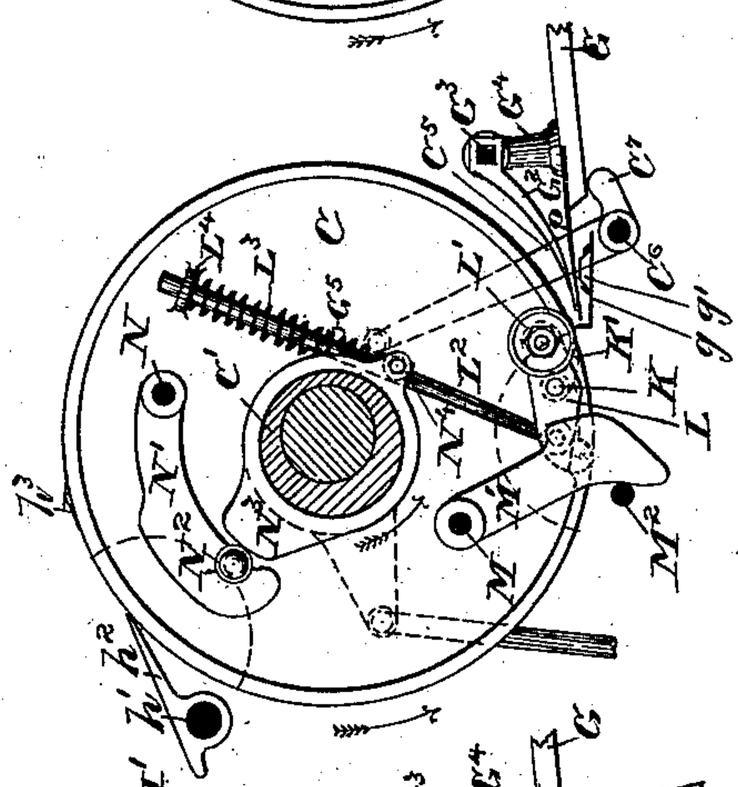


Fig. 5.

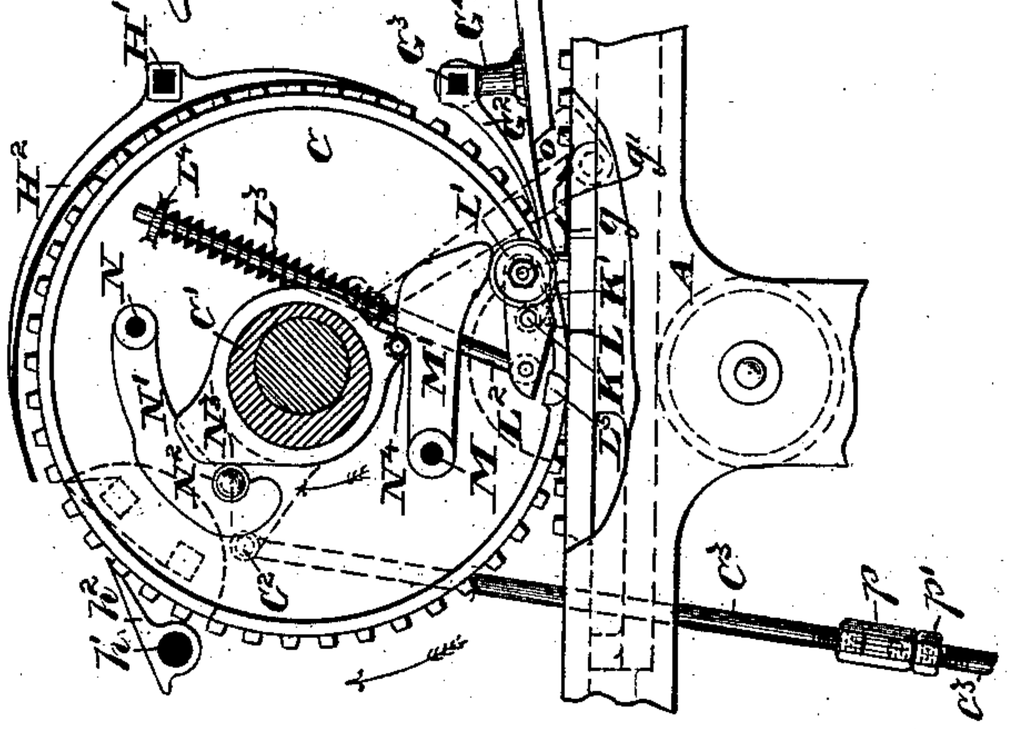
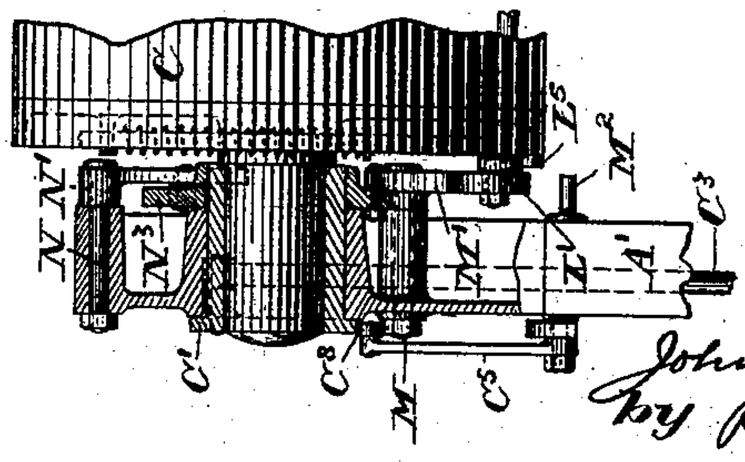


