J. L. FIRM.

ROTARY PERFECTING-PRESS.

No. 169,796. Patented Nov. 9, 1875.

Fig. 1.

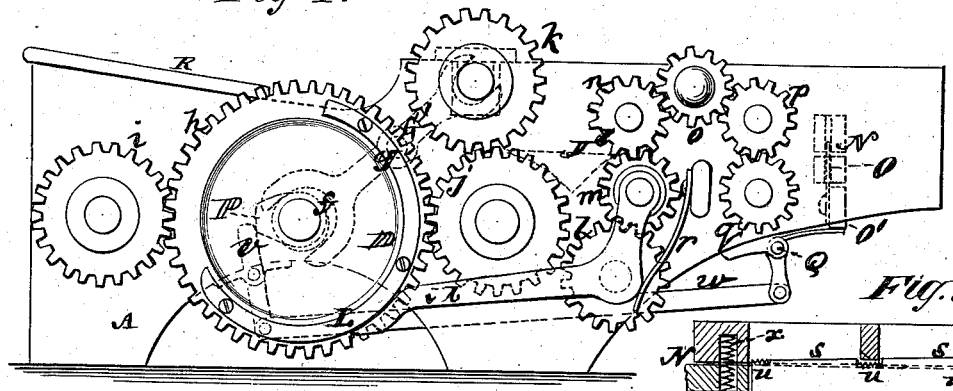


Fig. 5.

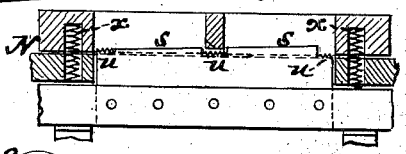


Fig. 2.

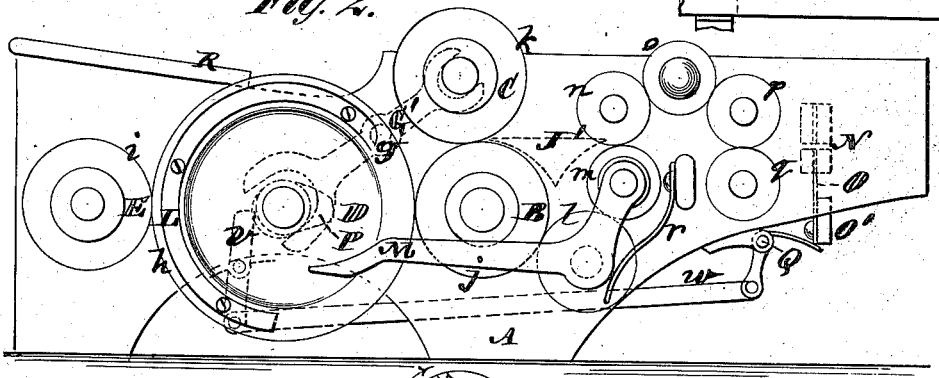


Fig. 3.

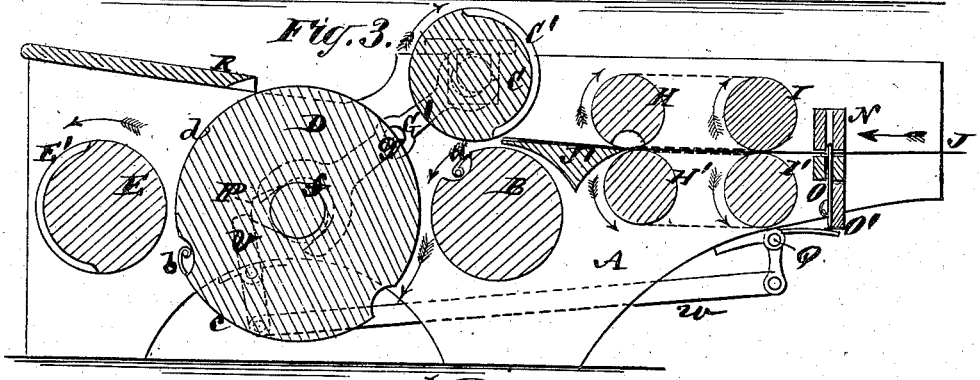
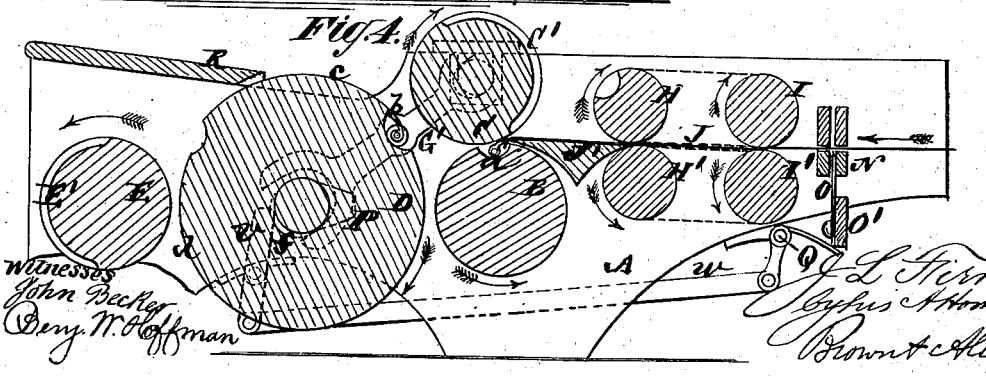


