

(No Model.)

2 Sheets—Sheet 1.

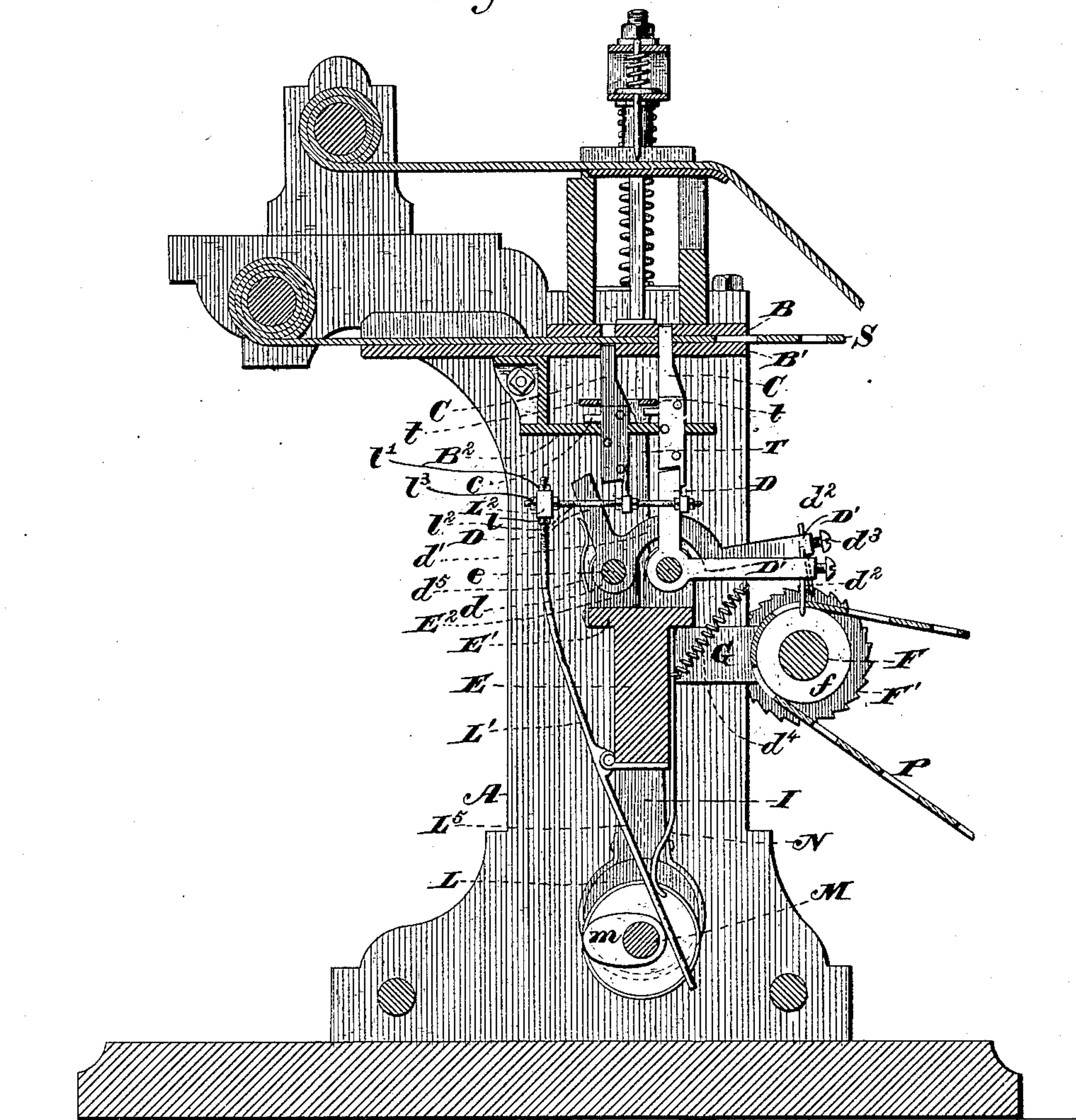
R. T. SMITH.

MACHINE FOR CUTTING MUSIC PAPER FOR AUTOMATIC MUSICAL  
INSTRUMENTS.

No. 318,049.

Patented May 19, 1885.

