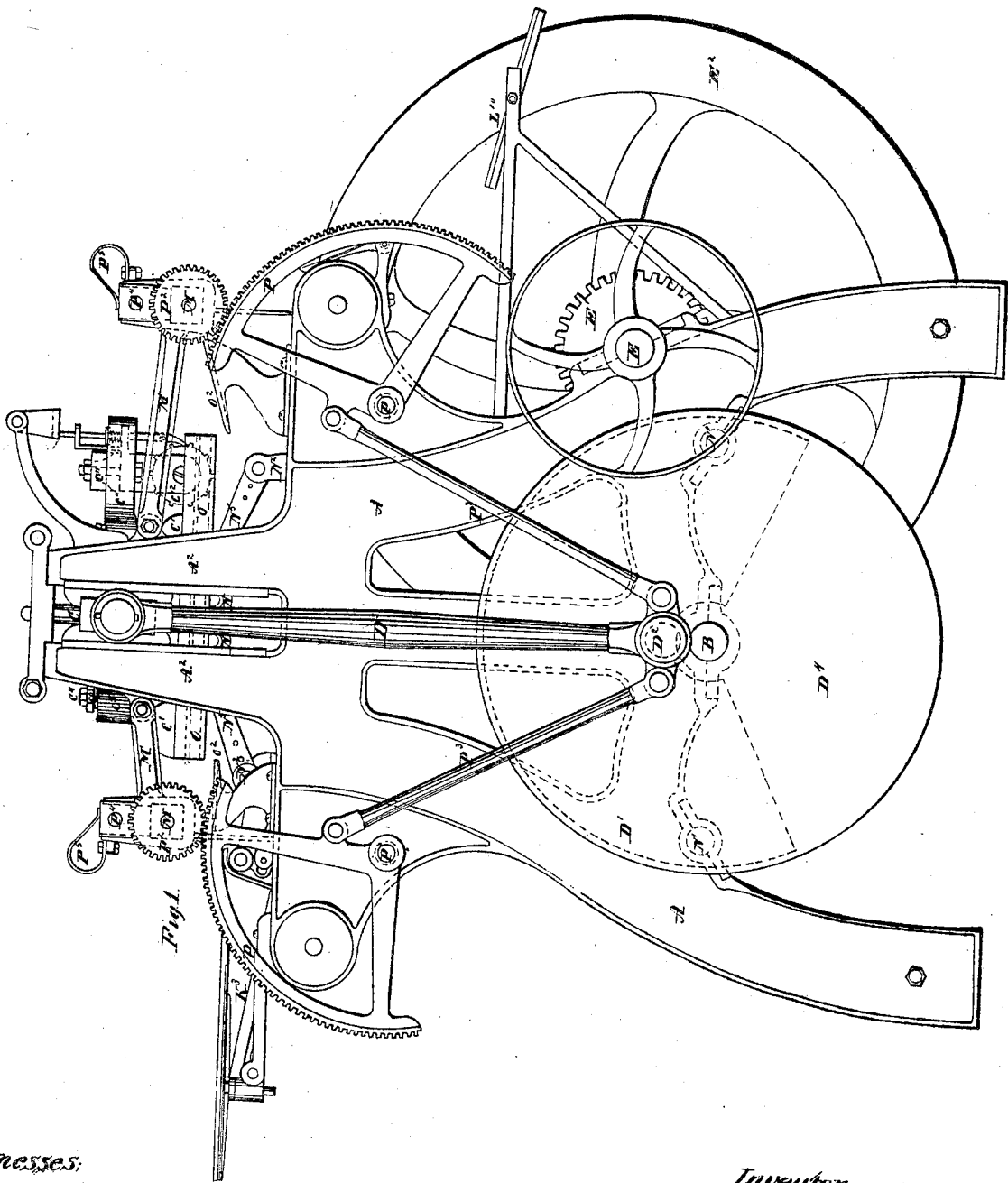


W. H. Forbush. Sheet 1 of 4 Sheets  
Railroad Ticket Printing Press.  
No 59533.  
Patented Nov. 6. 1866.



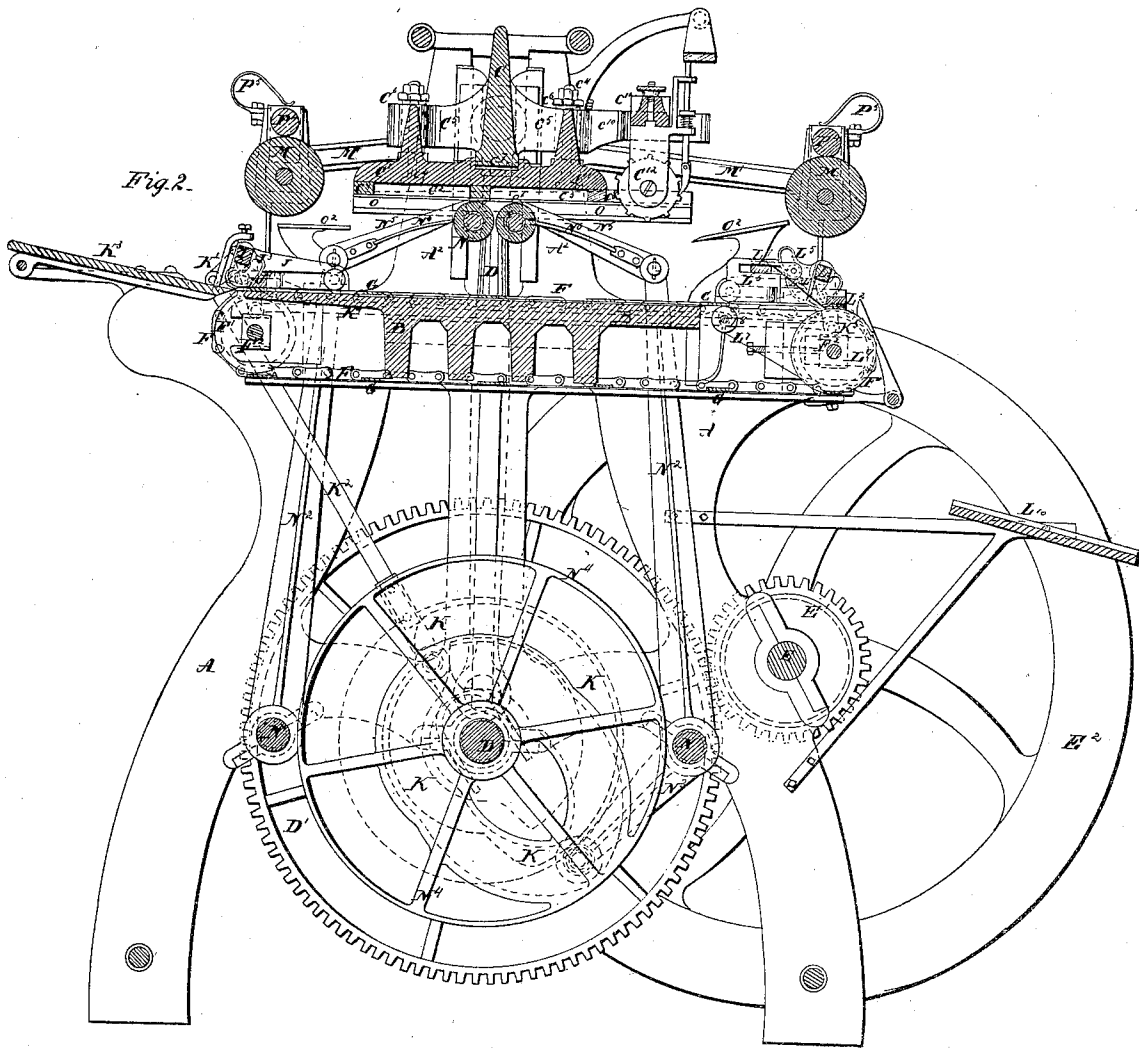
Witnesses:

W. H. Dodge  
W. B. Dodge

Inventor:

Walter H. Forbush

*W. H. Forbush. Sheet 2. of 5 Sheets*  
*Railroad Ticket Printing Press.*  
*No. 59533. Patented Nov. 6. 1866.*



*Witnesses.*  
*H. Dodge*  
*P. S. Dodge*

*Inventor.*  
*Walter H. Forbush*





# UNITED STATES PATENT OFFICE.

WALTER H. FORBUSH, OF BUFFALO, NEW YORK, ASSIGNOR TO HENRY G. LEISENRING, OF PHILADELPHIA, PENNSYLVANIA.

## IMPROVEMENT IN RAILROAD-TICKET PRINTING-PRESSES.

Specification forming part of Letters Patent No. 59,533, dated November 6, 1866.

