(No Model.)

4 Sheets—Sheet 1.

J. T. HAWKINS.

CYLINDER PRINTING PRESS.

No. 257,578. Patented May 9, 1882.

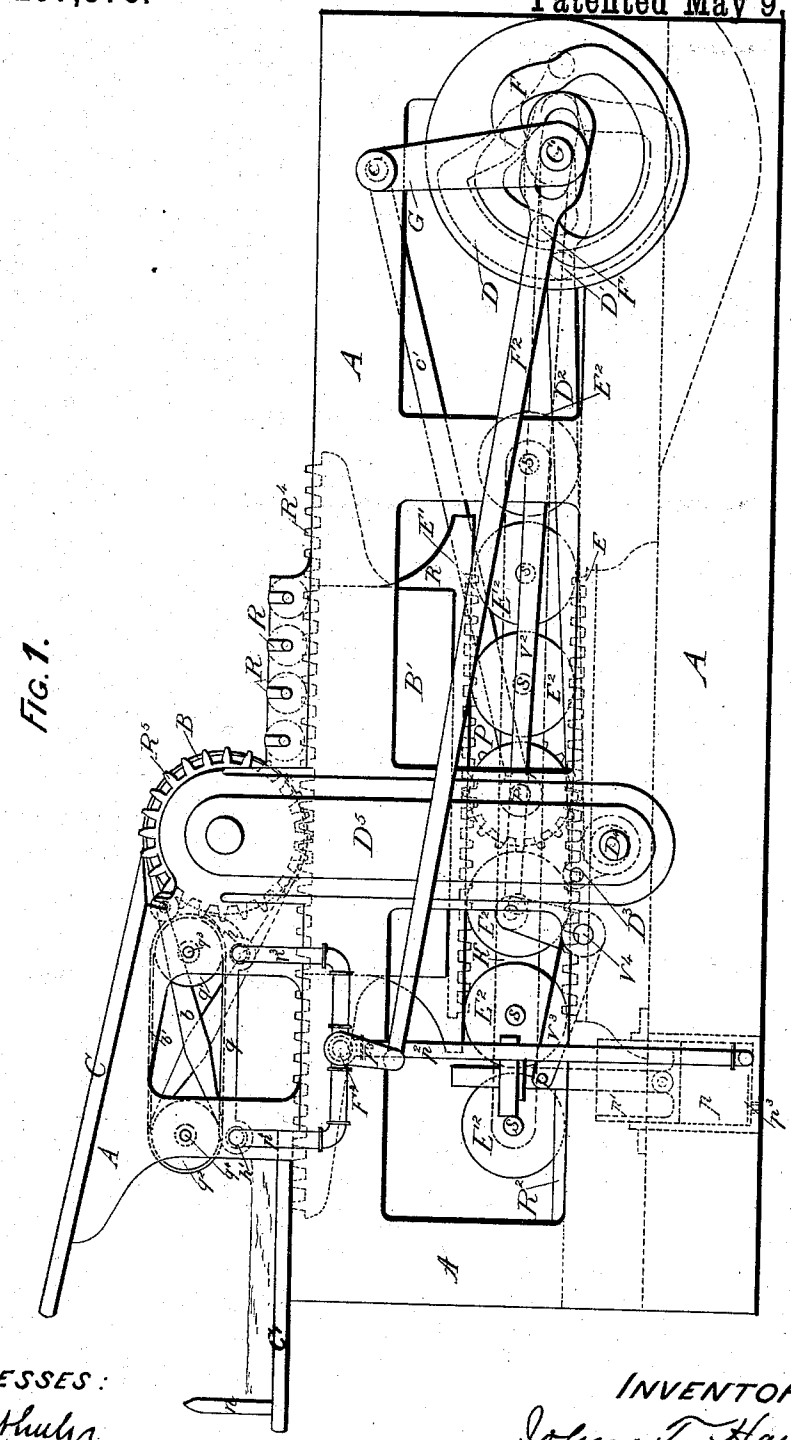

FIG. 1.

WITNESSES:
R. F. Uhler
Leo Rosenberg

INVENTOR:
John T. Hawkins
by P. B. Woodbridge
Atty

(No Model.)

4 Sheets—Sheet 2.

J. T. HAWKINS.

CYLINDER PRINTING PRESS.

No. 257,578

Patented May 9, 1882.