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN T. HAWKINS, OF TAUNTON, MASSACHUSETTS.

OSCILLATING-CYLINDER PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 359,442, dated March 15, 1887.

Application filed February 11, 1885. Serial No. 155,581. (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 certain new and useful Improvements in Oscillating-Cylinder Printing-Machines, which invention is fully set forth and illustrated in the following specification and accompanying drawings.

The object of this invention is to provide a cheap, simple, and effective printing-press having an oscillating cylinder and reciprocating type-bed, actuated by means of the ordinary crank by either hand or steam power, the machine delivering the sheets without contact of the freshly-printed matter with any part of its operative mechanism.

It is also its object to effect a cheap form of bed-and-cylinder movement by locating and arranging the several parts so as to transfer all principal strains to one of the main frames, thus avoiding the use of inside longitudinal girders, ribs, or ties.

It is further its object to obtain a crank and an oscillating sector for imparting the proper motion to the impression-cylinder and bed, each of large comparative radius, by placing said crank and sector on the outer side of the machine.

The invention consist of the combination of parts, as set forth in the claims.

In the accompanying drawings, Figure 1 is a longitudinal elevation of the side of the press carrying the actuating mechanism; Fig. 2, an end elevation, partly in section, as seen from the feed-board end of the machine, with the feed-board and its attachments omitted; Fig. 3, an end elevation from the fly-board end with the fly and fly-board removed. Fig. 4 is, on an enlarged scale, an elevation, partly in section, of one end of the impression-cylinder and part of the adjoining side frame and the parts constituting the gripper mechanism. Fig. 5 is an end elevation of the same end of the impression-cylinder, with side frame broken away to show the parts more clearly. Figs. 6 and 7 illustrate details, hereinafter described.

In said figures the respective parts are indicated by letters as follows:

A A′ are the main frames, carrying each a series of rollers, *a*, on their inner sides, upon which the type-bed A^2 runs. The central part of the type-bed A^2 is sustained immediately under the impression-cylinder by two rollers, *a′*, carried in bifurcated stands a^2, which are secured to the upper side of the main cross-girder or stay A^3. The type-bed A^2 carries on its upper face, on the side adjoining the main frame A, a toothed rack, B, engaging a corresponding spur-gear, B′, secured to one end of the impression-cylinder C. The cylinder C is journaled in eccentric bushes C′, which are in turn journaled in the main frames A A′. Upon the axis of the cylinder C is secured, outside of the main frame A, a flanged spur-gear, B^2. Vibrating upon a stud, *b*, near the bottom of frame A is a spur-sector, *b′*, engaging the flanged spur-gear B^2.

Journaled in the frames A A′ is a shaft, *c*. Secured to shaft *c* is a spur crank-gear, *c′*, carrying a crank-pin, c^2. The spur-sector *b′* carries a similar crank-pin, b^2, and the two crank-pins c^2 b^2 are connected by the connecting-rod D. In the frames A A′ is also journaled a shaft, *d*, carrying on one end a spur-pinion, *d′*, engaging the crank-gear *c′*, and upon the other end a pair of tight and loose pulleys, d^2, and a fly-wheel, d^3, which latter may be furnished with a crank-handle, S, where required to be run by hand. The pulleys d^2 receive a belt from any source of power when so driven.