To all whom it may concern:

Be it known that I, WALTER H. FORBUSH, of the city of Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Railroad-Ticket Printing-Presses, and that I have assigned my whole interest in the said invention and improvements to HENRY G. LEISENRING, of the city of Philadelphia and State of Pennsylvania; and I do hereby declare that the following is a full, clear, and exact description of my said invention and improvements, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure I, Sheet I, represents the same in side elevation. Fig. II, Sheet II, is a longitudinal sectional elevation. Fig. III, Sheet III, is a cross-sectional elevation. Fig. IV, Sheet IV, is a plan of feeding mechanism. Fig. V, Sheet IV, is a detail view of one of the nippers. Fig. VI is a section of the suspension-bolts which connect the platen to the cross-head.

My invention consists in improvements in certain mechanism, herein fully described, for printing railroad-tickets from previously cut sheets of paper or card-board, in two colors, and consecutively numbering the same at one passage of each sheet or ticket through the press.

In the accompanying drawings like letters refer to like parts in each of the figures.

For convenience and perspicuity I shall divide the description of my machine into several parts: first, the impression-movements; second, the feeding mechanism; third, the inking mechanism; fourth, summary of movements.

*Impression-movements.*—A represents the side frames which support the bed-plate, cross-head, and principal shafts of the machine. B represents the bed-plate, upon which the sheets of paper lie while receiving the impression from the type, it resting upon the flanges or shoulders A<sup>1</sup> on the inside of the side frames A, and being securely bolted thereto. C represents the cross-head, which carries the platen C<sup>1</sup>, holding the forms of type C<sup>2</sup> C<sup>3</sup>. This cross-head reciprocates to and from and at right angles to the bed-plate, moving between jaws A<sup>2</sup>, which are part of the side frames A.

The platen C<sup>1</sup> is connected to the cross-head at its four corners by suspension-bolts C<sup>4</sup>, passing up through the platen and through the arms C<sup>5</sup>, projecting from the cross-head, or rather through hollow impression-screws C<sup>6</sup>, screwing through said arms and bearing upon the upper side of the platen. By turning these impression-screws up or down, as occasion requires, (the suspension-bolts turning with them,) the platen may be raised or lowered on the cross-head in a manner to secure a proper impression of the forms on the bed-plate. A longitudinal groove is made in the platen, into which the cross-head fits, as shown at C<sup>7</sup>, vertical but no lateral play being allowed, so that when the impression-screws are set the platen and cross-head are joined rigidly together.

D represents the crank-shaft, having journal-bearings in the side frames below the bed-plate and in line with the jaws in which the cross-head moves. This shaft carries crank-wheels D<sup>1</sup>, one on each end thereof, and outside of the side frames A. From the crank-pins D<sup>2</sup> of these wheels extend the side connecting-rods D<sup>3</sup>, taking hold of the ends of the cross-head C, which are projected beyond the side frames for that purpose. The revolution of the crank-shaft thus gives the required reciprocating motion to the cross-head and the platen and forms of type connected therewith.

The crank-wheels are made of as large a diameter as possible, and upon the side opposite the crank-pins have counterbalance-weights D<sup>4</sup> attached to or cast in them, sufficient to balance the weight of the cross-head, platen, and forms of type, so that their motion may be steady and without jerk or jar.

E represents the main driving-shaft, having bearings in the side frames, and carrying a pinion, E<sup>1</sup>, at one end, gearing with cogs cut in the periphery of one of the crank-wheels, and thus giving motion to the crank-shaft. A fast and loose pulley are placed at one end of the driving-shaft, upon which the driving-belt communicating with the motive power runs, and a balance or fly wheel, E<sup>2</sup>, is placed on the opposite end.

The forms of type C<sup>2</sup> C<sup>3</sup> are locked in a double chase, C<sup>8</sup>, which is secured to the platen by insertion between grooved guides C<sup>9</sup>, Fig. III, at the ends of the platen, which construction per-

mits its convenient attachment to or removal from the platen. The first form contains such portion of the subject-matter of the ticket as is desired to print in a certain color, (say, black,) and the second form such other part of the subject-matter as it is desired to print in some other color, (say, red,) the relative position of the two forms being such that, supposing an impression of the first form to be taken, and the sheet carried directly forward to an impression of the second form, the double impression will give the whole subject-matter of the ticket properly spaced and arranged.