Fig. 4.



Witnesses
John Becker
Benj. W. Hoffman

J. L. Firm
by his Attorneys
Brown & Allen

UNITED STATES PATENT OFFICE.

JOSEPH L. FIRM, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF HIS RIGHT TO CALVERT B. COTTRELL AND NATHAN BABCOCK, OF WESTERLY, R. I.

IMPROVEMENT IN ROTARY PERFECTING-PRESSES.

Specification forming part of Letters Patent No. **169,796**, dated November 9, 1875; application filed September 7, 1875.

CASE C.

To all whom it may concern:

Be it known that I, JOSEPH L. FIRM, of the city, county, and State of New York, have invented certain new and useful Improvements in Rotary Perfecting-Presses; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, which forms part of this specification.

One part of this invention relates to rotary printing-presses designed to print on both sides of the paper as it passes through the machine. This part of the invention consists in a novel combination of two type-cylinders and two impression-cylinders—that is, one type-cylinder and one impression-cylinder—either of which is made to rise and fall, and one enlarged impression-cylinder and reduced type-cylinder, the whole operating together, so that the forms of both type-cylinders are double inked in or during the printing of the paper on its opposite sides. Another part of the invention consists in a combination, with a paper cutting or printing machine, to which the paper is supplied in a continuous web or roll, and subsequently divided into sheets, of a knife having the greater portion of its edge straight, but having portions of its edge serrated, whereby the sheet, when cut, has a clean straight edge, but is not detached from the web till the requisite feed has been made.

Figure 1 represents a side view of a rotary printing-press, in part, having my invention applied; and Fig. 2, a similar view with the working parts in a different position. Fig. 3 is a longitudinal vertical section with the parts in the position represented in Fig. 1; and Fig. 4, a further vertical longitudinal section with the parts in the position represented in Fig. 2. Fig. 5 is a vertical transverse section, in part, in illustration of the knife which cuts the web or roll.

A is the frame of the press constructed for printing on both sides of the paper. B is the first impression-cylinder, and C its form cylinder or roller. D is the second impression-cylinder, and E its form cylinder or roller. H H′ and I I′ are pressure and feed rollers, arranged between the knife K, which cuts the web or roll, and the first impression and form cylinders B C. J is the web of paper, fed from a roll into the press. Said paper J, being fed to the gripers *a* of the impression-cylinder B as the latter and the type or form cylinder C rotate in the direction indicated by arrows in Figs. 3 and 4, is carried round with the curved form C′ of said type cylinder, and is printed on its one side. At the point where the impression cylinders B and D and the gripers *b* of the cylinder D meet the gripers *a* take the sheet or paper and transfer it to the impression-cylinder D, by which, in connection with the curved form E′ of the second type or form cylinder E, the paper has its other side printed. The cylinders B, C, and E are all of the same diameter; but the impression-cylinder D is twice the diameter of the cylinders B, C, and E, and the several cylinders are so geared together that the cylinder D only makes one revolution for each two revolutions of the cylinders B, C, and E. Only a portion, *c*, of the circumference of the impression-cylinder D is designed to work in contact with the form or type cylinder E, the remaining portion *d* of said impression-cylinder D being suitably cut away or reduced. This construction and relative arrangement or proportion of the impression-cylinder D to the type-cylinder E allows the latter to ink the form E′ twice to one impression of the cylinder D. Furthermore, the type-cylinder C, or it might be the impression-cylinder B, is made to rise and fall once during each revolution of the cylinder D, so that the type-cylinder C will only print when said cylinder is down, thereby inking the form C′ twice to one impression of the cylinder B.

