(No Model.) 2 Sheets—Sheet 1.

J. L. COX.

CYLINDER PRINTING MACHINE.

No. 332,138. Patented Dec. 8, 1885.

Fig. 1.

Fig. 2.

WITNESSES

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Fig. 3.

Fig. 4.

Fig. 5.

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UNITED STATES PATENT OFFICE.

JOSEPH L. COX, OF LAFAYETTE, INDIANA, ASSIGNOR TO THE DUPLEX PRINTING PRESS COMPANY, OF BATTLE CREEK, MICHIGAN.

CYLINDER PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 332,138, dated December 8, 1885.

Application filed November 6, 1882. Serial No. 76,026. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH L. COX, of Lafayette, in the county of Tippecanoe and State of Indiana, have invented certain new and useful Improvements in Cylinder Printing-Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification, in which—

Figure 1 is a side elevation, partly in section, of the machine. Figs. 2, 3, and 4 are details. Fig. 5 is a transverse vertical section on line *z z*, Fig. 1.

The invention relates to printing-machines; and it has for its object to provide means whereby a longitudinally-reciprocating bed-plate adapted to carry the form, and a reversably-rotating impression-cylinder may be so made to coact as to produce impressions on both the inward and outward stroke of the bed-plate upon paper fed from a roll attached to a roller having bearings in the main frame, and actuated by mechanism connecting it with the driving-shaft of the press.

The invention consists in the construction and novel arrangement of parts hereinafter described, and pointed out in the appended claims.

Referring to the accompanying drawings by letter, A represents the main frame of the machine, supported on a proper base.

B is the bed-plate, the frame B′ of which extends downward, and is provided on its lower end with the double rack-bar B^2, composed of the upward-looking rack *b* and the downward-looking rack *b′*. The frame B′ reciprocates longitudinally on the ways A′, formed on the main frame, as shown in Fig. 3 of the drawings.

C is the impression-cylinder, having bearings in the sides of the main frame.

D is the driving-shaft.

E is the roll of paper on the shaft E′, journaled in the sides of the main frame and delivering the paper in a continuous sheet, *e*, to the impression-cylinder and actuating-rollers and mechanism hereinafter described, and F is a shaft driven by mechanism connecting it with the main shaft D and actuating the paper cutting and advancing devices.

The main shaft D is composed of the part D′, turning in the bearings *d d*, secured to the main frame, and the part D^2, which is at one end connected to the part D′ by the universal joint *d′*, and has a bearing in a journal-box, d^2, which is movable in a vertical slot, d^3, in a standard rising from the floor of the main frame. d^4 is a driving-pulley on the part D′, and d^5 is a bevel-gear on the same. The part D^2 is a tumbler-shaft, and is provided with a gear-wheel, d^6, which meshes with both the upper and lower racks, *b* and *d′*, and reciprocates the bed-plate frame when the shaft D is rotated.

The relation shown in the drawings between the gear-wheel d^6 and the racks *b* and *b′* causes the shaft D to rotate four times to make the bed-plate make one double reciprocation or complete motion to and fro. The gear-wheel d^6 is properly shaped on its edge to pass the end of the rack-bar B^2, as shown. The beveled gear d^5 meshes with a beveled gear, *f′*, on one end of a shaft, *f*, which has on its other end a beveled gear, f^2, meshing with a similar gear, f^3, on the shaft F. The gear f^3 has double the diameter of the gear-wheel f^2; consequently the shaft F makes two rotations to four of the shaft D, or two rotations to each double reciprocation. The impression-cylinder C has upon it, near one end, a gear-wheel, *c*, which meshes with a longitudinal rack, b^2, on one side of the upper surface of the bed-plate, so that the reciprocations of the latter cause the cylinder to rotate alternately in opposite directions and carry the form X on the bed-plate back and forth below the same.

G is a lever pivoted at its center upon the extended journal *c′* of the cylinder, and provided at its upper and lower ends, respectively, with the rack-bars *g* and *g′*, made on the arcs of circles concentric with said journal.

H is a short shaft journaled on one side of the main frame vertically below the cylinder, and provided with a circular segmental gear, *h*, which meshes with a downwardly-looking

horizontal rack, b^3, on the lower surface of the bed-plate. The said gear has upon it the fingers h', which rise up into position to be struck by the end of the rack b^3 on the return reciprocation of the bed-plate, so as to make the teeth engage.

h^2 is a disk on the shaft H, provided with two recesses on its edge, into which the point of a spring-detent, h^3, secured to the main frame, enters and limits the motion of the segmental gear in either direction.

h^4 is a pinion on the shaft H, to the outer side of the disk h^2, and engaging the lower rack-bar, g'.