In the frames A A′ is journaled a rock-shaft, E, to which is secured at either end an arm, E′. The eccentric bushes C′ each have projecting arms C^2, and a pair of links, C^3, passing partly through the frames A A′, are pivoted each to the projecting arm C^2 of the eccentric bushes C′ at the top and to the arms E′ at the bottom ends. On rock-shaft E, near one end, is secured an arm, E^2. Pivoted at one end to the arm E^2 is a rod, F. The other end of rod F is slotted to embrace the shaft *c*, and carries two rollers, *f f′*. The rollers *f f′* engage a suitably-formed cam, f^2, secured to shaft *c*, to impart the necessary motion at the proper times, through the parts last described, to the eccentric bushes C′, to elevate the cylinder C from contact with the type-bed through the non-printing stroke of the bed, and to hold it in contact with the type-bed during the printing stroke. The links C^3 are in two pieces, joined by nuts *p*, which have a right-hand

thread in one end and a left-hand thread in the other end, (or the threads may be of the same hand, but of different pitches,) so that by rotating the nuts *p*, and securing them in place by the jam-nuts *p'*, the links C^3 will be lengthened or shortened, as desired, as a means of adjusting the pressure of the impression-cylinder upon the form.

G is the feed-board; G', the fly-board.

G^2 are sheet-guides carried on a rod, G^3, carried in columns G^4, attached to the feed-board G, so that when adjusted to allow the sheet to pass under them freely said guides rise and fall with the feed-board G. A projection, G^5, from each of the eccentric bushes C' engages a roller, C^8, on the long arm of a lever, C^5, vibrating on a stud, C^6, secured in the frames A A'.

The feed-board G rests on the short arm C^7 of the lever C^5, and by means of said arm and lever said feed-board is slightly raised and lowered at the proper times, it being jointed at the point G, Fig. 1.

Secured in projections H from the frames A A' is a rod, H', to which are secured curved guards H^2, for the purpose of insuring that the sheet is not elevated from the cylinder on its non-printing or delivering rotation by the air getting under the tail of the sheet, (which then becomes the advancing edge,) particularly with short sheets.

The rods H' and G^3 are shown in position in Fig. 2, but unsupported at the ends, the feed-board G and its supporting-columns G^4 being removed and the projections H being broken away in order to show the central upper parts of the machine in section.

In the projections *h* from the side frames, A A' are secured a rod, *h'*, to which are secured a series of stripper-fingers, h^2. Pasted or otherwise secured to the covering of cylinder C is a series of loops of paper or other suitable elastic material, h^3, so situated as to escape contact with the strippers h^2, as fully described and claimed in an application filed by me December 27, 1884, bearing the Serial No. 151,282.

To a rock-shaft, I, journaled in the frame A A', is secured, in the usual way, a series of fly-fingers, I', which fingers, when their free ends rest on the rod *h'*, as shown in broken lines, Fig. 1, receive the sheet tail first from the stripper-fingers h^2 during the first portion of the non-printing or delivering rotation of the impression-cylinder C. On one end of the rock-shaft I is secured a pulley, I^2, partially inwrapped by a belt, I^3, which is secured at one end to the pulley I^2. The belt I^3 is secured at the other end to a lever, I^4, pivoted to the frame A' at I^5. The other end of lever I^4 carries a roller, I^6, engaging a suitably-formed cam, I^7, so located on and secured to the shaft *c* as to impart motion to the fly-fingers I', through the mechanism just described, from the position shown in Fig. 1 in full lines to that shown in dotted lines in the same figure. A spring (not shown) coiled on the rock-shaft I serves to return the fly-fingers I' from the position shown in dotted lines to that shown in full lines, Fig. 1, as permitted by the appropriate form of the cam I^7. Said return commences as soon as the whole or nearly the whole of the sheet has run upon the fly-fingers I'.

R R are the form-rollers, and R' R' R' the distributing angle-rollers.