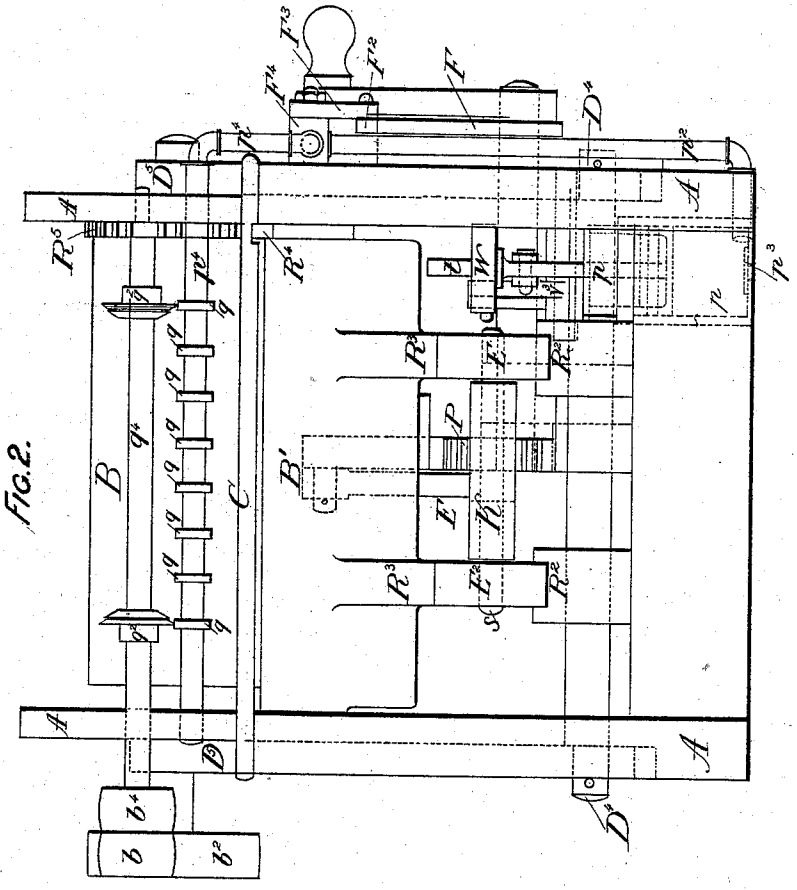

FIG. 2.

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Leo Rosenberg

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John T. Hawkins
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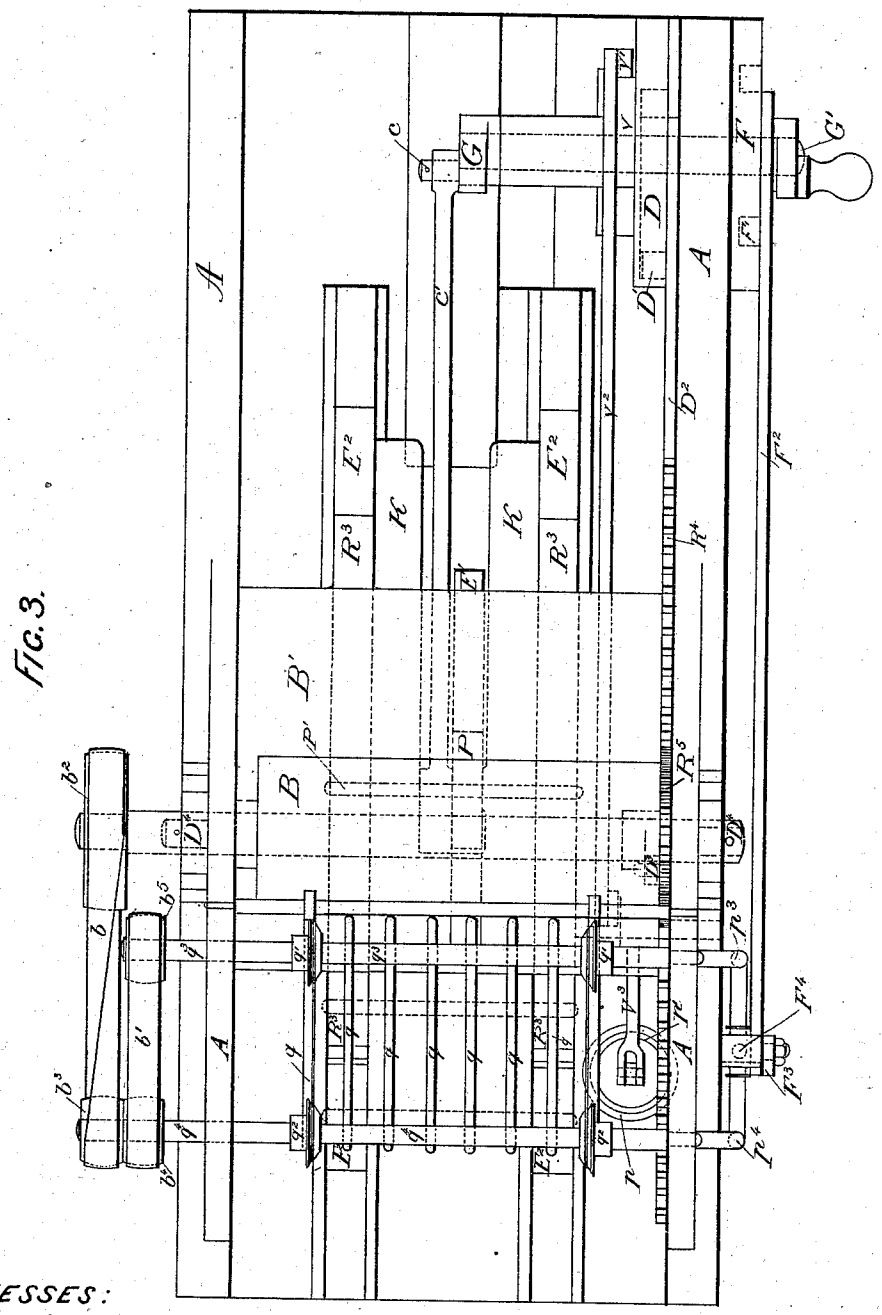
(No Model.) 4 Sheets—Sheet 3.