*Fig. 1.*



Witnesses:

*J. Henry Kaiser.*  
*Geo. T. Smallwood.*

Inventor:

*Roswell T. Smith,*

by

*Chas. B. Vildew*

*Att'y.*

(No Model.)

2 Sheets—Sheet 2.

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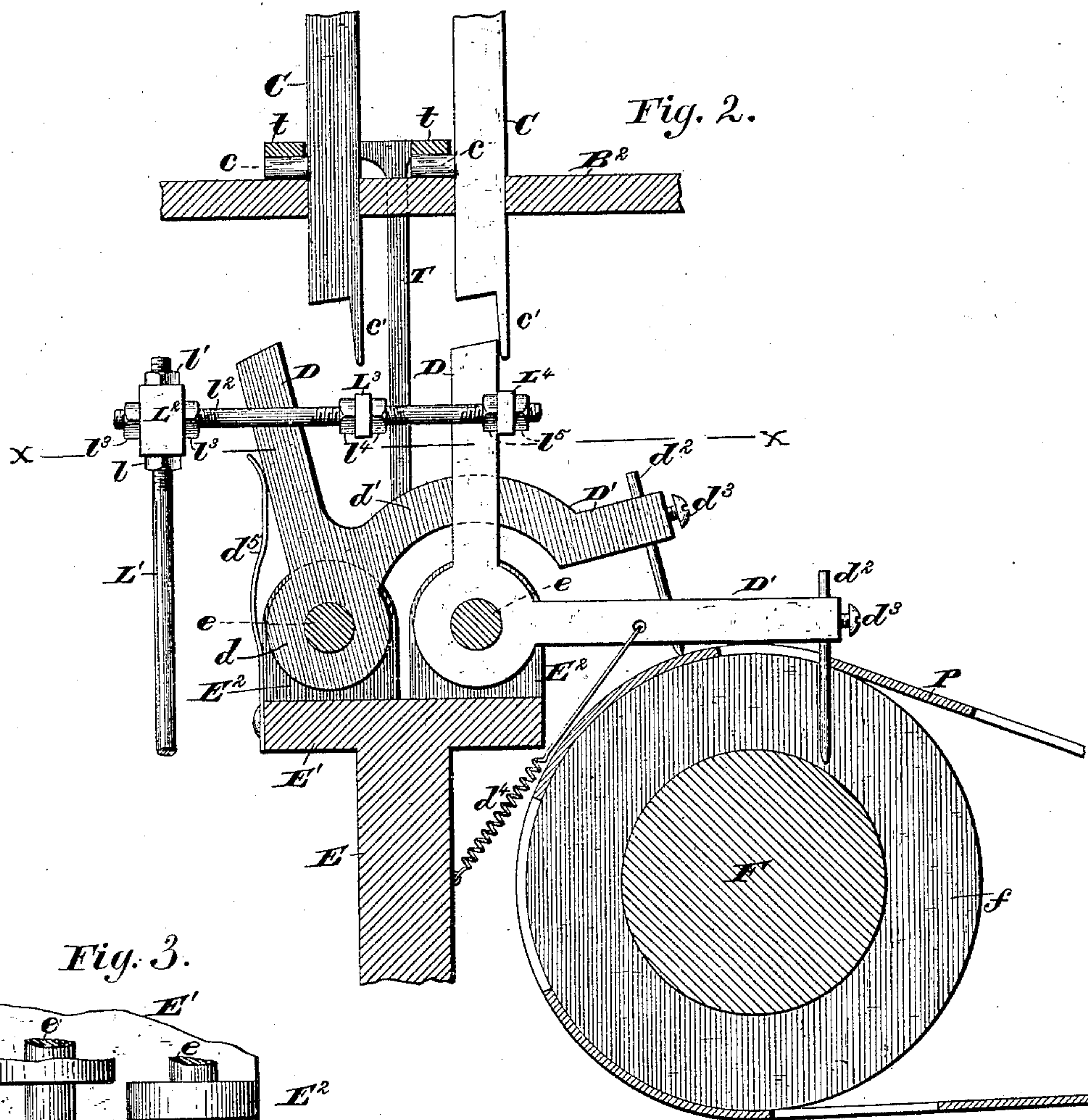


Fig. 3.

