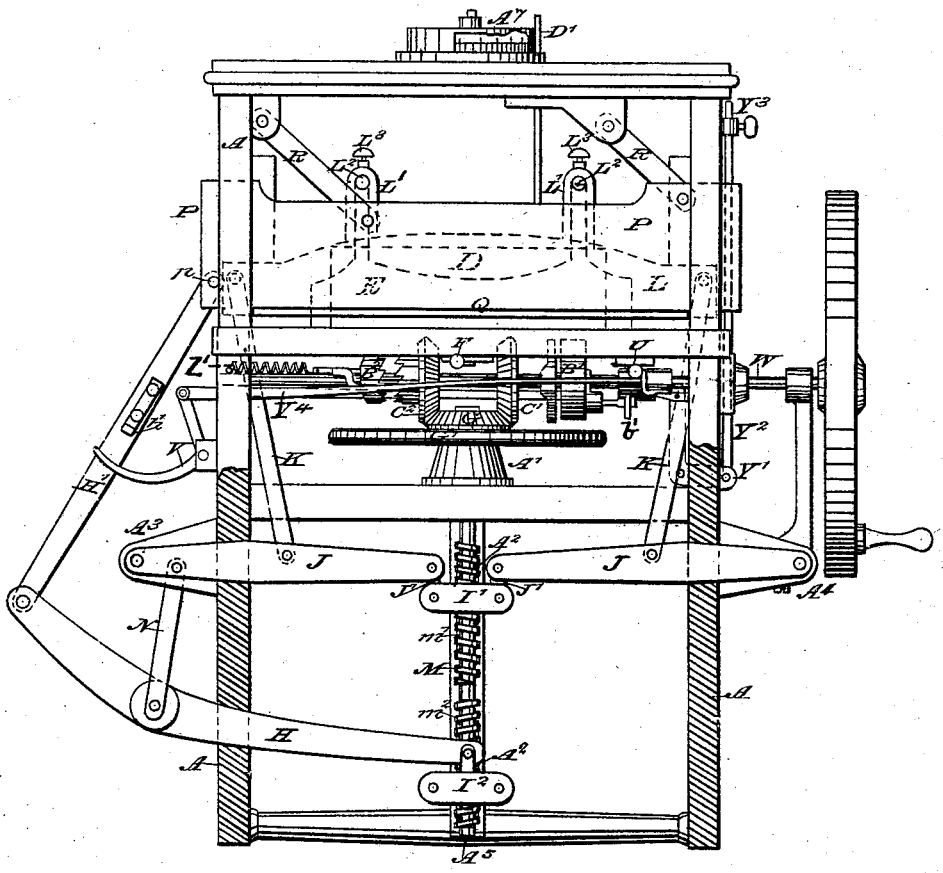
3 Sheets—Sheet 1.

G. R. CLARKE, E. J. STERLING & C. CRANSTON.

Paper-Cutting Machine.

No. 221,216. **Patented Nov. 4, 1879.**

FIG. 1.



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Ezra J. Sterling
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by their attorney
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3 Sheets—Sheet 2.