J. T. HAWKINS.

CYLINDER PRINTING PRESS.

No. 257,578. Patented May 9, 1882.

FIG. 3.



WITNESSES:
R. F. Uhler
Leo Rosenberg

INVENTOR:
John T. Hawkins
by P. R. Voorhees
Atty

(No Model.) 4 Sheets—Sheet 4.

J. T. HAWKINS.

CYLINDER PRINTING PRESS.

No. 257,578. Patented May 9, 1882.

FIG. 4.

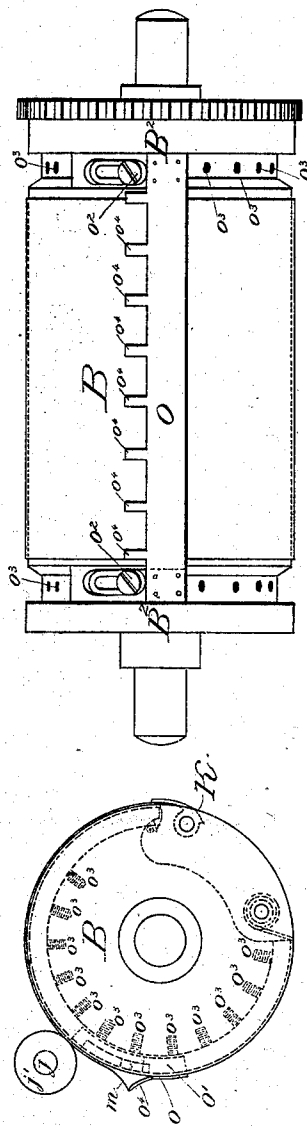


FIG. 6.

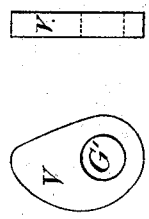
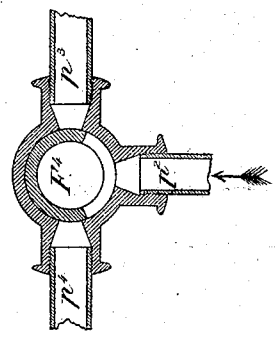


FIG. 5.



WITNESSES.

R. F. Wheeler

Leo Rosenberg

Inventor:

John T. Hawkins

by C. L. & P. B. Voorhees

Atty

UNITED STATES PATENT OFFICE.

JOHN T. HAWKINS, OF TAUNTON, MASSACHUSETTS.

CYLINDER PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 257,578, 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 Cylinder Printing-Presses, which improvement is fully set forth and illustrated in the following specification and accompanying drawings.