In addition to the forms of type, the cross-head carries, by means of extensions  $C^{10}$  of its arms  $C^5$ , a cross-bar,  $C^{11}$ , to which one or more numbering-wheels,  $C^{12}$ , may be attached for the purpose of numbering the sheets or tickets as they pass through the press.

The bed-plate  $B$  is made wide enough to receive the impression of both forms of type and the numbering-wheels.

From the foregoing it appears that each sheet must be passed to three successive impressions, viz.: to the first and second, which print the subject-matter, and to the third, which numbers, the distance between the first and second form and the second form and the numbering-wheels being made, by construction, such that equal progressive movements of the sheet will carry it from one to the other. The following described mechanism accomplishes the result.

*Feeding mechanism.*— $F$  represents two endless chains passing longitudinally around the bed-plate near each side thereof, and running over chain-wheels  $F^1$ , carried in pairs by shafts  $F^2$  extending across the ends of the bed-plate, said shafts turning in journal-brasses fitted to jaws projecting from the corners of the bed-plate. Grooves are cut in the surface of the bed-plate, which receive the upper stretchers of the chains, so that their upper edge may be flush with the surface of the bed-plate.

$G$  represents the nipper bars or slats, extending across the bed-plate, and connected at their ends to the chains  $F F$ , equidistant from and parallel to each other, their distance apart being made just equal to the distance a sheet is required to move in passing from one form to the other, as before mentioned.

Each nipper-bar carries two, four, or more nippers,  $G^1$ , each nipper consisting of two thin steel plates, the one riveted to the under side of the bar, and projecting backward from its edge a short distance, and the other secured by screws at one end to the upper side of the bar, its free end being bent to a right angle, and nipping tightly on the projecting end of the lower plate. (See Fig. V, Sheet IV.) The downward bend of the upper plate of the nipper is notched out, as shown at  $G^2$ , to permit the opening of the nipper to receive or discharge a sheet, as will hereinafter be described.

An intermittent progressive movement is given to the nipper-bars as follows: A ratchet-

wheel,  $H$ , is keyed on one end of the front chain-wheel shaft  $F^2$ , into the teeth of which a pawl,  $H^1$ , works, said pawl being carried by a loose pinion,  $H^2$ , on the same shaft as the ratchet, the pinion having a vibrating movement given to it by the reciprocating movement of a rack-bar,  $H^3$ , receiving its movement from an eccentric,  $H^4$ , upon the crank-shaft. The pawl  $H^1$  engages a tooth of the ratchet during the forward vibration of the pinion, and causes the shaft  $F^2$  to move with it, thus advancing the nipper-bars a certain distance. During the return vibration of the pinion, for the pawl to take a new hold on the ratchet-teeth, the nipper-bars are left in the position to which they were advanced.

The movement of the pinion bears such relation to the size of the chain-wheels that it will advance the nipper-bars a distance just equal to their distance apart, so that each movement will bring any one of them into the position just before occupied by the one in advance thereof.

The position of the eccentric with reference to the cranks is such that the cross-head will have begun to rise before the nipper-bars begin to advance, which will insure them being at rest when the cross-head is down and the impression being taken.

The position of the nippers when at rest is such that the sheets which they hold shall be in position to receive the impression of the forms. By always locking the forms, whether large or small, with their front edges to the same side of their respective chases, this at-rest position of the nippers never requires to be changed, but accommodates all forms large or small.

The sheets are fed to the first set of nippers above the bed-plate, and discharged from the last, both operations being performed simultaneously, and while the nippers are at rest.

The opening of the nippers to receive the sheet is effected as follows: A rock-shaft,  $I$ , extends across the front end of the bed-plate, directly over the at-rest position of the first nipper-bar, being supported at each end by brackets  $J$  bolted to the bed-plate outside of the chain grooves. This shaft carries the nipper-openers  $I'$ , corresponding in number and position to the nippers on each bar. The openers are wedges, which by the movement of the rock-shaft  $I$  swing into the notches  $G^2$  of the nippers, and spring the upper plate thereof upward. A clamp-bar,  $J^1$ , hinged to the brackets  $J$  is thrown down upon the nipper-bar, before the openers enter the nippers, by the action of cams  $J^3$  on the rock-shaft  $I$ ; so that the nipper-bar is held perfectly firm and rigid during the opening of the nippers. The rock-shaft receives its movement from a cam,  $K$ , on the crank-shaft, connecting with a lever-arm,  $K^1$ , at one end of the rock-shaft by a connecting-rod,  $K^2$ . The form of this cam and its position upon the crank-shaft with reference to the feed-eccentric  $H^4$  is such that it gives movement to the rock-shaft to clamp the

nipper-bar and open the nippers immediately after they have come to rest, and to raise the clamp-bar and close the nippers before their next forward movement begins.