G. R. CLARKE, E. J. STERLING & C. CRANSTON.

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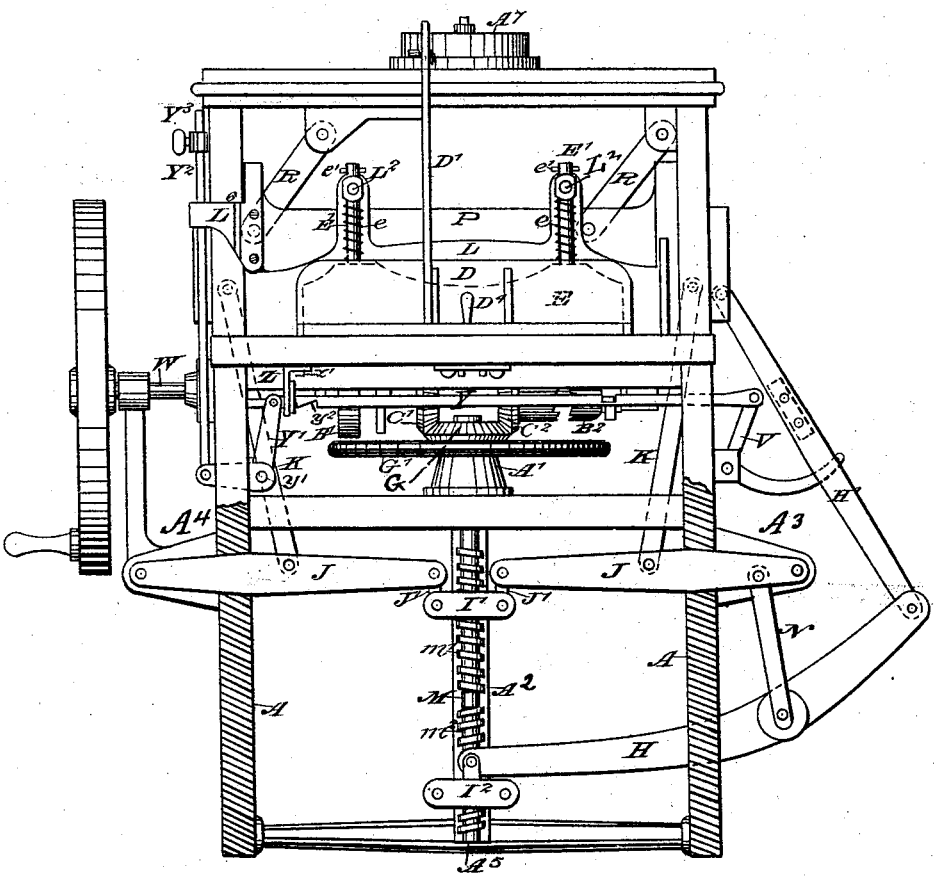
FIG. 2.



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3 Sheets—Sheet 3.

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Paper-Cutting Machine.

No. 221,216. **Patented Nov. 4, 1879.**

FIG. 3.