The objects of this invention are the same as those set forth in connection with a summary of the state of the art in the specification of my invention in printing-presses, herewith filed and marked Case A; but the distinctive characteristic of this invention is that the sheet is delivered tail first from the cylinder, instead of head first, by means of certain combinations of devices, which will now be described, as follows:

In the said drawings, Figure 1 illustrates in side elevation a cylinder-press containing the improvements constituting this invention. Fig. 2 is a rear elevation of the machine illustrated in Fig. 1, having the feed-board and part of the delivery-board omitted in order to more clearly exhibit the delivery mechanism. Fig. 3 is a plan of the machine with the feed and delivery boards omitted for the purpose above mentioned. Figs. 4, 5, and 6 illustrate details of the machine hereinafter described.

In the said figures the same parts are indicated by like letters, as follows:

The letter A indicates the side frames of the machine; B, the impression-cylinder; C, the feed-board; C′, the fly-board; R, the ink-rollers; B′, the bed; G, a crank secured to a shaft, G′, to be driven by any suitable means or power.

To the crank G is secured the crank-pin *c*, which, by the connecting-rod *c′*, is connected to the shaft P′, which serves as the axis or journal of the rolling pinion P.

The stationary rack E is secured to the bed or roller-ways R^2 of the framing of the machine, and a corresponding rack, E′, is attached to the under side of the reciprocating bed of the press B′, to and between which racks the rolling pinion P is geared and rotates.

Journaled within the roller frame or carriage K are a series of rollers, E^2, which are secured to shafts S S, as is likewise secured the pinion P to the shaft P′, journaled in the said frame or carriage. The rollers E^2 revolve and traverse within the roller-ways R^2 and support the bed B′ by its corresponding roller-ways, R^3. This arrangement gives to the bed a rectilinear motion or length of travel double that imparted to the carriage K, thus avoiding the use of a crank of inconvenient length or too great radius.

The rack R^4 is secured to the upper side of the bed B′, to which is geared the gear-wheel R^5, secured to the impression-cylinder B.

The cam D upon the shaft G′, through the intervention of the roller D′, connecting-rod D^2, crank-arm D^3, eccentric rock-shaft D^4, and cylinder-journal side rods, D^5, raises and lowers the cylinder B to clear the types or form at the proper time.

The cam F upon the shaft G′ is of such form and secured in such position that, through the roller F′, connecting-rod F^2, and crank-arm F^3, it operates at the proper time the three-way cock F^4. (Shown in enlarged section in Fig. 5.)

The cam V (not shown in Fig. 2, but shown in detail in Fig. 6) is of such form and so secured to shaft G′ that, through the roller V′, connecting-rod V^2, and crank-arm V^3 on rock-shaft V^4, it operates at the proper time to lift the plunger *p′* of a single-acting air-pump, *p*. The plunger *p′* is caused to descend by means of weights *w*, (not shown in Fig. 3,) placed upon the stem *t* of plunger *p′*, which weight *w* may be raised at will to regulate the pressure under which the air is expelled from beneath the plunger *p′* after the roller V′ has left the crown of the cam V. A valve, p^3, opens inward to admit air to the cylinder of the pump *p* as the plunger *p′* is carried upward by the action of cam V. A pipe, p^2, leads from the bottom of the pump *p* to the cock F^4. Branch pipes p^3 p^4 lead from the cock F^4, and finally lead across the press under the feed-board and form supports for a series of stationary sheet-guides, *g*. These pipes pass through the side frames, A. That part of the pipe p^3 leading across the press is perforated with a line of holes, *h*, so situated as to direct streams or jets of air at an angle upward, so as to cause said jets to strike the cylinder B at, or about at, a tangent to its circumference for the purpose of lifting the tail of the sheet from the cylinder B and insuring its entrance upon the fin-

ger-points of the sheet-guides g as the cylinder B commences to retrograde. That part of the pipe p^4 which extends across the press is perforated with a line of holes, h', so placed as to direct streams of air in about a horizontal direction over the fly-board C′ for the purpose of supporting the sheet as it passes over the pile of paper already on the fly-board C′, and preventing contact between it and the preceding sheet until it has arrived at the termination of its end motion in the course of its delivery. The points of the sheet-guides g next the cylinder B are curved upward, and are so placed as to clear the periphery of the cylinder B sufficiently to escape the tail of the sheet as it passes them on the direct or printing revolution of the cylinder.