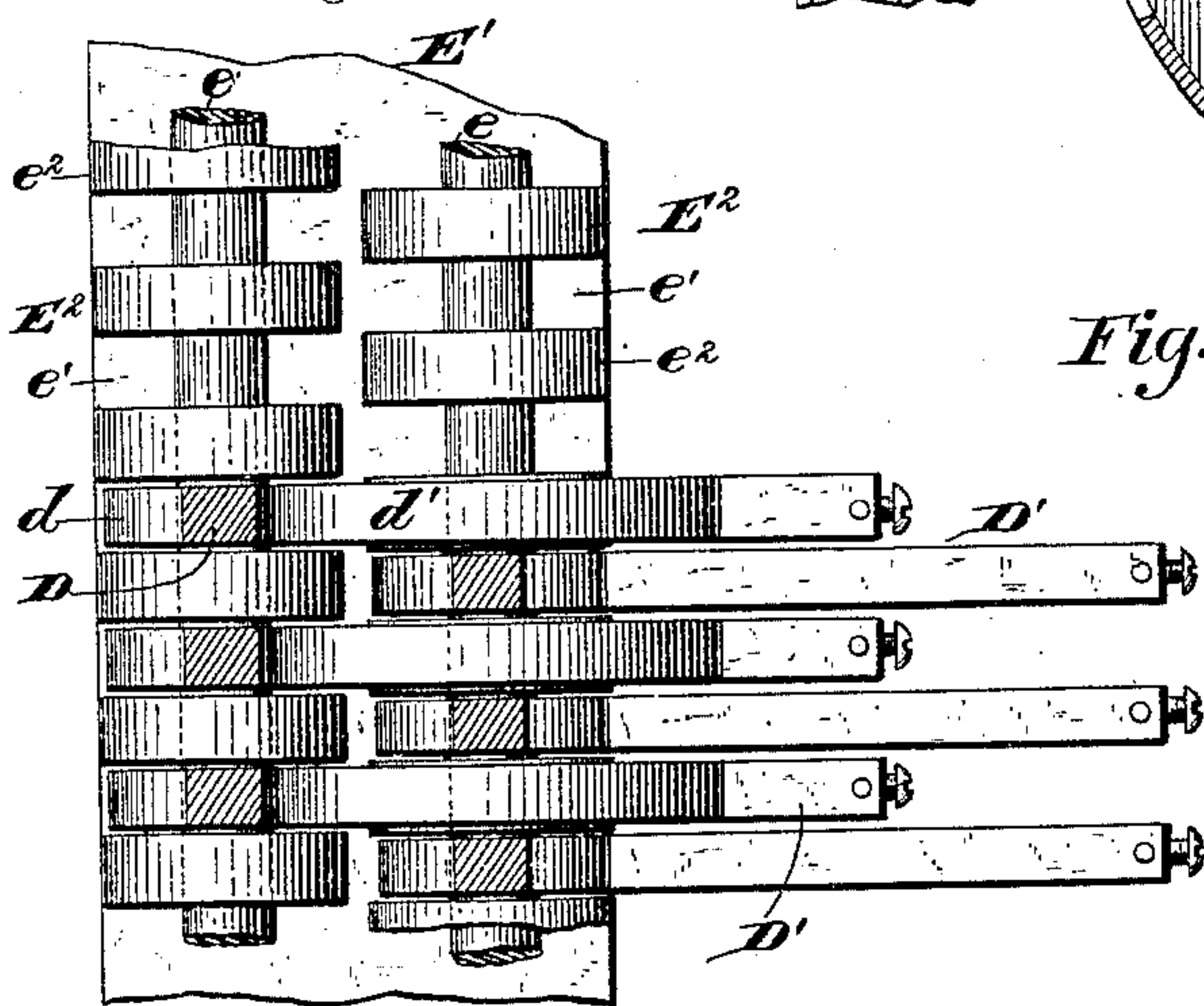