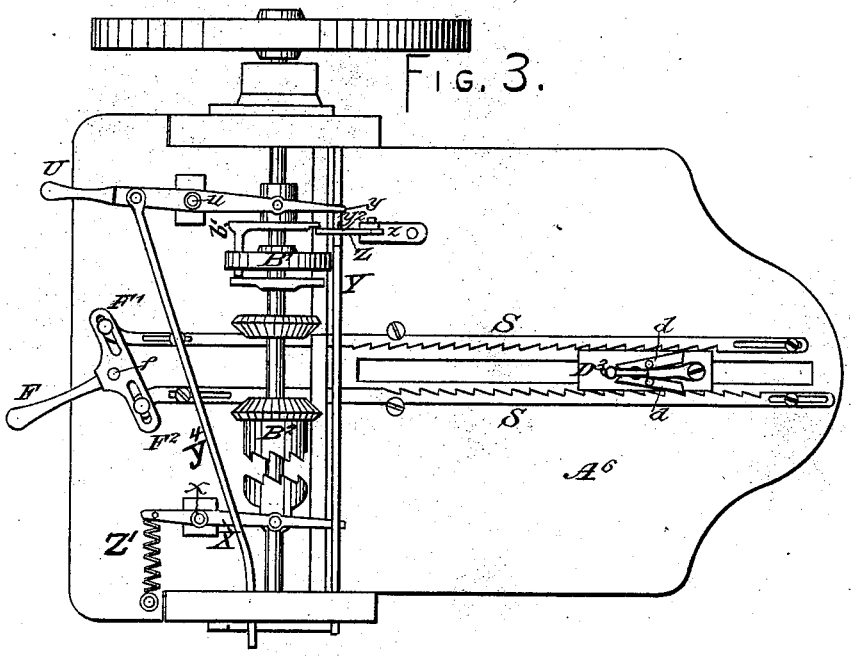
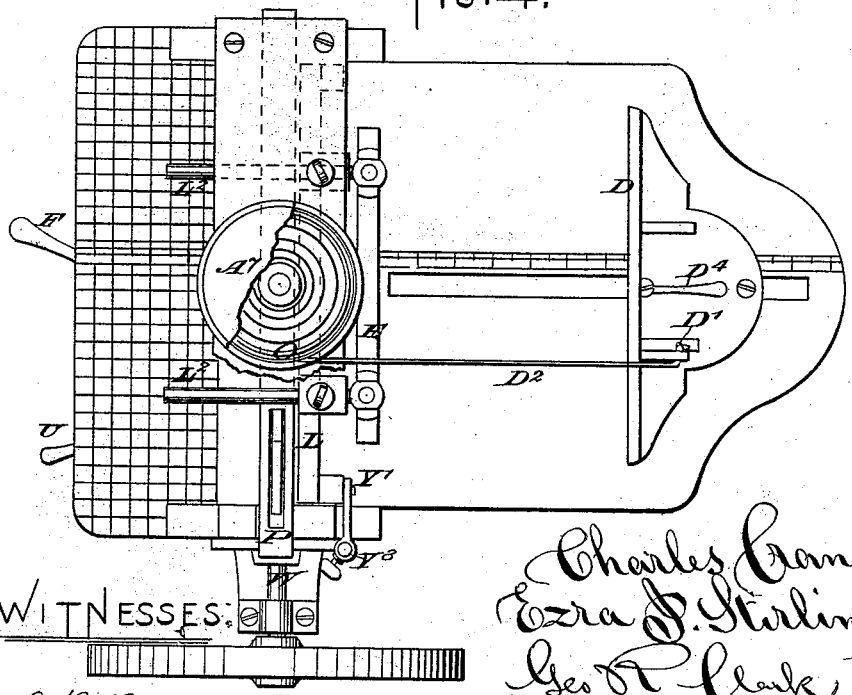


FIG. 4.



WITNESSES:

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UNITED STATES PATENT OFFICE.

GEORGE R. CLARKE, EZRA J. STERLING, AND CHARLES CRANSTON, OF BROOKLYN, N. Y., ASSIGNORS TO SAID CRANSTON AND STERLING.

IMPROVEMENT IN PAPER-CUTTING MACHINES.

Specification forming part of Letters Patent No. **221,216**, dated November 4, 1879; application filed January 21, 1879.

To all whom it may concern:

Be it known that we, GEORGE R. CLARKE, CHARLES CRANSTON, and EZRA J. STERLING, all of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements Relating to Paper-Cutting Machines, of which the following is a specification.

The invention is intended for use by printers, book-binders, and others, in cutting through masses of paper, either to divide it into parts, all of which are utilized, or to simply shear off a narrow portion from an edge.

Machines for this purpose have been long known. It is common to provide a stout plane knife, of sufficient length, and made sufficiently stiff, either of itself or by bolting to a stout part moving therewith, and to bring it down with a drawing cut. It has been also common to compress the paper firmly adjacent to the line to be cut by means of a clamping-bar. It has also been common to provide a broad horizontal table on which the paper to be cut is sustained with a movable back piece, which gages the position of the back edges of the paper. This piece may be brought forward or moved backward, as desired, within wide limits, to gage the size of the paper to be cut. The pile of paper being previously arranged uniformly, the back edges are pressed against the gage, the clamping-bar depressed to hold the part near the knife firmly, and the knife is operated to produce a smooth, clean cut through the mass of paper.

Our machine operates in this long approved manner; but the means whereby the motions of the parts are obtained are peculiar, and involve important advantages.

We provide means for operating the clamp rapidly and automatically by the same motion of the parts which operates the knife, thus economizing time and labor, with provision for operating by the same mechanism to depress the clamping-bar by hand, when desired. We can vary the height to which the clamping-bar is raised previous to the operation. Both the clamping-bar and the knife act on the upper side of the pile of paper.