Two series of frictional-surfaced sheet-driving wheels, g' g^2, two or more of said wheels in each series, are secured respectively upon the shafts g^3 and g^4, journaled in the frames A. When the distance between the centers of the shafts g^3 and g^4 is greater than the length of the smallest sheet designed to be printed on the machine an additional shaft and series of sheet-driving wheels may be placed between the shafts g^3 and g^4 and driven in a similar manner, in order that such short sheet shall not be at any part of its travel free from at least one set of sheet-drivers. The sheet-drivers g' and g^2 revolve in contact with the sheet-guides g by means of the belts b and b', the cross-belt b receiving motion from the pulley b^2, secured to the cylinder's axis and transmitting motion to the pulley b^3 on the shaft g^3. The pulleys b^3, b^4, and b^5 are of equal diameters, and the pulleys b^2 and b^3 are so proportioned as to give to the peripheries of the sheet-drivers g' and g^2 the same velocity as that of the periphery of the cylinder B.

The belts b and b' are not shown in Fig. 2.

The sheet-guides g are polished upon their upper faces, so that the sheets may slide easily upon them, and the conical frictional peripheries of the sheet-drivers g' and g^2 are made of india-rubber or other suitable frictional substance competent to propel the paper upon the polished surfaces of the sheet-guides g. The conical shape given to the peripheries of the sheet-driving wheels g' and g^2 keeps the sheets tightly stretched crosswise of the press. The sheet-stop n (not shown in Figs. 2 and 3) is made adjustable for varying sizes of sheet. The tail edge of the sheet, as delivered upon the fly-board C′, strikes against said stop, thus insuring an even pile of paper upon the board. The cylinder B is so proportioned to the travel of the bed B′ as to make a greater rotation than one complete revolution for each single stroke of the bed sufficient to carry the tail end of a full-sized sheet above the points of the sheet-guides g, so that this tail edge of the sheet may enter upon said guides as the cylinder B commences its retrograde revolution. The sheet-drivers g' upon the shaft g^3 are placed within a short distance of the cylinder B in order to take the tail of the sheet immediately upon its entering upon the points of the guides g, and the sheet-drivers g^2 upon the shaft g^4 are placed at such a distance from the cylinder B that the head or gripper-edge of the sheet shall have just passed from under the sheet-drivers g^2 by the time the cylinder B shall have completed its retrograde movement and the crank G have arrived at its dead point or center, the object here being to overcome the momentum or end motion of the sheet in its passage through the air by bringing it nearly to a state of rest at the time of its release by the sheet-drivers g^2, and thus prevent its being forcibly projected against the sheet-stop n when the machine is run at high speed. The cam F is made adjustable angularly upon the shaft G′ in order to properly time the operation of the cock F^1 for longer or shorter sheets. The short puff required to be projected from the apertures h to raise the tail of the sheet upon the points of the sheet-guides g is required to be made about upon the arrival of the tail of any width of sheet near to the points of the guides g; but as the distance to be traveled by the tail of a sheet from the points of said guides to the sheet-drivers g^2 is the same for all sizes of sheet (the longer the sheet the longer the time before its tail will arrive at any given point) the time for projecting the air-jets from the perforations h' will require to be correspondingly varied. All such variations are effected by simply changing the angular position of the cam F upon the shaft G′.

Fig. 4 illustrates in two views a side and end elevation, enlarged, of the cylinder B, showing the details of construction omitted from the other figures for the sake of clearness. The cylinder-grippers K are operated to open and close at the proper time in any of the usual ways. In the said end view of the cylinder, m indicates the tail of the sheet; O, a very thin strip of steel extending across the cylinder B and stretched tightly in contact with the usual blanket or tympan which covers the cylinder. Said strip O is thus stretched by means of slotted clamps O′, which may be secured in any position in the circumference of the cylinder B to suit different lengths of sheet by the screws O^2 and screw-holes O^3. The strip of steel O is riveted to the clamps O′, and the latter fit into grooves—one at each end of the cylinder B—next to the cylinder-bearers B^2. These grooves are beveled on their inner sides, as shown, for the purpose of stretching tightly the steel strip O in contact with the blanket or tympan, all the parts O′ being below the impression-surface of the cylinder B. The thin strip O has formed on one of its edges which is toward the tail of the sheet m a series of stationary sheet-supporting fingers, O^4, raised up slightly from the cylinder-surface. The strip O, with its sheet-supporting fingers O^4, is so placed, depending upon the length of sheet, that the tail m shall lie upon the slightly-raised fingers O^4, and the