As the feed-eccentric allows the nippers to remain at rest one-half of the revolution of the crank-shaft, the cam K may be made to give the required movement to the rock-shaft and hold the nippers open one-third (or nearly so) of a revolution, which gives ample time for the introduction of a sheet therein.

The sheets are fed from a table, K<sup>3</sup>, the surface of which stands slightly above the lower plate of the nippers, so that the introduction of the sheet is made sure and easy.

The opening of the last set of nippers and the discharge of the printed sheet are effected as follows: A rock-shaft, L, with its openers L<sup>1</sup> and clamp-bar L<sup>2</sup>, is arranged over the last nipper-bar, the same as described for the first nipper-bar, its motion being obtained from the lever-arm K<sup>1</sup> of the first, through a connecting-rod, K<sup>4</sup>, reaching to a similar lever-arm, K<sup>5</sup>, at its end.

After the nippers are opened the sheet is withdrawn from them by a set of fingers, L<sup>3</sup>, attached to a cross-bar, L<sup>4</sup>, moved backward and forward by means of the cams L<sup>5</sup> on the rock-shaft L. The cross-bar moves in slotted arms L<sup>6</sup>, which are part of the clamp-bar, so that the fingers are made to partake of the up-and-down movement of the clamp-bar, in addition to the back-and-forth movement given to them by the cams L<sup>5</sup>. Hence, as the clamp-bar moves down on the nipper-bar, the fingers L<sup>3</sup> strike in between the front edge of the sheet and the nipper-bar, and as the openers enter the nippers and release the ticket, the backward movement of the fingers given by the cams withdraws the ticket therefrom. The upward movement of the clamp-bar raises the draw-out fingers with it, so that the sheet may pass forward under them. The sheet, as it is withdrawn from the nippers, is received on tapes L<sup>7</sup>, passing from a loose spring-roller, L<sup>8</sup>, around tape-wheels L<sup>9</sup>, secured to the chain-wheel shaft and moving therewith, so that at the next movement of the nippers the tapes carry the withdrawn sheet forward and discharge on it a receiving-table, L<sup>10</sup>.

*Inking mechanism.*—M represent the fountain ink-rollers, arranged one on each side of the platen, they being supported by arms M<sup>1</sup>, hinged to the jaws A<sup>2</sup> of the side frames.

N represents the form-inking rollers, each of which, starting from contact with its fountain-roller, moves over the adjacent form and returns, so that by supplying each fountain-roller with a different-colored ink the forms may be inked in different colors without conflict.

The motion of the inking-rollers is obtained as follows: N<sup>1</sup> are rock-shafts, located one on each side of and equidistant from the crank-shaft, and having bearings in the side frames. Each shaft carries two long arms or levers, N<sup>2</sup>, and a short arm, N<sup>3</sup>, with a stud-roller at its end,

working in a cam, N<sup>4</sup>, on the crank-shaft, by which a vibrating motion is given to the levers N<sup>2</sup>. To the vibrating ends of said levers radius-arms N<sup>5</sup> are hinged, the free ends of which carry the inking-rollers N, supported thereon by spring-bearings N<sup>6</sup>, the vibration of the levers carrying the inking-rollers over the forms, as required.

O are grooved slides, attached to the under side of the platen at the ends thereof, and parallel to the face of the forms. Stud-rollers O<sup>1</sup>, projecting sidewise from the free ends of the radius-arms, run in these slides as the rollers travel over the forms, which causes the radius-arms and the rollers they carry to rise and fall with the platen as they pass in and out over the forms.

The shape of the inking-roller cams N<sup>4</sup> is such that they will hold the inking-rollers back against the fountain-rollers during one-half or two-thirds of their revolution, or sufficient to receive a proper quantity of ink therefrom; and their relative position to the cranks giving motion to the platen is such that the inking-rollers will reach the limit of their forward vibration at the same time that the platen reaches the limit of its upward movement, so that both platen and inking-rollers change the direction of their movement at the same time.