We provide a yielding clamp-bar a little back of the main clamp-bar, which, rising and sinking with the clamp-bar, performs an important function in holding down the body of the material, and preventing it from becoming cocked up or inclined by the severe pressure of the clamping-bar on one edge. This yielding clamp-bar is adjustable, and can be set at various distances from the main bar. For cutting narrow paper, as trimming the edges of small books, it should be set very near the main bar. For cutting large sheets it should be set further back.

We have provided means for conveniently indicating to the attendant at the front of the machine the exact breadth of the sheets of paper we are cutting. The movable gage-bar is connected to an index at the front, and as the gage-bar is moved backward or forward the index shows its position plainly to the eye.

The accompanying drawings form a part of this specification, and represent what we consider the best means of carrying out the invention.

Figure 1 is a front view of the machine, having the rear part of the lower framing removed. Fig. 2 is a back view, in which that part of the lower half of the framing nearest us is removed. Fig. 3 is a view from below, showing the under side of the table and parts connected directly thereto. Fig. 4 is a top view.

Similar letters of reference indicate like parts in all the figures.

A is a rigid frame-work of cast-iron or other suitable material. W is the operating-shaft, driven by a belt from any convenient power. This shaft is mounted in fixed bearings in the framing, and may be turned uniformly in one direction, communicating the power at will to depress or elevate the clamping-bar and the knife according as the beveled gear-wheels C′ C^2 are alternately connected to the shaft by means of clutches B′ B^2, controlled by the hand-lever U and a suitable train of connections.

The beveled gear-wheels C′ C^2 both mesh into a third beveled gear-wheel, G, which is in effect the hub of a large horizontal hand-wheel, G′. It is supported on a boss, A′, of the fixed frame-work. The boss is hollow, the

hole being sufficiently large to allow the operating-screw M to rise and sink freely in its interior without touching it.

M is the operating screw-shaft. The main portion is threaded right and left. The right-hand thread is marked m'; the left-hand thread m^2. The upper portion of the shaft is feathered in the wheel G. It follows that the wheel G controls the turning of the screw-shaft M, while the latter is free to rise and sink relatively to it.

I' I^2 are guide-nuts, which receive the corresponding threads m' m^2, and are drawn together and moved apart according as the screw is turned in one direction or the other. They also serve as slides, being made to work in the upright guides A^2 of the frame-work, and thus maintain the screw in the proper position under all conditions.

J J are strong levers. Their outer ends are pivoted to the fixed framing at A^3 A^4. The inner end of each is connected by a short link, J', to the upper guide-nut, I'. A link, K, leads from a point about the mid-length of each lever, J, and communicates the rising and sinking motion of that part to a strong clamping-bar, J.

H is a lever, connected near its mid-length by a link, N, to a point near the fulcrum of one of the levers J. The inner end is centered on arms reaching upward from the lower guide-nut, I^2. The outer end is connected by the link H' to the knife-bar P. Both ends of this lever H are forked, to facilitate the pivoting of the respective parts. The link H' operates the knife-bar P. It is hinged thereto at the point p, and the knife-bar, being firmly guided in slots in the framing and suspended by inclined links R, moves with the proper drawing cut whenever it is depressed. It is strongly drawn downward, when desired, by the screw-shaft M raising the lower nut, I^2, and correspondingly tilting the lever H.

The screw-shaft M is stepped on a portion, A^5, of the fixed framing.

Q is the knife.

The operation of the parts is as follows: The friction-clutch B' being thrown into engagement with the shaft W, the wheel C' takes control of the wheel G and operates the screw-shaft M in the direction to draw the guide-nuts I' I^2 together. This motion causes both the clamping-bar L and the knife-bar P to descend. But the parts are so proportioned and adjusted that the clamping-bar bears first on the paper and holds the latter firmly before the knife begins to act. So soon as the clamping-bar descends and presses firmly on the paper so that it can descend no farther, a new state of affairs is initiated. The screw-shaft M m' m^2, so long as it simply turns in its original position, causes both the clamp-bar and the knife-bar to descend. When the clamping-bar has come to a fair bearing on the paper, and can descend no farther, it holds the upper guide-nut, I', strongly suspended. The continued turning of the screw-shaft under these conditions causes it to climb through the nut I', and correspondingly hastens the ascending motion of the lower guide-nut, I^2. This quickens the descent of the knife-bar P. This condition soon brings the knife Q into contact with the paper and it commences to cut.

