J. C. FORMAN.

Paper-Ruling Machine.

No. 213,042 Patented Mar. 11, 1879.

Fig. 1.

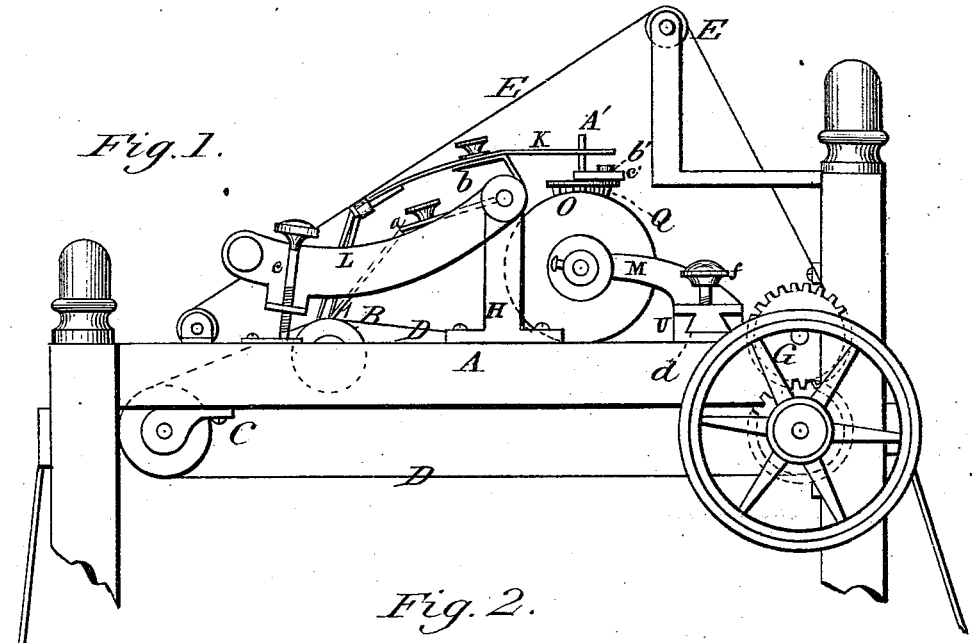


Fig. 2.

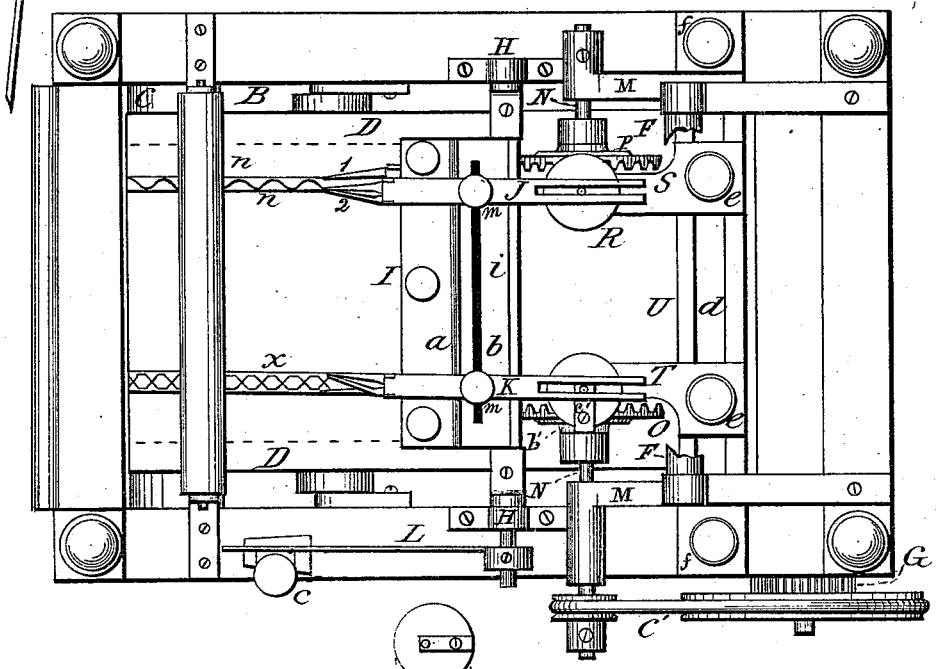
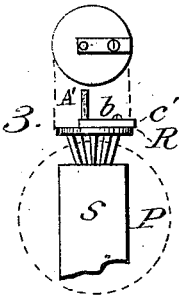


Fig. 3.



