(No Model.) 2 Sheets—Sheet 1.

J. L. COX.

CYLINDER PRINTING MACHINE.

No. 332,139. Patented Dec. 8, 1885.

Fig. 5.

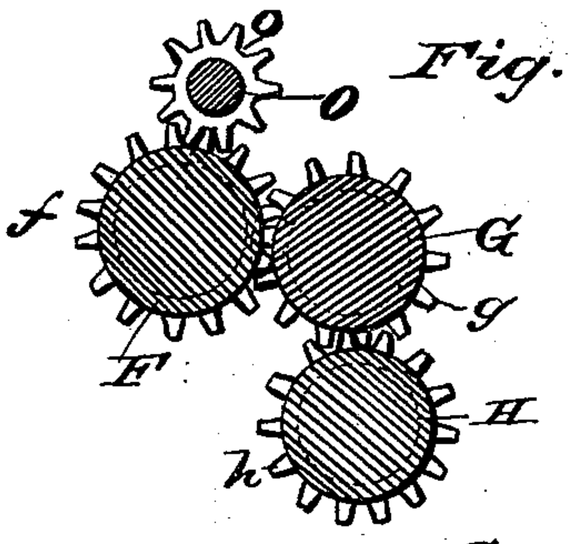
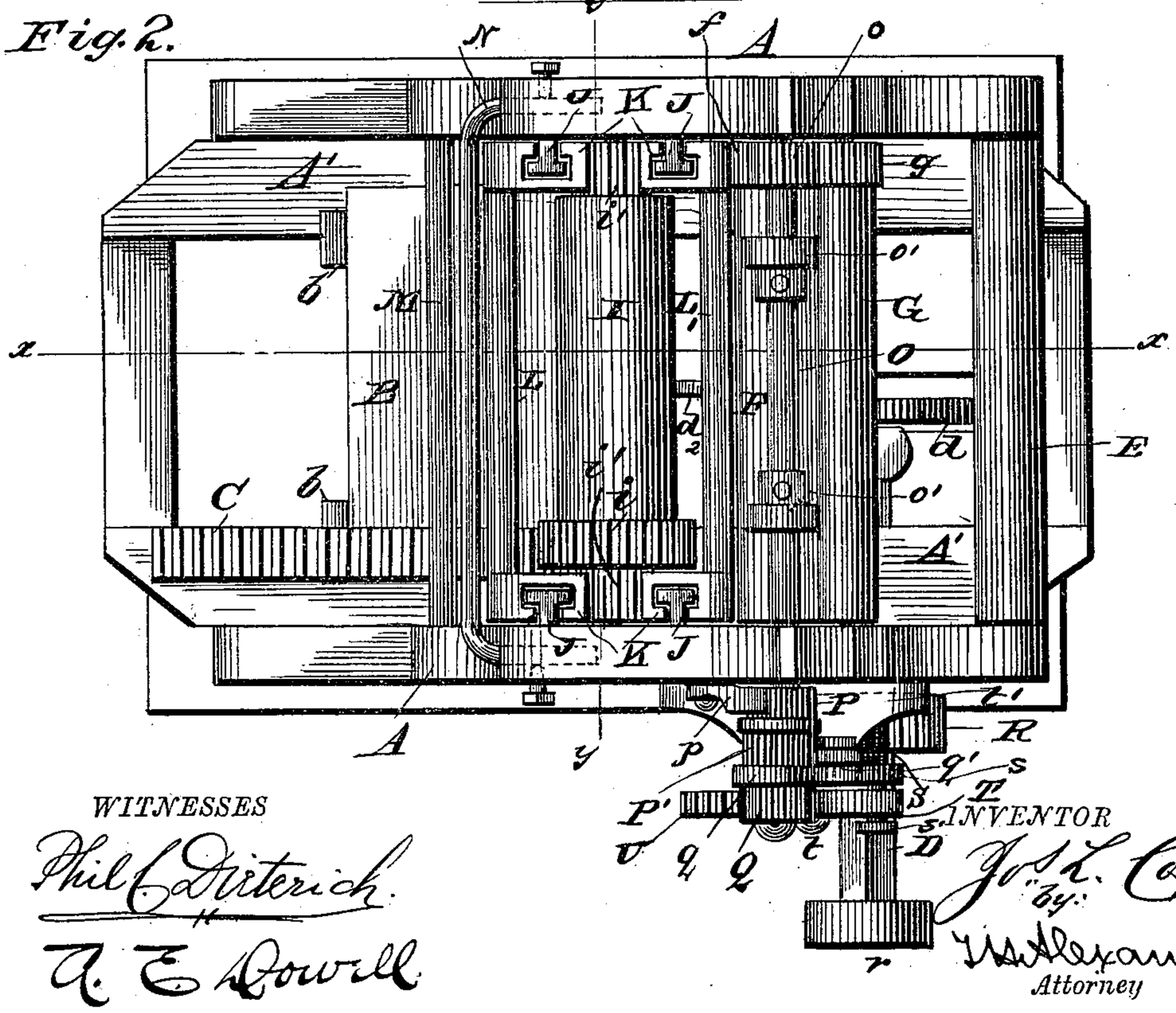