It is evident from the above that the reciprocation of the bed-plate will oscillate the shaft H and by means of the pinion h^4 vibrate the lever G.

I is a transverse shaft journaled in the main frame vertically above the cylinder, and having near its end a pinion, i, which meshes with the upper curved rack-bar, g. The said shaft will evidently be rotated alternately in opposite directions by the vibrations of the lever G.

J J′ are rollers (shown in Fig. 2 in a different position from that in Fig. 1) of equal diameter, journaled in boxes $j\,j$, which are adapted to slide in vertical slots $j'\,j'$, made in the sides of the main frame at equal distances on each side of and above the impression-cylinder.

K K′ are transverse rollers journaled in the main frame above the rollers J J′, respectively, and at equal distances on each side of and above the roller I. Each of the blocks j, in which the roller J is journaled, has a cord, L, secured to its upper side, and running thence over the roller K and down to a pulley, i', secured on the shaft I. These pulleys i' are secured on the said shaft near its ends, and are each provided with two circumferential grooves, in one of which the upper end of a cord, L, is secured, so as to wind and unwind in the groove as the shaft I is rotated in opposite directions.

L′ L′ are cords similarly secured to the journal-blocks of the rollers J′, passing over the roller K′, and secured in the other grooves of the pulleys i' in such manner as to wind up therein as the cords L unwind, and the reverse.

It is evident from the above that as the rotation of the roller I alternately reverses, as heretofore explained, the rollers J J′ will be alternately raised and lowered, one rising equally as the other descends; also, that they will move in one direction as the bed-plate reciprocates inward, and in the opposite direction as it reciprocates outward, the roller J moving downward and the roller J′ upward as the bed-plate moves inward, and the reverse. This motion passes a loop of paper between the cylinder and bed-plate at each reciprocation of the latter, as hereinafter explained.

M is a transverse roller journaled in the sides of the main frame, near the top thereof, and provided near its end with a loose gear-wheel, m, to the side of which is secured a ratchet-wheel, m', controlled by a spring-commanded pawl, m^2, pivoted to an arm from the journal of the roller M, extended outside of its bearing.

M′ is a roller journaled in the main frame to the side of and below the roller M, and adapted to receive and carry the paper between itself and the latter roller.

M^2 is a roller journaled in the main frame vertically above the roller M, and performing the same function therewith as the roller M′.

N N′ are similar transverse rollers journaled in the main frame on opposite sides of and at equal distances from the impression-cylinder.

O is a transverse guide-roller journaled in arms standing outward from the main frame, and preferably made longitudinally adjustable thereon.

The course of the continuous sheet of paper e from the roll E is first between the rollers M M′, thence below the roller N′, thence over the reciprocating roller J′, thence below the impression-cylinder, thence over the reciprocating roller J, thence below the roller N, thence over the guide-roller O, and thence between the rollers M and M^2, which pass it over a directing board or table to the cutting mechanism to be cut into proper lengths. The co-action of the rollers M M′ draws the paper from the roll, and the co-action of the rollers M M^2 moves just as much paper away from the machine; but while the rollers J J′ and the impression-cylinder are acting the rollers M M′ M^2 are idle, so that the paper is not advancing, the printing being done on the loop formed by the reciprocating rollers and the impression-cylinder.

P is a disk secured to the end of the shaft F, and having a radial recess, p, in which is secured a wrist-pin, p', which may be adjusted to stand out from any point of the recess.

Q is a vibrating lever pivoted on the main frame at q, and having the longitudinal slot q', formed on its lower arm, by means of which slot and the wrist-pin p' the lever is vibrated. To the upper end of the lever is secured the curved rack-bar q^2, which is made on the arc of a circle concentric with the pivot q', and meshes with the loose gear-wheel m on roller M.

On account of the ratchet-wheel m' and pawl m^2, the action of the gear-wheel and curved rack-bar can rotate the roller M only in the proper direction to feed the paper from the roll E. When acting in the opposite direction, the gear-wheel turns loosely and the feed stops. The feed is thus intermittent. The slot p and pin p' are so arranged on the disk P that this intermittent feed occurs about the end of the reciprocations of the bed-plate, or, more properly, during the time that the short

rack b^3 on the under surface of the bed-plate is disengaged from the segmental gear h, and is traveling either inward or outward therefrom, so that the lever G and reciprocating rollers J J′ are not acting, and, as the gear-wheel f^3 on the shaft F, as before described, has double the diameter of the beveled gear f^2 on the shaft f, the feed takes place at the end of each inward and outward reciprocation of the bed-plate. The pin p' can also be adjusted nearer to or farther from the center of the disk Q, so as to give the paper more or less feed, according to the size of the form.