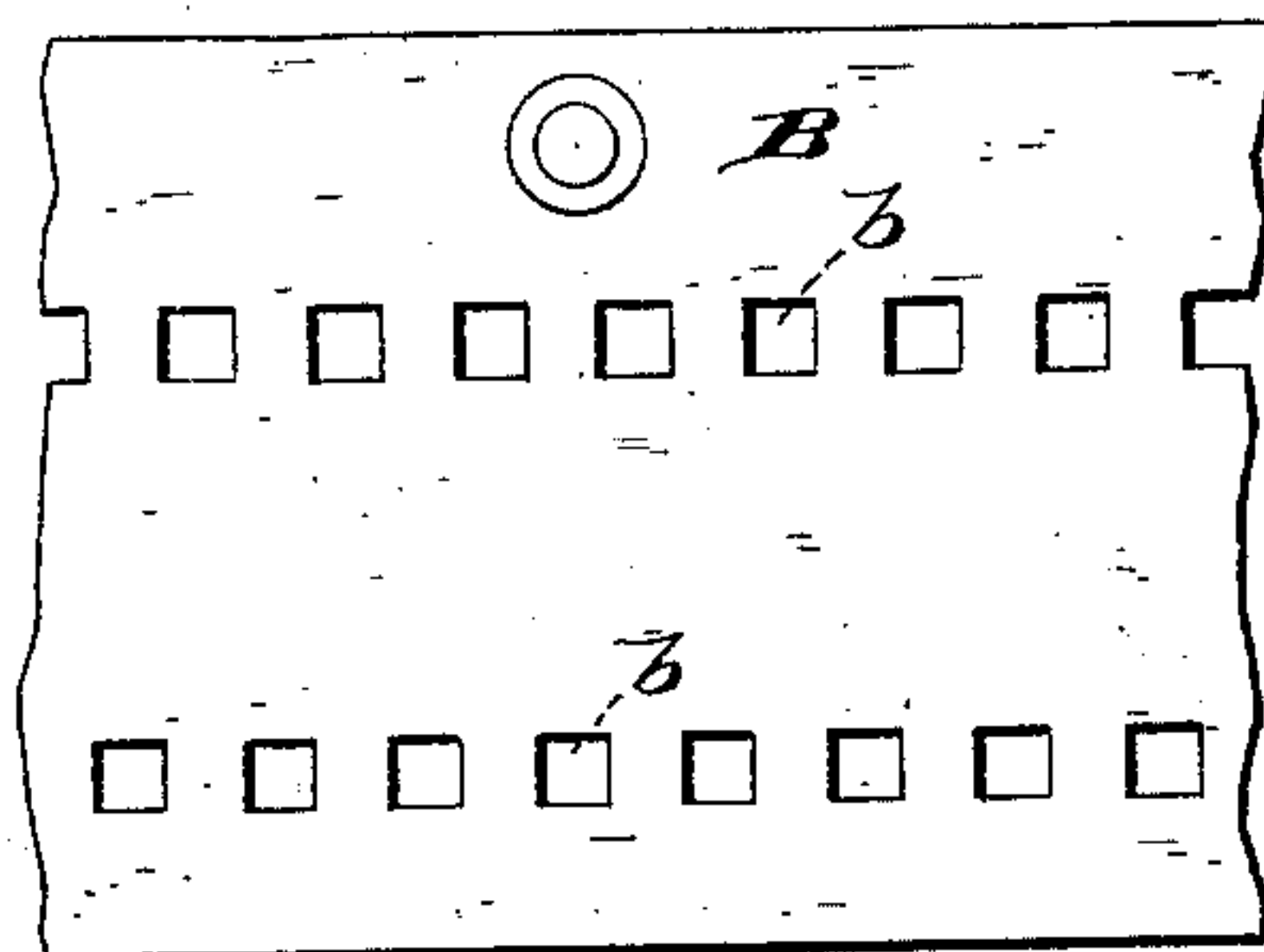