Fig. 1.

Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

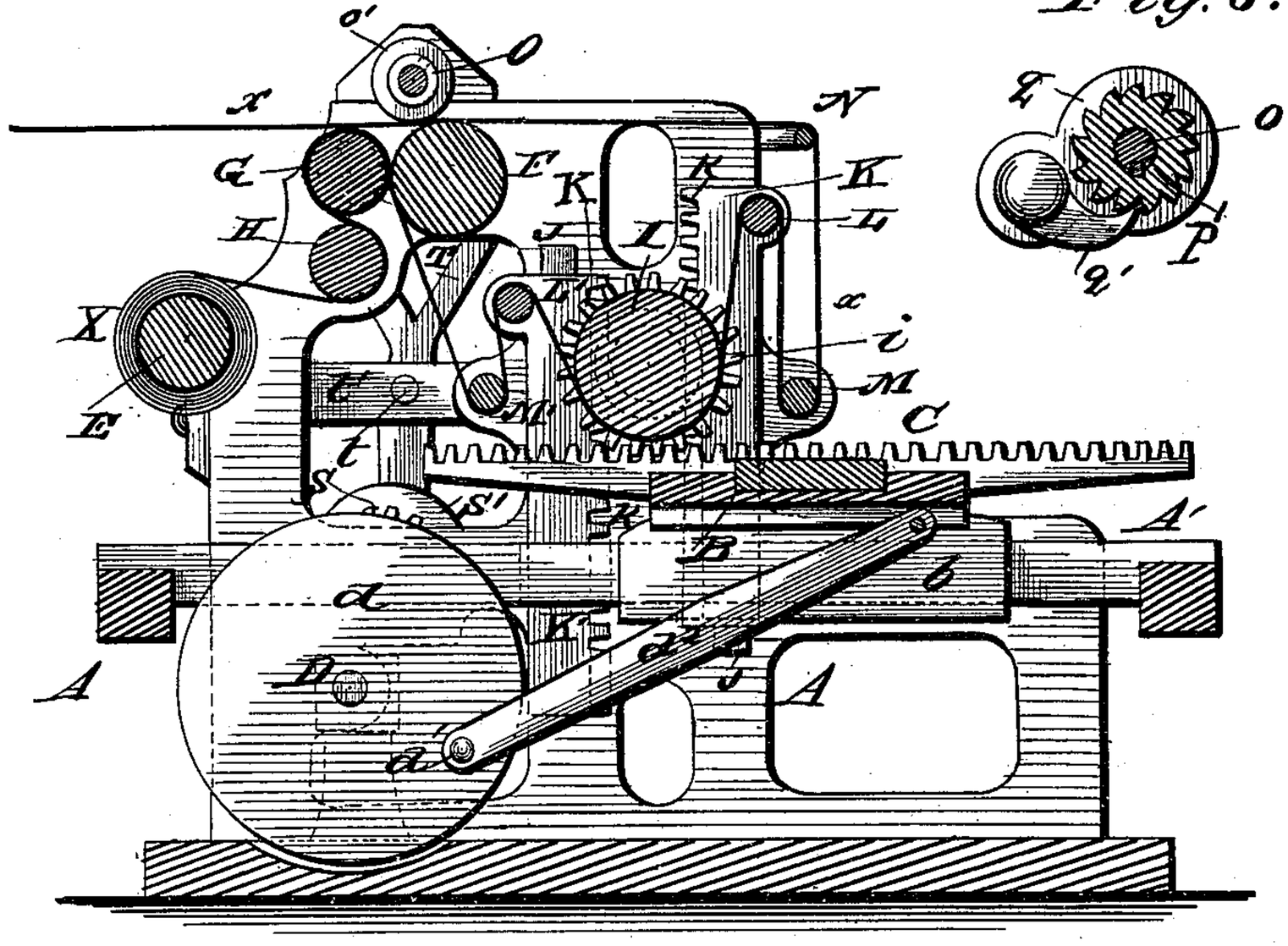
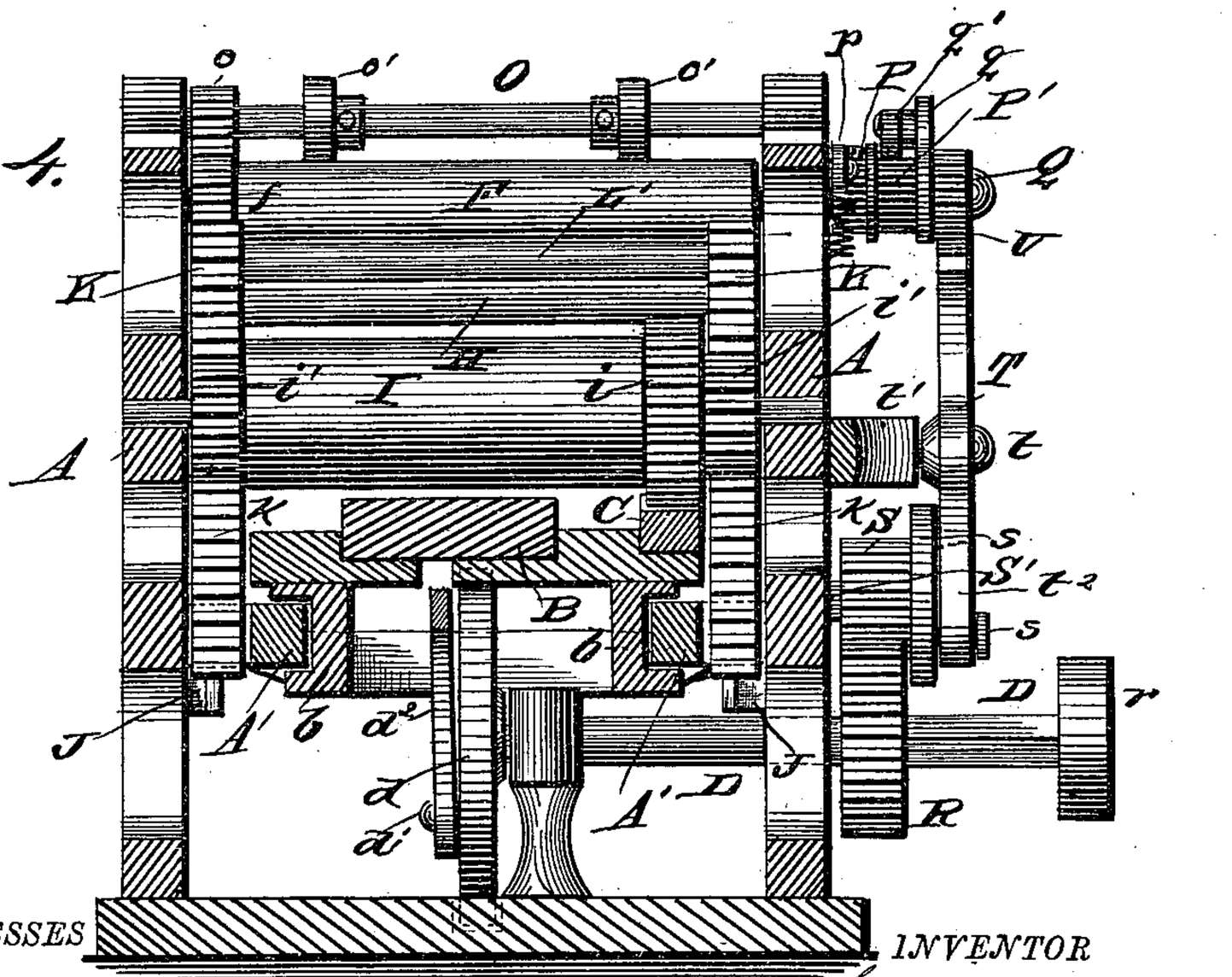


Fig. 6.

Fig. 4.



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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. 332,139, dated December 8, 1885.