R is a transverse cutter blade or block secured to the arms of the main frame above the paper roll, and R′ is a transverse cutter-blade having its end rigidly secured to the upper end of a reciprocating bar, S, which passes through the directing-brackets s s', secured to the main frame, and has pivoted to its lower end a friction-roller, s^2, which rests upon the edge of the cam T, provided with the vertical shoulder t, which cam is secured to and rotates with the shaft F. As the cam rotates the bar S and cutter R′ are lifted until the roller s^2 comes to the shoulder t. They then fall, and the cutter R′ severs the paper against the cutter R, as the feed from the machine equals the feed into the same. Each fall of the cutter severs just the proper amount of paper.

The mode of operation is as follows: The paper is first fed into the machine from the roll E by the action of the lever Q, curved rack q^2, and rollers M and M′. When the lever reverses its motion, the feed stops. At that moment the segmental gear h and rack b^3 engage, the lever G begins to act, and the loop of paper formed on the rolls J J′ and the impression-cylinder is passed, as described, between the latter and the bed-plate, the tension of the paper being kept steady because the rolls J J′ are always equally distant from each other. After the reciprocating bed-plate has passed far enough to disengage the rack b^3 and gear h the lever Q reverses and the feed again acts. The bed-plate then reverses its motion, and so do the lever G and rollers J J′.

It is to be observed that the segmental gear h and rack b^3 may be constructed to reverse only, and not to cease motion, and the feed mechanism arranged to act near the ends of the reciprocations of the bed-plate at the times when the cylinder is not passing over the form.

Having thus described my invention, I claim—

1. In a printing-press, the combination, with a reciprocating bed-plate and an impression-cylinder, of vertically-moving and alternately-reciprocating rollers adapted to form a loop of paper in connection with the impression-cylinder, substantially as specified.

2. In a printing-press, the combination, with a bed-plate adapted to have the form secured thereto and reciprocating on the main frame of the press, and impression-cylinder rotated alternately in opposite directions by the motion of the bed-plate, of two rollers situated at equal distances on each side of the impression-cylinder, reciprocating vertically in opposite directions to each other, actuated by the reciprocations of the bed-plate, and adapted to form a loop of paper from the feed mechanism around themselves and the impression-cylinder, and pass the said loop between the impression-cylinder and bed-plate, substantially as specified.

3. In a printing-press, the combination, with the reciprocating bed-plate, the impression-cylinder rotated alternately in opposite directions by the motion thereof, and the rollers reciprocating alternately in opposite directions and actuated by the reciprocations of the bed-plate, of the vibrating lever provided with the curved rack-bar, and the feed-roller provided with the ratchet and loose gear-wheel on its end, and adapted, by means of the coaction of the said curved rack-bar, loose gear-wheel, and ratchet, to feed the paper intermittently into the machine and at the times when the cylinder and bed-plate are not printing, substantially as specified.

4. In a printing-press, the combination, with the reciprocating bed-plate, the impression-cylinder actuated thereby, the reciprocating rollers actuated by the bed-plate, and the feed mechanism acting intermittently and only when the bed-plate and cylinder are not printing, of the automatically-reciprocating bar carrying a transverse cutter at its upper end which acts with a stationary cutter secured to the main frame, substantially as specified.

5. In a printing-press, the combination of the bed-plate provided with the longitudinal racks b^2 and b^3, the impression-cylinder provided with the gear-wheel c, the reciprocating rollers J J′, the stationary rollers K K′, the shaft I, provided with the pulley i' and pinion i, and the cords L L′, with the lever G, provided with the curved racks g g', the segmental gear h, the disk h^2, spring-detent h^3, and pinion h^4, substantially as specified.

6. The combination, with the reciprocating bed-plate provided with the racks b b', and the driving-shaft D, composed of the tumbling-shaft D′, provided with the gear-wheel d^6, meshing with the racks b b', and the shaft D, provided with the beveled gear d^5, of the shaft f, having a bevel-gear, f', of the same size as and meshing with the gear d^5, and a bevel-gear, f^2, which meshes with a bevel-gear, f^3, of double its diameter, and the shaft F, which carries the bevel-gear f^3, and is thus adapted to actuate the feed and cutting mechanism at double the rate at which the main shaft actuates the base-plate, substantially as set forth.

7. The combination, with the reciprocating bed-plate, impression-cylinder actuated thereby, the vertically-reciprocating loop-rollers,

and feed-actuating mechanism constructed substantially as described, of the feed-rollers M, M′, and M^2, the feed-rollers M′ and M^2 being of equal diameter and both coacting with the roller M, the former to draw the web from the roll, the latter to draw the same out of the machine, the three rollers thus forming an automatically-compensating tension mechanism for the web.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JOSEPH L. COX.

Witnesses:
ALEX. TILLMAN,
A. H. YOUNT.