Witnesses:

W. L. Beecher

James Gay

Inventor:

J. C. Forman

By Burridge & Co

Atty.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JONATHAN C. FORMAN, OF CLEVELAND, OHIO.

IMPROVEMENT IN PAPER-RULING MACHINES.

Specification forming part of Letters Patent No. **213,042**, dated March 11, 1879; application filed December 13, 1878.

To all whom it may concern:

Be it known that I, JONATHAN C. FORMAN, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new Improvements in Paper-Ruling Machines; and I do hereby declare that the following is a full, clear, and complete description thereof, reference being had to the accompanying drawings, making a part of the same.

This invention relates to certain mechanism attached to a paper-ruling machine for ruling ornamental borderings, head-lines, &c.; and consists of vibrating pen-holders operated by an adjustable cam secured to the crown of a beveled pinion, and made to engage a corresponding beveled wheel for actuating the same. By means of the said adjustable cam various ornamental borderings may be made, consisting of curvilineal lines in various degrees of curvature, in combination with right lines.

A full and complete description of the aforesaid invention is substantially as follows:

Figure 1 is a side elevation of the ruling-machine, to which the mechanism above referred to is attached. Fig. 2 is a plan view of the same.

Like letters of reference refer to like parts in the several views.

In a suitably-constructed frame, A, is journaled the pen-roller B; also, a roller, C. In the opposite end of the frame is journaled a roller corresponding to the roller C, around which roller and said roller C and over the pen-roller passes the apron D, whereon are laid the sheets of paper for being ruled.

E are the binding-cords, arranged and operating for holding the paper to the apron, substantially in the same way as those in ordinary use.

The elevated roller F is shown as broken away in Fig. 2, that the mechanism beneath may be seen.

The apron and the binding-cords, together with their respective rollers, are actuated by the gearing G, all of which is or may be like such in common ruling-machines; hence a further description thereof will not be necessary.

In the standards H is journaled the pen-beam I. Said pen-beam consists of a pen-clamp, *a*, in which are secured the pens for ruling straight lines. Immediately above said clamp *a* is a leaf, *b*, to which are secured the vibrating levers J and K, in the ends of which are secured the pens for ruling curved lines, in combination with the straight lines, for ornamental work. To the outer end of the pen-beam is attached an arm, L, for lifting the pens from the paper, which are retained above the paper by the adjusting-screw *c*.

By means of said screw *c* the pens are adjusted in their relation to the paper for ruling. M are a pair of arms, in which is journaled a shaft, N. To said shaft are secured the beveled wheels O and P, made to engage the beveled pinions Q and R, having their pivotal bearings in the arms S and T. The said arms S T are attached to a bar, U, provided with a dovetail groove *d*, Fig. 1, in which the arms are fitted so as to slide therein. Said arms are secured at any particular place by set-screws *e*.

The arms M, above alluded to, are also fitted in the dovetail groove, and secured therein by the set-screws *f*.

To the upper end or face of the pinions P and Q, above referred to, is secured, respectively, a cam-block, *c'*, or its equivalent, by a set-screw, *b*. Said block is adjustable, so that the pintle A', projecting upward from the block, can be adjusted more or less near to the axial line of the pinion, around which axial line the pintle rotates, thereby vibrating the pen-levers J and K, above referred to, through the bifurcated end of which the pintles respectively project, as shown in the drawings. The said pen-levers are attached by set-screws *m* to the pen-beam, the screws being the axis of vibration. Said set-screws pass loosely through the levers into the slot *i*, and are screwed into a plate below the slot.

By means of the set-screws and slot the pen-levers may be adjusted transversely, to adapt the pens to different widths of paper, and for ruling closer or wider, as the case may be.