Application filed May 7, 1885. Serial No. 164,706. (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 of my improved printing-press, showing the paper in position to be printed. Fig. 2 is a top plan view of the same with the paper removed. Fig. 3 is a central vertical section through the press on the line *x x*, Fig. 2, showing the roll of paper in position to be printed. Fig. 4 is a transverse vertical section of the same on line *y y*, Fig. 2, the paper being removed to more clearly show the construction. Fig. 5 is a detail view of the rollers and their gearing. Fig. 6 is a detail view of the ratchet and pawl.

The invention relates to improvements in printing-presses; and it consists in the construction and novel arrangement of parts hereinafter described, and pointed out in the appended claims.

In the accompanying drawings, A represents the frame-work of the press, having made upon it the horizontal ways A′ A′.

B is a reciprocating bed-plate, upon which the form is secured in the center. The bed-plate has secured to its under surface the rabbeted clips *b b*, which move on the ways A′ as the bed-plate reciprocates.

C is a horizontal rack-bar, secured to the upper surface of the bed-plate, near one side, within the main frame A. The rack-bar C serves a purpose hereinafter explained.

D is the main or driving shaft of the machine, having upon it the disk *d*, upon which is a wrist-pin, *d′*.

d^2 is a connecting-rod or pitman, which is pivoted both to the wrist-pin and to the under surface of the bed-plate A, so that the revolution of the disk on the shaft reciprocates the bed-plate. Any other ordinary and suitable mechanism may be used to reciprocate the bed-plate; but as the said mechanism forms no part of the invention a very specific description thereof is not necessary.

E is a transverse roller, bearing the roll of paper X. The said roller is journaled in the main frame A at the end of the machine opposite that near which the bed-plate is situated.

F is a transverse roller, journaled in the main frame, near its top, a proper distance inward from the roller E, and having on one side within its bearings a gear-wheel, *f*, as shown. The said roller is arranged both to carry the paper from the roll X to the impression-cylinder before printing and convey it from the form after printing. Both of these actions are hereinafter fully explained.

G is a transverse roller, journaled in the main frame to the outer side and somewhat below the center of the roller F, and *g* is a pinion on the end thereof meshing with and rotated by the gear-wheel *f*.

H is a roller vertically below the roller G, and of equal diameter therewith. The roller H has bearings in the frame A and bears upon its end a pinion, *h*, which meshes with and is rotated by the pinion *g* of the roller G.

The rollers H and G receive between them and direct the web-paper *x* from the roller X. The rollers F and G receive the web between them and bite it sufficiently to draw it from the roll.

I is the impression-cylinder, journaled in the main frame a proper distance above the bed-plate B and having secured to it a pinion, *i*, which meshes with a rack-bar C.

J J are four vertical clips, T-shaped in cross-section, two of which are secured to the inner surface of each side of the main frame at equal distances from a bearing of the impression-cylinder.

K K are reciprocating bars provided with longitudinal grooves, T-shaped in cross-section, so as to travel on the clips J, and provided on their facing-edge with the vertical racks *k k*.

i′ i′ are pinions on the ends of the impression-cylinder, each of which lies between the two racks *k k* at its side of the machine and meshes with both.

L and L′ are transverse rollers of equal diameter, the roller L having bearings in the bars K on one side of the impression-cylinder, and the roller L′ having bearings in the bars K on the opposite side of the same. Now, it is evident that when the bed-plate and rack-bar C are reciprocated by the pitman d^2 the rack-bar will alternately reverse the motion of the pinion *i* of the impression-cylinder. The pinions *i′ i′* will consequently cause the rack-bars K on each side of the impression-cylinder to travel in opposite directions and will reverse their motions at equal intervals of time while the machine is operating at uniform speed.

M and M′ are transverse rollers, journaled in the main frame at equal heights, the former below and outward from the roller L and the latter below and outward from the roller L′.

N is a transverse guide-bar, secured to the main frame above the roller L, as shown. If desired, a roller may be substituted for the said guide-bar. The guide-bar or roller N is adjustable longitudinally in reference to the machine, so as to bring the paper at the right point under a stationary cutting device and at the same time preserving the tension of the same.