The letter *i* indicates the ink-plate. (Seen in dotted lines in Fig. 1 only.) A lever, *i'*, is fulcrumed to the inside of the frames A A' at i^2, carrying rollers i^3, which engage inclines i^4 on the sides of the ink-plate *i*. In the free ends of the lever *i'* is journaled the ink ductor-roller i^5. (Seen in Fig. 3 only.) The letter *j* indicates the ink-fountain. On one end of the ink-roller shaft *j'* is secured a ratchet, j^2, and running freely on its shaft is a pulley, j^4, carrying a pawl, j^3, which engages the ratchet j^2. Inwrapping and secured at one end to the pulley j^4 is a belt, j^5. The lower end of belt j^5 is looped over a stud adjustably secured in a slot in the face of a cam, I^7, which imparts motion, through the mechanism just described, to the ink-fountain roller.

K is the usual rock-shaft, journaled in the ends of cylinder C and carrying a series of grippers, K'.

L is a lever secured at its center to the gripper rock-shaft K, carrying on one end a roller, L'. To the other end is pivoted a rod, L^2, encircled by a helical spring, L^3, acting against a lug, L^4, projecting from the head of the cylinder C to close the grippers K', as limited by the stop L^5, also projecting from the head of the cylinder C. Secured in the side frame, A', is a stud, M, upon which is fulcrumed a cam-lever, M', whose lower motion is limited by a stud, M^2, Fig. 6, also secured to the frame A'. Fulcrumed upon another stud, N, secured to the side frame, A', is another cam-lever, N', carrying a roller, N^2. Secured to one of the eccentric bushes C', which is journaled in the frame A', is a cam, N^3, carrying opposite its principal enlargement a roller, N^4. The roller N^4 engages the upper, and the roller L' the lower, side of the cam-lever M'. The principal enlargement of the cam N^3 engages the roller N^2, and the roller L' engages the upper edge of the cam-lever N'. In the rotation of the bush C', to raise and lower the cylinder, it carries with it the cam N^3, and causes the two cam-levers M' and N' to operate upon the roller L' to effect the opening and closing of the grippers at the proper times.

Fig. 7 shows the cylinder C rotating in the direction of the arrow, nearly at the termination of the non-printing or delivering rotation, and the grippers K' forced open to their widest open position by the roller N^4 depressing the cam M', and at the same time the roller L' engaging the curved contour of the lower side of cam-lever M'. By a continuation of the motion of said lever until the exact end of the non-printing rotation of the cylinder the parts arrive at the position shown in Fig. 5, in which the roller N^4 has passed to the deepest part of the upper edge of the cam-lever M', partially

releasing it upward, while the roller L′ has still farther advanced to the convex portion of the under edge of the cam-lever M′. In this position the grippers K′ have become nearly closed again; but, as will be seen by the position of the stop end of the lever L with reference to the stop L^5, they are not quite closed.

From the positions of the parts shown in Fig. 5, owing to the form of the lower edge of cam-lever M′, the grippers close finally during a very short first part of the succeeding printing rotation of the cylinder C. This construction and the action of closing the grippers for the last small part of their closing, while moving in the direction of the printing rotation of the cylinder C, insures that the grippers K′ shall close at precisely the same place every time relatively to the cylinder and sheet, and therefore insures also correct register.

In the positions shown in Fig. 7 the roller N^2, carried on the cam-lever N′, is passing down the inclined part of the cam M^3, due to the motion of the bush C′ in the contrary direction to the cylinder C, until, in the position shown in Fig. 5, the end of the non-printing rotation is reached, when the cam-lever is thereby allowed to fall into such position as to allow the roller L′ to escape contact with its upper edge as the cylinder C makes its printing rotation. Thus the grippers K′ remain closed until the entire printing rotation of the cylinder is performed and the parts arrive at the positions shown in Fig. 6. During the early part of this rotation the cam-lever M′ drops down upon the stud M^2, so as to be out of the way of roller L′ at the completion of the printing stroke, the cylinder C making about one entire revolution each way. Continuing the printing rotation until the roller L′ has passed by the cam-lever N′ and the form has passed entirely through the impression, the cam N^3, through the operation of lifting the cylinder C from the form by the rotation of the bushes C′, is moved in the direction indicated by the arrow, Fig. 6, until the parts all assume the position shown in said figure, corresponding to the termination of the printing stroke. The cam-lever N′ will be raised to the position to act upon the roller L′ during the non-printing stroke and at the proper time to open the grippers partially, allowing the fly-fingers I′ to draw the sheet out from them, the said fly-fingers being moved by mechanism already described at the proper time.