points of the guides *g* are so placed across the press as to come between the fingers O⁴. The strip O and fingers O⁴, being placed so that only the points of the fingers O⁴ remain under the tail *m* of the sheet, on which there is nearly always an unprinted margin, will all clear those parts which make the impression, and as such parts are alone required to be type-high, and are upon the bed, (the chase, furniture, &c., always being on a plane below the surface of the types, except upon lithographic presses, in which the level of the stone-surface extends beyond the design, and to which class of printing this method of supporting the tail of the sheet is not applicable,) the strip O and fingers O⁴ come in contact with nothing in passing through the impression. The object in keeping the tail of the sheet slightly elevated by the fingers O⁴ is to insure the entrance of the air-jets from the perforations *h* between the sheet and the surface of the cylinder B, and therefore the entrance of the tail of the sheet upon the sheet-guides *g* is assured. A small shaft, *j*, (not shown in Fig. 2,) is journaled on the frames A and carries two or more narrow pressure rollers or wheels, *j'*, which are so placed as to be in line with the sheet-drivers *g'*, running therefore on the unprinted margins of the paper, and adjusted to bear lightly upon the cylinder-surface or on the sheet passing under them, causing friction between the cylinder-surface and the sheet, and thus insuring its being carried backward by the cylinder B during the commencement of its retrograde motion, and until the sheet shall have fully entered between the sheet-guides *g* and the sheet-driving wheels *g'*.

The complete operation of the machine is as follows: The sheet is fed to the usual guides from the feed-board C, is taken thence by the cylinder-grippers K' just as the cylinder B comes practically to rest in consequence of the crank G reaching its dead point or center at this time. Correct feeding-register is thus insured, all parts connected with the feeding and gripping of the sheet being then in a state of least motion. The crank G now commences to move the bed B' upon its forward or printing stroke, the cam D, through its connections heretofore described, having at this point brought down the cylinder B into position to make the impression. During this time the cam V has, through its connections already described, raised the plunger *p*, and the roller V' has passed from the crown of the cam, permitting the weight W to act to depress the plunger *p'* at about the completion of the printing-stroke of the bed B', if the sheet be of the full size designed for the machine to print, and the cam F, through its connections already described, causes the cock F⁴ to open momentarily between the pipe p^2 and the branch pipe p^3 by the roller F passing into the depression *f*, Fig. 1, of the cam F, projecting jets of air from the perforations *h*, in pipe p^3 under the tail end of the sheet as the cylinder B commences its retrograde motion. If the sheet be less than a full-sized one, the tail of the sheet will have more or less distance to travel backward with the cylinder B before reaching the points of the sheet-guides *g*, and in such cases the cam F is so placed upon the shaft G' as to open the cock F⁴ at the proper time. The jets of air from the perforations *h* raise the sheet to pass upon the sheet-guides *g* and between the outer two of said guides (situated under the side margins of the sheet) and the sheet-drivers *g'*. The crank G, now continuing its revolution, causes the bed B', and with it the cylinder B, to perform its retrograde or non-printing stroke, at the commencement of which the cam D, through its connections, has again raised the cylinder B to clear the type or form. By the time the tail of the sheet *m* has fairly entered upon the points of the sheet-guides *g* the cam F, through its connections, causes the cock F⁴ to cut off communication between the pipes p^2 and p^3, as is shown in Fig. 5, in section, and maintained in that position until the tail *m* of the sheet has passed along the sheet-guides *g* under the sheet-drivers g^2, when the cam F opens communication between the pipes p^2 and p^4, when by the further action of the weight W jets of air are projected from the perforations *h'* in the pipe p^4, supporting the sheet as it passes out over the pile of paper on the fly-board C' until the tail of the sheet *m* reaches the stop *n*, when the cam F again closes the cock F⁴ into the position shown in Fig. 5. The cylinder-grippers K' are caused to seize and release the sheet at the proper times by any of the well-known methods, the release in this case being permissible at any time after the tail *m* has passed upon the points of the guides *g* and before the head or gripper-edge shall have reached the same point in the retrograde stroke of the bed and cylinder. The sheet, when released by or having passed entirely from under the sheet-drivers g^2, settles by its own gravity quietly down upon the fly-board C' or the preceding sheet.