It will be observed from the above that the measure of the vibrations of the pen-levers will depend upon the distance that the pintle is from the axis of the pinions—the greater the distance the greater the vibration; hence the lateral stroke of the pens will accord with the stroke of the pintle.

In the event a greater vibration is required

than can be obtained by the adjustment of the cam-block and pintle, the levers can be moved forward, making the pen end of the levers longer than the pintle end. This, however, will seldom, if ever, be necessary.

In making a lateral adjustment of the pen-levers, if the change be much, the pinions and companion-wheels O P will also need adjustment, that the levers and operative mechanism may be in line. To this end is the purpose of fitting the arms supporting the pinions in the groove of the bar U, as above described. The wheels O P are movable on the shaft and secured by set-screws, that they may be adjusted for the purpose above said.

The practical operation of the above-described machine is as follows: As hereinbefore said, the purpose of the machine is for ruling curved lines for borderings, &c. To this end, if straight lines are to be ruled with the curved ones—the straight-line pens are secured in the clamp *a* of the pen-beam, as shown at 1 and 2, whereas the pens for ruling the curved lines are fixed in the ends of the vibrating levers.

It will be obvious that as the machine operates the straight lines *n* will be drawn by the stationary side pens, while the middle curved line will be drawn by the vibrating pens, thereby producing a simple wave-line between the two straight ones, as shown in Fig. 2.

The undulations of the line may be more or less, according to the measure of the lever's vibration; hence the curve may be very wide or short, as the nature of the work may require. In the event double-curved lines are required, interlocking or crossing each other, forming loops, as shown at *x* in Fig. 2, two pens are attached to the lever, and are so adjusted that the point of one pen shall be in advance of the other and directly in front of it, as shown in Fig. 1. If straight lines are to be ruled in association with the curved ones, the pens for that purpose are fixed in the clamp *a* of the beam, and are therefore stationary. As the machine operates the straight side lines will be drawn by the stationary pens, while the curved lines will be drawn by the two vibrating pens, forming the loops between the two side lines.

Many variations of the above double lines can be made—viz., the loops may be made longer or shorter by setting the points of the pens nearer together or farther apart, and greater breadth may be given them by increasing the vibratory throw of the lever. This may be done by adjusting the cam-block so as to carry the pintle farther from the axis of the pinion. By adjusting the pintle nearer the axis of the pinion the vibrations will be shorter, thereby reducing the curvature of the lines, making a succession of elongated loops.

Without changing the points of the pens, but increasing the throw of the pen-levers, the elongation of the loops may be made in a transverse direction from the line of ruling, thereby changing the character of the design. By the addition of more pens the lines, both straight and curved, may be multiplied, and each one be of a different color by supplying each pen with a different-colored ink.

The number of variations in ruling which may be produced by changing the relation of the pens in respect to each other and the number of pens used are many, and therefore need not be represented. The two examples given will readily suggest others.

It will be proper to remark here that the various changes in the style of ruling depend more or less upon the speed of the wheels O P. In the event the wheels revolve slowly and the paper is moving fast, the curvings in the lines will be longer in consequence of the slow vibrations of the pens resulting from the slow movement of the wheels, and vice versa. This change in the speed of the wheels is effected by changing the pulley C′ from larger to smaller, as the case may be.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In paper-ruling machines, the adjustable vibratory pen-levers, in combination with the adjustable cam-block *c′*, pintle A′, pinion Q, and pen-beam, consisting of the clamp and leaf, substantially in the manner as described, and for the purpose set forth.

2. The pinion Q, having attached thereto the adjustable cam-blocks *c′* and pintle, in combination with the vibratory pen-levers and wheel O, in the manner substantially as described, and for the purpose set forth.

3. In paper-ruling machines, the combination of the wheels O P and shaft, journaled in the adjustable arms M, pinions Q R and pintle, pivoted in the adjustable arms S T, vibrating pen-levers, and pen-beam, substantially as set forth, for the purpose described.

JONATHAN C. FORMAN.

Witnesses:
J. H. BURRIDGE,
W. H. BURRIDGE.