The letters *g* indicate the gages or front guides, adjustable crosswise of the press upon a dovetailed bar, *g′*. The bar *g′* is made adjustable to and from the cylinder C, for changing the width of margin or gripper-hold upon the sheet where the ends are secured to the frames A A′, but not shown.

O is a thin plate of metal, forming the front edge of the feed-board G.

The general operation of the machine is as follows: Power, being applied to the shaft *d*, is transmitted by the pinion *d′* to the crank-gear *c′*, which latter, acting as a crank, through the connecting-rod D, communicates an oscillating motion to the sector *b′*. The sector *b′* in turn causes the cylinder C to rotate in either direction, and the cylinder C being geared directly to the bed A^2, the latter is reciprocated coincidently with its oscillation. During the first part of the printing stroke of the bed A^2 the sheet is taken from the feed-board G by the grippers K′, as already described, printed, and the tail of a full sheet (the impression-surface occupying a portion of the periphery of the cylinder C only in this case) brought to a height sufficient to make it enter upon the strippers h^2 at the commencement of the non-printing stroke. The sheet having then passed down the fly-fingers I′ during the non-printing stroke the proper distance, said fingers carry it over and deposit it on the fly-board G′, the unprinted side coming in contact with the fly-fingers I′, and the sheets being laid last-printed side down on the fly-board. The remaining operation of the parts—as of the impression-cylinder, the fly, the fountain, and the gripper motion—has already been sufficiently described.

I do not confine myself to the method shown of mounting the cam N^3 upon the bushes in which the cylinder is journaled, as it is evident that said cam may be elsewhere mounted, if preferred, and oscillated by motion taken from any suitable moving part of the machine. It is also evident that the grippers K′ may be closed by any suitably-formed spring other than the coiled spring L^3, shown in connection with an inclosed rod, L^2.

I do not herein claim the method of supporting the sheet at the tail margin, so as to insure its entrance upon the strippers h^2, nor the combination of the paper loops h^3 for that purpose with the cylinder C, stripper-fingers h^2, or fly-fingers I′, as this has been made the subject of a separate application for Letters Patent, as above mentioned.

Having thus fully described my said improvements, as of my invention I claim—

1. An actuating mechanism for oscillating the impression-cylinder and reciprocating the type-bed of a printing-machine, consisting of a crank-gear, as *c′*, a connecting-rod, as D, a bell-crank toothed sector, as *b′*, vibrating upon a fixed fulcrum and gearing directly with a gear-wheel, as B^2, secured to the impression-cylinder, and a gear-wheel, as B′, secured to said cylinder and gearing directly with a rack, as B, secured to the type-bed, all combined and operating substantially as and for the purposes set forth.

2. In a printing-machine, in combination with a crank or crank-gear, as *c′*, an oscillating bell-crank toothed sector, as *b′*, actuated therefrom upon a fixed fulcrum by means of a connecting-rod, as D, each journaled in and situated outside of one of the side frames of the machine, and a spur-gear, as B^2, meshing with said sector and secured to the shaft of an impression-cylinder, as C, geared to a reciprocating type-bed, as A^2, by a spur-gear, as

B′, and a rack, as B, whereby said cylinder is caused to oscillate in its bearings and said bed reciprocated by said cylinder, and the principal strains due to such operation all transmitted to the side frame nearest to which said crank or crank-gear and sector are situated, substantially as and for the purposes set forth.

3. In a printing-machine, an oscillating impression-cylinder provided with sheet-grippers and mechanism for opening and closing the same for the reception of the sheet, consisting of a lever, as L, secured to a gripper rock-shaft and carrying on one end a roller, as L′, and provided at its other end with a spring for closing said grippers, a roller, as N^4, carried on an automatically-oscillated cam, as N^3, and a cam-lever, as M′, pivoted at one end to a fixed stud, as M, and engaging on its under and upper sides, respectively, said rollers L′ and N^4, whereby the oscillation of said cam causes the grippers to be opened and again partially closed during the latter part of the non-impression rotation of said cylinder, and finally closed during the first part of the succeeding impression rotation of said cylinder, substantially as and for the purposes set forth.