O is a shaft journaled in the main frame above the roller F, and having on its end a gear-wheel, *o*, which meshes with and is rotated by the gear-wheel *f*.

o′ o′ are collars or disks on the shaft O near its ends. The edges of the collars and the surface of the roller F are just sufficiently apart to receive and bite the paper between them, their motion conveying it away from the machine. The collars may be adjustable longitudinally on and are arranged near the ends of the shaft, so as not to pass over and smear the printed parts of the paper.

The course of the web-paper *x* is from the roll X below the roller H, then up between said roller and the roller G, over the latter and between it and the large roller F. It descends from the roller F, passes under the roller M′, and thence ascends and passes over the roller L′, whence it descends and passes under the impression-cylinder I. Ascending from the impression-cylinder, it passes over the roller L, and descending thence and passing below the roller M, it ascends and passes over the guide-bar or roller N, whence it runs between the roller F and the disks *o′ o′* of the shaft O, which disks have diameters equal to that of the rollers H or G. The rollers F and G feed the paper toward the form, and the roller F and disks *o′* convey it away from the same. Thus the same roller F performs both acts simultaneously, and consequently the tension of the paper is kept always the same. Thus any unevenness or inequality in the roller F will effect the delivery just exactly as it does the feed, and the paper will feed evenly and with the same tension. This is a very important feature of the invention.

The rollers L L′ are the feed-rollers proper for the form and impression-cylinder; but the roller F feeds the paper toward the form, and is actuated from the main shaft D by the following mechanism:

P is a ratchet-wheel secured to the journal of the roller F, extended outward from its bearing, and controlled by the spring-pawl *p*, pivoted on the main frame.

P′ is a ratchet-wheel similar to the ratchet-wheel P, and secured to the journal of the roller F, to the outer side of the latter.

Q is a pinion turning loosely on the said journal, to the outer side of the ratchet-wheel P′, and having a disk, *q*, fixed to its inner face, to an extension from the upper edge of which is pivoted a pawl, *q′*, which coacts with the ratchet-wheel P′.

R is a gear-wheel on the extended journal of the main shaft D, which is turned by a driving-pulley, *r*, from a proper source of power. The gear-wheel R meshes with a gear-wheel, S, of one-half its diameter, secured to a shaft, S′. The shaft S′ has a bearing in the main frame, and carries at its outer end a disk, *s*, having a wrist-pin, *s′*, secured to its outer face.

T is a vibrating lever, pivoted at *t* on a bracket, *t′*, bolted to the outer surface of the main frame. The lower end of the lever has a longitudinal slot, t^2, which engages the wrist-pin *s′*, so that the rotation of the disk *s* vibrates the lever T. The upper end of said lever is formed into a rack, U, made on the arc of a circle having for its center the pivot-point *t*. The said rack engages the pinion Q and turns the same back and forth as it vibrates.

When the pinion Q is turned in the opposite direction to that in which the pawls *p* and *q′* engage, the former pawl holds the ratchet-wheel P, and the latter pawl slips over the ratchet-wheel P′; consequently the roller F does not rotate and the paper is not fed toward the form. When the rack U reverses its motion, the pawl *q′* engages the ratchet-wheel P′ and the roller F is turned and feeds the paper.

The lever and wrist-pin are so arranged that the roller does not rotate while the form is reciprocating below the impression-cylinder, but rotates at or near the end of each stroke of the bed-plate. The paper is not fed toward the form when the bed-plate is passing under the impression-cylinder. When the bed-plate reciprocates inward, the roller L′ ascends and the roller L descends by the action of the described mechanism. The loop of paper between said rollers is thus carried between the bed-plate and cylinder and an impression taken. The roller F then feeds the printed paper a proper distance forward from the form and comes to rest. The bed-plate then reciprocates outward, the cylinder reverses its

rotation, and the rollers L L′ reverse their action, taking an impression on the outward stroke of the bed-plate.

The diameter of the gear-wheel S is only one-half of that of the gear-wheel R, so that the former makes two rotations to one of the latter; hence as the bed-plate is reciprocated back and forth by one rotation of the gear-wheel R the gear-wheel S will rotate the roller F twice during the said double reciprocation, the mechanism being so arranged that these rotations will occur at or near the same time that the movement of the bed-plate reverses. The intervals of rest of the roller F will occur at the time that the bed-plate is passing under the impression-cylinder and the paper is being printed by the coaction of the bed-plate and cylinder.