Fig. 4.



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# UNITED STATES PATENT OFFICE.

ROSWELL T. SMITH, OF NASHUA, NEW HAMPSHIRE.

MACHINE FOR CUTTING MUSIC-PAPER FOR AUTOMATIC MUSICAL INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 318,049, dated May 19, 1885.

Application filed August 29, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, ROSWELL T. SMITH, a citizen of the United States, residing at Nashua, in the county of Hillsborough and State of New Hampshire, have invented new and useful Improvements in Machines for Cutting Music-Paper for Automatic Musical Instruments, of which the following is a specification.

My invention relates to machines for cutting music-paper for automatic musical instruments; and it consists in certain improvements upon an invention for which Letters Patent of the United States were granted to me upon the 23d day of October, 1883, No. 287,062, wherein the cutting-punches are arranged in a double rank, and the selecting mechanism is controlled by two independent stencils or pattern-sheets.

The object of my present invention is to provide a perforating-machine, having its cutting punches arranged in double ranks, the members of one rank alternating with those of the other, said punches being selected and operated by devices having a similar two-rank arrangement, but controlled by a single pattern or stencil.

Referring to the drawings forming part of this application, Figure 1 is a vertical section taken from front to rear of the machine. Fig. 2 is a detail section taken in the same plane, showing a modification. Fig. 3 is a horizontal section taken on the plane  $x x$ , Fig. 2. Fig. 4 is a plan view of the die-plate detached. The three last figures are drawn upon an enlarged scale.

In the present instance, as well as in my application heretofore filed, the mechanism is so organized that the punches will cut upon what is termed a "hair-line." That is, if the punches in the rear rank were placed in the intervals between those in the front rank their adjacent faces would be in contact throughout the whole series, and if all the punches were operated simultaneously they would cut a single continuous opening or slot across the music-sheet.

In the patent heretofore granted to me, the cutting-punches are arranged in a single row, with an interval between the adjacent punches about equal to the width of each cutting. It has been found desirable, however, to cut for certain kinds of work upon a hair-line in the manner described, and my application now pending shows and describes an arrangement

of punches in two alternating ranks with a similar arrangement and alternation of the selecting and operating devices, the latter being controlled by two independent stencils, each representing alternate lines of cutting to be formed in the music-sheet.

In order to avoid the use of a double pattern-sheet, and to reduce the mechanism to its simplest form, whereby I avoid the necessity of accurately timing the two stencils relatively to each other, I employ a single stencil by which the selection and operation of the punches is controlled, the construction and operation being as follows:

A in the drawings represents one of the side standards of the machine by which the operative parts are supported. B is the die-plate, and B' the paper-supporting plate, which is arranged under the die-plate, with sufficient space between to permit the passage of the sheet or sheets to be cut. The punches C are arranged beneath the plate B', their ends resting in apertures formed in said plate. Below the latter is placed a guide-plate, B<sup>2</sup>, through which the body of each punch passes. Upon the back side of each punch is formed a tooth, c, which rests upon said guide-plate and supports the punch when it is not in action.

As already mentioned, the punches are arranged in two ranks, one in advance of the other, with the members of one rank alternating with those of the second. This arrangement will be more clearly understood by reference to Fig. 4, the apertures b formed therein indicating the relative arrangement of the punches.

Beneath each rank of punches is placed a corresponding rank of operating devices, D, having the same alternate arrangement. These parts, which are commonly termed dogs, are substantially similar in shape to the body of the punch, and have each a selecting-arm, D', formed upon or attached to the lower end, extending outward at right angles, or thereabout, to the dog. Each dog, with its arm, is mounted upon a pivot, e, which passes through a disk, d, formed at the point of junction.

E represents a reciprocating support, having a cross-head, E', formed upon its upper end. Upon this head are formed or secured two half-round trunks, E<sup>2</sup> E<sup>2</sup>, extending transversely from side to side of the machine, the arrangement being such that these trunks lie



beneath the two alternating ranks of punches. Cross-slots  $e'$  are cut in each, having a width sufficient to admit the disk  $d$ , as shown in Fig. 3, an intermediate solid portion  $e^2$  being left between the adjacent slots equal in thickness to the width of the slot. These cuttings,  $e'$ , are alternated between the two trunks to correspond with the alternations of the punches above, so that when the dogs D are mounted in place they will stand directly beneath the lower ends of the punches. The pivot-rods  $e$ , upon which the dogs D and arms E are mounted, are passed longitudinally through the solid portions  $e^2$  of each trunk, and have bearing therein. It is convenient to make each of these rods continuous, to extend from end to end of each trunk. The selecting-arms D' extend in the same direction and lie, normally, side by side. Those forming part of, or attached to, the front row of dogs are straight; but those belonging to the rear rank have an upward curve,  $d'$ , by which they are carried over the solid parts  $e^2$  of the forward trunk, and are thereby enabled to lie in the same horizontal plane with the other arms. At or near the forward extremity of each arm is placed a vertical pin,  $d^2$ , which may be placed in an opening in the arm and secured by a binding-screw,  $d^3$ , which enters the end.