4. In a printing-machine, an oscillating impression-cylinder provided with sheet-grippers and mechanism for opening and closing the same for the reception of the sheet, consisting of a lever, as L, secured to the gripper rock-shaft of said impression-cylinder, carrying at one end a roller, as L′, and provided at its other end with a rod and spring as L^2 L^3, for closing said grippers, a roller, as N^4, carried on a cam, as N^3, mounted on a bushing in which the axis of the impression-cylinder is eccentrically journaled, and a cam-lever, as M′, pivoted at one end on a fixed stud, as M, engaging on its under and upper sides, respectively, said rollers L′ and N^4, whereby the oscillation of said cam causes said grippers to be opened and again partially closed during the latter part of the non-impression rotation of said cylinder, and finally closed during the first part of the succeeding impression rotation of said cylinder, substantially as and for the purposes set forth.

5. In a printing-machine, in combination with an oscillating impression-cylinder provided with sheet-grippers, mechanism for opening the same for the delivery of the sheet, consisting of a lever, as L, secured to a gripper rock-shaft and carrying at one end a roller, as L′, and provided at its other end with a spring for closing said grippers, an automatically-oscillated cam, as N^3, a cam-lever, as N′, pivoted at one end to a fixed stud, as N, and carrying on its other end a roller, as N^2, engaging the said oscillating cam, the whole proportioned and operating so as to cause the upper edge of said cam-lever N′ to engage said roller L′ at the proper point in the non-impression rotation of said cylinder and to escape it during its impression rotation, substantially as and for the purposes set forth.

6. In a printing-machine, in combination with an oscillating impression-cylinder provided with sheet-grippers, mechanism for opening the same for the delivery of the sheet, consisting of a lever, as L, secured to a gripper rock-shaft and carrying at one end a roller, as L′, and provided at its other end with a rod and spring, as L^2 L^3, for closing said grippers, a cam, as N^3, mounted on a bushing in which the axis of the impression-cylinder is eccentrically journaled, a cam-lever, as N′, pivoted at one end to a fixed stud, as N, and carrying on its other end a roller, as N^2, engaging said cam N^3, the whole proportioned and operating so as to cause the upper edge of said cam-lever N′ to engage said roller L′ at the proper point in the non-impression rotation of said cylinder and to escape it during its impression rotation, substantially as and for the purposes set forth.

7. In a printing-machine, in combination with an oscillating impression-cylinder provided with sheet-grippers, mechanism for operating the same both for gripping and releasing the sheet, consisting of a lever, as L, secured to a gripper rock-shaft and carrying at one end a roller, as L′, and provided at its other end with a spring for closing said grippers, an automatically-oscillated cam, as N^3, carrying a roller, as N^4, a cam-lever, as M′, pivoted at one end to a fixed stud, as M, and engaging on its under and upper sides, respectively, said rollers L′ and N^4, a cam-lever, as N′, pivoted at one end on a fixed stud, as N, and carrying on its other end a roller, as N^2, engaging said oscillating cam N^3, and engaging on its upper face said roller L′, the whole proportioned and operating to open and close the cylinder-grippers for the reception and delivery of the sheet at the proper times, substantially as and for the purposes set forth.

8. In a printing-machine, in combination with an oscillating impression-cylinder provided with sheet-grippers, mechanism for operating the same both for gripping and releasing the sheet, consisting of a lever, as L, secured to a gripper rock-shaft and carrying at one end a roller, as L′, and provided at its other end with a rod and spring, as L^2 L^3, for closing said grippers, a cam, as N^3, carrying a roller, as N^4, and mounted on a bushing in which the axis of the impression-cylinder is eccentrically journaled, a cam-lever, as M′, pivoted at one end to a fixed stud, as M, and engaging on its under and upper sides, respectively, said rollers L′ and N^4, a cam-lever, as N′, pivoted at one end on a fixed stud, as N, and carrying on its other end a roller, as N^2, engaging said cam N^3, and engaging on its upper face said roller L′, the whole proportioned and operating to open and close the cylinder-grippers for the reception and delivery of the sheet at the proper times, substantially as and for the purposes set forth.

9. In a printing-machine, in combination with an oscillating impression-cylinder, receiving an under-fed sheet head first at the commencement of its impression rotation and

delivering such sheet tail first during its non-impression rotation, a series of sheet-guards, as H^2, partially surrounding said cylinder, and a series of sheet-strippers, as h^2, in advance of said guards, near the top of said cylinder, whereby when said cylinder is reversed on its non-impression rotation the tail of the sheet is guided to said strippers by said guards, substantially as and for the purposes set forth.

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