While the roller F must necessarily have periods of rest, as explained, the bed-plate reverses its movement immediately in the same manner as the piston of a reciprocating engine, as the driving mechanism shows. The impression-cylinder and rack-bars K, being actuated by the rack-bar C on the bed-plate, must also reverse their motion in the same manner and at the same time as the latter, and as the rollers L L′ are carried by the rack-bars the loop of paper formed by the said rollers and the impression-cylinder will also be reversed; but at the end of each stroke of the bed-plate the roller F will move the sheet *x* from the roller X a sufficient distance to afford sufficient unprinted paper to receive impression from the form on the return-stroke of the bed-plate. Thus the bed-plate and cylinder coact to print the paper with each movement of the former both outward and inward. Without this forwarding action of the roller F the loop of paper formed by the rollers L L′ and the cylinder would be merely reprinted over again as the bed-plate reciprocated.

As the rollers L L′ move the same distance during their reversed action as during their forward action, the amount of the movement, so that it is sufficient to clear the form and the margin thereto, is not essential, as the forward motion will carry the formed loop of paper as far forward as the reversed action has carried the previous loop backward. It is essential, however, that the loop should be of sufficient length to clear the form and margin.

The loops of paper formed by the rollers L L′ and the impression-cylinder do not travel through the machine when the form is printing, but merely travel around the cylinder in the direction of its rotation, which is alternately in opposite directions, and that part only of each loop is printed under which the form passes as the bed-plate reciprocates. In relation to each loop, the rolls M M′ may be regarded as fixed points, that portion of the web lying between said rollers not traveling through the machine when the form is printing. The coacting of the impression-cylinder and rollers L L′ causes the proper part of the loop to be brought against the form as it passes thereunder on the bed-plate. When the bed-plate is at the end of its stroke in each direction, the feed mechanism is arranged to come into play. The coacting of the roller F and disks *o′* then draws the web around the rollers N M L, the impression-cylinder, and rollers L′ and M′, and the coacting of the rollers F and G forwards the web as fast from the roll X. The disks *o′* and roller G being of equal diameter, and all coacting with the roller F, form a compensating-tension mechanism, for any irregularity of the roller F will affect the delivery just as much as it does the feed, and in the same direction, so that the tension will always be regular.

In my pending application for printing-press filed November 6, 1882, Serial No. 76,026, the reciprocating bed-plate, reversely-rotating cylinder, vertically-reciprocating rollers actuated by the bed-plate, vibrating lever having a curved rack-bar, and feed-roller provided with a ratchet and loose gear, are shown and claimed. I therefore disclaim said parts as shown and claimed in application No. 76,026.

Having described my invention, I claim—

1. In a printing-press, the combination, with the reciprocating bed-plate adapted to have a form secured thereto, and provided with a horizontal rack, and the impression-cylinder having a gear-wheel secured upon it, which gear-wheel meshes with and is actuated by the rack of the bed-plate, of the four vertically-reciprocating rack-bars actuated by pinions on the ends of the impression-cylinder, and the two rollers which have bearings in and reciprocate with the rack-bars on each side of the impression-cylinder, and are adapted to form a loop of paper with the latter, which loop passes between the bed-plate and cylinder when the same are actuated, substantially as described.

2. The combination, with the main frame and impression-cylinder I, of the fixed rollers E F G H M M′, the adjustable guide-bar or roller N, and shaft O, provided with the collars *o′*, the reciprocating rollers L L′, and the rack-bars K, reciprocated by the pinions *i′ i′* on the ends of the impression-roller, substantially as specified.

3. In a printing-press, the combination of the reciprocating bed-plate provided with a horizontal rack, the impression-cylinder provided with the pinion *i*, meshing with the said rack, the vertically-reciprocating rack-bars, and the rollers L L′, with the rollers E F G H M M′, the adjustable guide-bar or roller N, and the shaft O, provided with the disks *o′*, substantially as specified.

4. In a printing-press, the combination of the reciprocating bed-plate provided with a horizontal rack, the impression-cylinder having a gear-wheel upon it actuated by said rack, and provided at its ends with pinions of equal size, the four reciprocating rack-bars actuated

by said pinions, the reciprocating rollers having bearings in the rack-bars, and mechanism, substantially as described, whereby the web of paper may be intermittently fed to the impression-cylinder, and adapted to feed equal quantities of the web at or near the ends of the reciprocations of the bed-plate.

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

JOSEPH L. COX.

Witnesses:
T. H. ALEXANDER,
H. R. KEYWORTH.