F is the stencil-roll, arranged in bearing-plates G, supported by the reciprocating carrier or gate E, and so arranged that it lies beneath the ends of the arms D', and with its axis in or about in the vertical plane of the pins  $d^2$ , and at such a point that when the cam  $m$  acts upon the lever L' it lifts all the pins  $d^2$  clear of the stencil, and when said cam ceases to act, the collecting-arms being lowered, those pins which register with openings in the stencil will pass through the same and enter channels  $f$  cut in the roll at equal intervals. A ratchet, F', is rigidly mounted upon the end of the stencil-roll, and the latter is driven with a step-by-step motion by a pawl mounted upon a pawl-carrier which is loose upon the roll-shaft and reciprocated by a pitman upon the main shaft. These actuating devices are not shown in the drawings, as they are substantially identical with those shown in my patents of January 27, and November 2, 1880.

P represents the stencil or pattern sheet which passes over the roll F, and which has the music-openings formed therein in the usual manner and at such intervals as to bring the several lines of cuttings beneath the pins  $d^2$  and over the channels  $f$  cut in the roll F. The support E is reciprocated by pitman I, actuated by ring-cams L upon the main shaft M. As it rises those dogs which stand beneath the lower ends of the punches will engage therewith and drive them up through the paper sheet S. The selection of the punches required to act is effected, as set forth in my several patents mentioned, by means of the stencil P, in the following manner: When the pins  $d^2$  rest upon the surface of the stencil, the arms

D' are raised, as shown in Fig. 2, and the dogs D are thereby tilted back in such position that they are out of engagement with the punches. On the other hand, when the perforations of the pattern-sheet fall under the pins  $d^2$ , the latter pass through them and into the channels  $f$  of the stencil-roll. This allows the arm or arms to drop into a nearly horizontal position, bringing the end of the dog into engagement with the punch, the arms in the front rank being drawn down normally by springs  $d^4$  of light tension, and a similar function being exercised in the devices of the rear rank by leaf-springs  $d^5$ , arranged behind and bearing against the dogs. In order to effect a new selection after each stroke of the punches, it is necessary to lift all the arms in both ranks until the pins  $d^2$  are cleared from the openings in the pattern-sheet, thereby allowing the latter to be fed a single step forward, after which the arms are dropped, and a new disposition of the selecting and operating devices is effected corresponding with the new requirements of the pattern.

I provide the following mechanism for lifting the selecting-arms simultaneously: At the lower end of the carrier E is pivoted a lever having two parallel arms, L', arranged near each standard A, and projecting upward in rear of the dogs to a point about opposite their upper extremities. Upon the upper threaded ends of the arms L' are turned nuts  $l$ , upon which rests a bar, L<sup>2</sup>, extending from end to end of the series of dogs, the arms of the lever passing through holes in the bar. Nuts  $l'$  are then turned down upon the bar, holding it securely in place. In the bar L<sup>2</sup>, outside the arms L', are formed perforations transverse to those which receive said arms, and through them are passed rods  $l^2$ , having their ends threaded, with a nut,  $l^3$ , turned thereon upon each side of the bar L<sup>2</sup>, clamping said rods firmly in place and rendering them rigid upon it. These rods are each threaded at their forward ends and at an intermediate point, and nuts  $l^4$  being turned upon the latter a plate, L<sup>3</sup>, is slipped upon the rods, pushed up against said nuts and outer nuts,  $l^4$ , are then turned up against the plate, which is so adjusted that when the arms L' are thrown forward toward the dogs the face of the plate which is contiguous to said dogs will lie so nearly in the vertical plane of the forward faces of the punches as to permit the perfect engagement of the dogs therewith without the latter coming in contact with the plate. A similar plate, L<sup>4</sup>, is adjusted by nuts  $l^5$  upon the ends of the rods, and arranged in the same manner relatively to the front rank of punches and dogs. A lever-arm, L<sup>5</sup>, is rigidly connected with the pivoted arms L' and passes downward over the main shaft M, upon which is formed a cam,  $m$ , which at each revolution of the shaft throws the lever forward and draws the arms L' toward the rear, causing the plates L<sup>3</sup> and L<sup>4</sup> to tilt the dogs backward and raise all the arms D' until the pins  $d^2$  are cleared from the



openings in the stencil, and those which are resting upon the imperforate portions are raised slightly above it. At this moment the stencil P is fed a single step forward, after which the cam *m* leaves the lever *l*<sup>5</sup>, which is restored to its position by a leaf-spring, N, attached to the supports E, and bearing against the front of said lever. The action of the cam is timed so that it shall raise the arms after the punches have operated and just before the feed of the stencil begins. The arms D' are lowered after this feed is accomplished when those pins which happen to register with openings in the pattern will drop through the same and bring the corresponding dogs under those punches required to act at the next stroke of the machine.