Various mechanical devices may be employed to raise and lower the type-cylinder C; but a suitable means for the purpose is an eccentric, *f*, on each or opposite ends of the shaft of the cylinder D, and made to rock levers G, having intermediate fulcrums *g*, which levers are constructed with jaws at their upper ends, to receive within them the shaft of the type-cylinder C at its opposite ends.

The gearing by which the cylinders B, C, D,

and E are connected is lettered, respectively, *h i j k*.

The usual or any suitable tapes are applied to said cylinders, or certain of them, for holding on to the edge of the paper during its travel while being printed; but these and the inking devices it is not necessary here to show.

The pressure and feed rollers H H′ I I′, for conducting the paper to the type and impression-cylinders, are arranged in pairs one above the other, and should also be provided with or connected by tapes for conveying and holding the paper at its edges. The upper or advance one, H, of these rollers may also be fitted with gripers for taking hold of the paper. Said rollers H H′ I I′ are geared to rotate in concert in the direction indicated by their respective arrows by spur-wheels *l m n o p q*. Unlike the cylinders B, C, D, and E, which have a continuous rotatory motion, these rollers H H′ I I′ have an intermittent rotary motion, for the purpose of stopping the feed of the paper during the double inking of the form-cylinders C and E, and to hold on to the paper while the forward portion of the paper corresponding with the sheet to be produced is caught and torn from the web at any suitable point between the feed-rollers or advance feed and pressure rollers H I, and the type and impression cylinders B C. If desired, said tearing operation may take place over the front edge of an intermediately-arranged board, J′.

The means for intermittently rotating the feed and pressure rollers in proper relation with the impression and type cylinders may be varied; but a simple means for the purpose consists in a cam or broken ring, L, on the face of the gear-wheel *h* of the impression-cylinder D, arranged so that when coming round it bears on a lever, M, to throw the operating-wheel *l* of the feed and pressure rollers out of gear with the wheel *j* of the first impression-cylinder, whereby the feed of the paper is stopped while the form-cylinders C E receive their double inking, and till after the impression-cylinder B or its gripers have got a hold on the paper to tear it apart between the feed-rollers and the first impression and type cylinders. After the rear end of the cam L has passed the lever M, the latter is shot by a spring, *r*, into between the broken or interrupted cam L, and the wheel *l* accordingly put into gear with the wheel *j* to actuate the feed.

The paper J is passed in a web from a roll, or otherwise, to the feed-rolls through a clamp or slotted frame, N, up and down within which a knife, O, is made to work at intervals. This knife, unlike a mere serrated cutter, operating to perforate the web throughout its entire width, so that it may be afterward torn off at the perforated portion, leaving a ragged edge to the sheet, and unlike a straight-edged cutter throughout its length operating to wholly sever the web, combine both of these features in the one device by constructing said knife with the greater portion of its edge straight, but the other portion of its edge serrated. Thus it is made straight at its edge portions *s* to give a clean or through cut, and such portions set inclining to give a draw-cut, and serrated at its edge portions *u* to simply perforate the paper at points in the length of the knife between or beyond the straight-edge portions of the latter.

By means of this construction of the knife, the portions of the paper perforated by the edge portions *u* of the knife present a sufficient continuity of the web to provide for the feed of the paper, yet admit of a free or easy tearing action, and, by reason of the cut throughout its greater portion being made thorough by the straight-edge portion *s* of the knife, each sheet as it is torn from the web will present a smooth severed edge, or mainly so.

Said knife O is worked up and down at suitable intervals to cut the web during the stopping periods of its feed into lengths corresponding with the sheets to be produced. A simple means for this purpose consists of a cam, P, on the shaft of the cylinder D, arranged to operate a lever, *v*, which, by means of a rod, *w*, and arms or cranks and toes connected with a rock-shaft, Q, lifts the frame O′, which carries the knife O as against springs *x*, having a reverse action on the knife-frame.

R is a feed-board, for the passage of slip-sheets to the impression-cylinder D, which may be provided with special gripers to gripe the slip-sheets as fed from the board, essentially as described in my Letters Patent No. 146,441, issued to me January 13, 1874.

I claim—

1. The impression-cylinder B and type-cylinder C, either of which is made to rise and fall, as described, in combination with the enlarged impression-cylinder D and its reduced type-cylinder E, whereby the forms of both type-cylinders are double inked in or during the printing of the paper on its opposite sides, essentially as described.

2. The combination, with a paper cutting or printing machine, of the knife O, having the greater portion of its edge straight, but having portions of its edge serrated, substantially as and for the purpose herein described.

JOSEPH L. FIRM.

Witnesses:

MICHAEL RYAN,

BENJAMIN W. HOFFMAN.