While in contact with the fountain-rollers the inking-rollers are supported by the stud-rollers O<sup>1</sup> of the radius-arms resting upon permanent bearings O<sup>2</sup> bolted to the side frames, which, when the platen is at a certain point of its upward or downward movement, form extensions of the under lip or flanges of the grooved slides O. This alignment of the bearers O<sup>2</sup> with the grooved slides O during the upward movement of the platen, takes place just as the inking-rollers in their forward movement reach the grooved slides, so that they pass fairly from the bearers into the slides. It occurs again during the downward movement of the platen, just as the inking-rollers in their return movement reach the bearers, so that they pass fairly from the slides on to the bearers.

The slides O being parallel to the face of the forms, the inking-rollers must necessarily move parallel thereto, although their movement is compounded with the movement of the platen. A perfect rolling of the form is the result of this parallel movement.

Motion is given to the fountain ink-rollers to supply the form ink-rollers, as follows: P represents gear-segments, supported by studs P<sup>1</sup> projecting from the right-hand-side frame, said segments gearing with pinions P<sup>2</sup> on the ends of the fountain-roller shafts. A vibrating motion is given to the segments from the crank-pin D<sup>2</sup> on that side through the connecting-rods P<sup>3</sup>. The vibration of the segments gives an alternately-reversed rotary motion to the fountain-rollers, which distributes the ink to the form-rollers while the same are in contact therewith, as before stated.

Each fountain-roller is provided with a dis-

tributing-roller, P<sup>4</sup>, which is held in close contact therewith by springs P<sup>5</sup> pressing upon its bearing-boxes, so that it may turn with the fountain-roller, it having a screw-thread, P<sup>6</sup>, cut at one end and working through a box-nut, which causes it to vibrate longitudinally upon the fountain-roller.

*Summary of movements.*—The first sheet, after making two of its progressive movements, reaches its position to receive the impression of the first form. The next progressive movement carries it to the impression of the second form and brings the second sheet forward to the impression of the first form. The next progressive movement carries the first sheet to the impression of numbering-wheels, the second sheet to the impression of the second form, and the third sheet to the impression of the first, this impression on the three sheets being given by same downward movement of the platen, and completing the printing of the first sheet. The next downward movement of the platen completes the printing of the second sheet, which has been properly progressed by the movement of the nippers, the first being withdrawn from the nippers and lying upon the discharge-tapes, so that at the next progressive movement it is discharged onto the receiving-table. From this time a completed sheet is discharged at each impression of the platen.

After each impression the inking-rollers pass over their respective forms and supply them with ink for their next impression.

Although the feeding mechanism, as described, is calculated to carry a sheet to three successive impressions, yet it is evident that it may be modified to carry the sheet to only one impression, or extended to carry it to more than three, without changing the nature of the devices used.

It is evident, also, that the inking mechanism may be used in a press having only one form to ink.

Having thus described my improved printing-press, what I claim therein as new, and desire to secure by Letters Patent, is—

1. The combination of the wedge-openers I<sup>1</sup>, or their equivalent, with the nippers G<sup>1</sup>, having an intermittent feed movement, constructed and operating substantially as described.

2. The draw-out fingers L<sup>3</sup>, operating, in connection with the wedge-openers, to remove the sheets from the nippers G<sup>1</sup>, substantially as set forth.

3. The grooved slides O, attached to the platen parallel to the face of the form, and carrying the inking roller or rollers over the form, in the manner and for the purpose substantially as described.

4. The arrangement of the inking-roller cams N<sup>1</sup>, radius-arms N<sup>2</sup>, supported upon the vibrating levers N<sup>2</sup>, and carrying the form-inking rollers N, combined with the grooved slides O and permanent bearers O<sup>2</sup>, so that the inking-rollers will reach the limit of their forward vibration at the same time the platen reaches the limit of its upward movement, and so that both platen and inking-rollers change the direction of their movement at the same time, substantially as described.

5. The fountain ink-rollers, in combination with segments P, which receive their motion from one of the cranks D<sup>2</sup>, for the purpose and substantially as set forth.

6. Attaching the platen to the cross-head by the combined suspension-bolts C<sup>4</sup> and impression-screws C<sup>6</sup>, in the manner and for the purpose set forth.

7. The clamp-bars J<sup>1</sup> and L<sup>4</sup>, (either or both,) arranged and operating substantially as described, and for the purpose specified.

WALTER H. FORBUSH.

Witnesses:

P. T. DODGE,  
N. C. DODGE.