It will be seen that the construction described enables me to adjust the position of the tripping-plates L<sup>3</sup> and L<sup>4</sup> relatively to the dogs in both directions, as well as vertically. After each stroke of the punches they are drawn out of the paper, and restored to their position by means of a double yoke, *t t*, arranged above the teeth *c* upon the backs of the punches. This yoke is carried by the bars T rigidly mounted upon the ends of the reciprocating carrier E.

In Fig. 1 I have shown the arms D' attached to the rear rank of dogs of such length that their ends lie in the same transverse line with those of the front rank. In Figs. 2 and 3 they are shown as being of equal length in both ranks, whereby the pins *d*<sup>2</sup> upon their ends have an alternate arrangement corresponding with that of the punches. Either form may be used, but on some accounts I prefer that shown in Figs. 2 and 3. In using this form it is well to make the stencil-roll somewhat larger, and arrange it so that the axis lies in the vertical plane between the two ranks of pins, as shown in Fig. 2.

In the arrangement shown in Fig. 1, in which the pins *d*<sup>2</sup> lie in the same transverse line, the cuttings in the stencil-sheet must be alternated—that is, each alternate line of cuttings must have an arrangement relative to the others, corresponding with the arrangement of one rank of punches in advance of the others, and this displacement of the alternate lines of openings corresponds in degree with the distance between two transverse lines passing through the center of each rank of punches. In the arrangement shown in Figs. 2 and 3, however, the pins *d*<sup>2</sup> upon the selecting-arms have an alternation corresponding with that of the punches, and here I use a stencil precisely similar to that employed with a single rank of punches. The reason for this is too evident to require explanation.

I have shown in this case no special apparatus for feeding the paper sheet, as I propose to use that shown in my former patents, especially that of November 2, 1880, reissued April 10, 1883, No. 10,311. The stencil-marking and rack-cutting devices are shown, and are the

same as those set forth in the patent named above.

In order to effect an operative engagement between the dogs and the punches, points *c'* are formed which extend below their ends, and are upon the forward sides of the punches. The lower ends of the latter are slightly beveled off to form an acute angle with these points, the ends of the dogs being shaped to fit therein. I may, if necessary, allow a small interval between the alternating punches in order to impart additional strength to the paper, and this change involves no departure from my invention.

What I claim is—

1. The combination, with the cutting-punches arranged in double rank and alternated in the manner described, of operating devices, substantially as described, mounted upon a reciprocating support beneath said punches, and selecting-arms extending from the operating devices toward the front of the machine and carrying pins in their ends, the latter being alternated to correspond with the alternation of the punches, and a single stencil with which said pins engage, the relative arrangement of the longitudinal cuttings being the same as in a stencil used with a single rank of punches, substantially as described.

2. The combination, with cutting-punches arranged in two ranks and alternating with each other, of dogs mounted upon a reciprocating support and having similar arrangement, selecting-arms extending from said dogs toward the front of the machine, and a tripping-plate supported in front of each rank of dogs by a vertically-adjustable bar carried by a lever pivoted to the reciprocating support and vibrated by a cam on the main shaft, substantially as described.

3. The combination, with the parallel lever-arms having threaded ends, of a bar placed thereon and adjustably secured by nuts below and above, rods passing through perforations in said bar and having nuts turned up against each side, and tripping-plates mounted upon threaded portions of said rods and adjustably secured in place by nuts turned against both faces of said plates, substantially as described.

4. The combination, with the reciprocating support, of the dogs arranged in two ranks, the selecting-arms D', having pins *d*<sup>2</sup>, and extending toward the front of the machine, the arms of the rear rank being curved over the mountings of the front rank, and a single stencil, P, the arms D' being of equal length, whereby the pins *d*<sup>2</sup> are alternated to correspond with the arrangement of the dogs, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ROSWELL T. SMITH.

Witnesses:

JEROME A. BLANCHARD,  
C. E. P. SMITH.