The principal advantages due to the constructions and combinations above described in this machine are the following: The cylinder is so proportioned that its fractional part of a revolution in excess of its complete printing-revolution is sufficiently great to bring the tail of a full-sized sheet to a sufficient height above the type line or level of the form at the completion of the printing-stroke of the bed to permit of the sheet being stripped from the cylinder tail first by a series of stationary fingers forming the points of the sheet-guides during the retrogression of the bed and cylinder, the sheet being furthermore delivered upon the fly-board at the back of the press, under and beyond the feed-board, by means of said stationary sheet-guides, revolving frictional-surfaced sheet-drivers, and an air-blast, particularly above described, thus constituting a simple, durable, and comparatively

inexpensive arrangement of parts, which produces the finest kinds of printing without danger of marring the work by contact with parts of the delivery mechanism, which, dispensing with all tapes, cords, or strings, delivers each sheet upon an even pile on the fly-board with the last-printed side upward in plain sight of the pressman, and which accomplishes these results under much higher speeds of press than in those machines involving the use of buffer-springs, stop-cylinder, or cylinders revolving in one direction only. In this machine, also, the crank motion employed for operating the bed and cylinder imparts to each the smoothest and easiest gradations of motion and perfect equality of surface-velocity of bed and cylinder. The diameter of the cylinder is reduced to a minimum, its entire surface or periphery being utilized for making the impression, except the narrow section cut out for containing the grippers and lifter-fingers and the blanket-rods. The sharpest impression possible is thus obtained with a minimum strain upon the machine due to minimum weight of cylinder. All articulations or locking and unlocking devices, universal joints, or other objectionable devices or intermediate gearing between bed and cylinder are dispensed with. The sheets are taken from the feed-board by the cylinder-grippers when the cylinder is nearly or practically at rest, insuring thereby accurate feed-register. Each sheet is delivered upon the preceding one under no other or greater pressure than that due to its own weight when the sheet has been deprived of its end motion through the air.

I do not confine myself to the above-described methods or means of imparting motion to the sheet-driving wheels g' and g^2 for operating the pump p or for regulating the air-jets h and h', as any suitable means may be employed for such purposes.

I am aware that it is not new to rotate the cylinder in one direction only for making the impression and in the reverse direction during the retrogression of the reciprocating bed of the press, the cylinder being driven directly by the bed, and such method I do not claim; but,

As of my invention, I claim—

1. In a cylinder printing-press, a cylinder, stationary sheet-guides, frictional-surfaced sheet-driving wheels, and means for forcing two series of jets of air under the sheets of paper in the course of delivery, in combination with means for transmitting motion to said parts, as described, each movement being so timed in relation to the others that one series of air-jets is first forced against the surface of the cylinder under the tail edge of each sheet, and then the sheet is delivered tail first from the top of the cylinder to and between said sheet-guides and frictional-surfaced driving-wheels, and finally discharged upon another series of air-jets to the fly-board, all substantially as set forth.

2. In a cylinder printing-press, in combination with a reciprocating bed and an impression-cylinder provided with sheet-supporting fingers, and geared to said bed so as to make a greater rotation than one complete revolution of the cylinder to a single stroke of the bed in each direction, a series of stationary sheet-guides, sheet-driving wheels and jet-pipes, and means, substantially as described, for forcing air through said pipes, substantially as and for the purposes set forth.

3. In a cylinder printing-press, the combination, with the cylinder, of means, substantially as described, for alternately forcing jets of air first under the delivery edge of the sheet to raise it from the cylinder, and then under the body of the sheet to float it in horizontal projection to the delivery-board, whereby the use of tapes, cords, and fly is entirely eliminated from the delivery mechanism, substantially as and for the purposes set forth.

4. In a cylinder printing-press, in combination with the cylinder and secured thereto, a series of stationary but adjustable sheet-supporting fingers, whereby the margin of the sheet is supported out of contact with the surface of the cylinder, thereby facilitating the delivery of the sheet, substantially as set forth.

5. In a cylinder printing-press, the combination, with the cylinder provided with a series of stationary but adjustable sheet-supporting fingers, of means for forcing jets of air against the surface of the cylinder between said fingers and under the sheet to be delivered, substantially as and for the purposes set forth.

6. In a cylinder printing-press, the combination, with a series of two or more jet-pipes, of means, substantially as described, for alternately forcing air-jets through said pipes, whereby the edge of the sheet to be delivered is first elevated by one series of jets preparatory to its delivery and the delivery completed by the support given to the sheet by another series of jets, substantially as and for the purposes set forth.

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Witnesses:
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