The resistance interposed by the paper to the descent of the knife-bar P now induces a still further change in the conditions by opposing a new resistance to the further lifting of the screw. Now, the continued turning of the screw-shaft increases the force with which the clamping-bar confines the paper. This attains the important end of causing the clamping force to be modified according to the resistance which the paper offers to the knife. In cutting small piles of paper, as in trimming the edges of a single small book, the pressure of the clamping-bar upon the paper is slight, being a little more than the weight of the parts dependent from the clamp. But when the machine is called to cut across a large surface of paper, the resistance of the knife being considerable, it increases the resistance to the ascent of the screw, and consequently pulls downward with increased force on the links K and the clamping-bar L. When by the working of the machine the lower nut, I^2, and the inner end of the attached lever H have been raised nearly into contact with the upper guide-nut, I', the paper has been completely severed and the motion is ready to be reversed. A self-acting device accomplishes this end, setting free the gear wheel C', and engaging the gear-wheel C^2 with the driving-shaft W. This instantly reverses the turning of the screw-shaft M, and now, by the action of the screw-threads m' m^2, the guide-nuts are rapidly separated, the screw-shaft M being lowered back to its place if it had risen out of it, and all the parts being returned to their original position, with the clamping-bar L and knife-bar P again raised, ready to allow the cut paper to be removed, and the same or another lot to be presented for a fresh cut.

In the upper portion of the clamping-bar I form two bosses, L' L', through which are fitted adjustable rods L^2, which are held in the desired positions by the thumb-screws L^3. On the back end of each rod L^2 is a knob.

E is an auxiliary clamping-bar, adapted to press on the paper at adjustable distances back of the main clamping-bar L. This auxiliary clamping-bar is raised and lowered with the main bar, but is fitted with springs e, which encompass the rods E', extending upward loosely through the knobs on the back ends of the rods L^2. The upper ends of these rods E' carry cross-pins e'. The parts are so proportioned that when the clamping-bar is depressed the auxiliary bar E comes early upon the paper, but is allowed to yield by the action of the springs e, and allow the main clamping-bar L to be further depressed.

When the main clamp-bar L rises it compels the auxiliary clamping-bar E to rise therewith. When the clamping-bar L descends in

advance of the knife, it presses the spring clamping-bar E on the paper at the required distance back of the main clamping-bar, and prevents the paper from assuming any very greatly inclined position. The tendency of the upper sheets of paper to become inclined by the severe pressure of the clamping-bar on its front edge is thus successfully resisted without devolving any trouble or care on the operator.

D is the back gage. It presents a broad plane surface to receive the back edges of the sheets in the pile of paper. It is adjustable from the front of the machine through the following mechanism:

F is a T-shaped hand-lever, turning on a fixed center, *f*. Each arm F′ F² is connected to one of two parallel slide-rods, S S, which extend backward under the table A⁶ to the back of the machine.

The inner edges of the bars S are toothed, as shown, and as the hand-lever F is vibrated at the front these teeth engage with dogs *d* on the sides of the slide D³, which is a part of the back gage, and runs in the slot in the table A⁶. The back gage is thus moved forward at will by the attendant at the front. When it is desired to shift it backward, he operates the lever D⁴, and detaches the dogs *d*. This sets the back gage free, and it may then be moved backward to any extent desired, and on again liberating the hand-lever D⁴ the dogs *d* again come into action and hold it by the aid of the rods S.

The back gage carries an upright arm, D′. A cord, D², extends forward therefrom, and is wound on a wheel, O, inclosed in a cage, A⁷, the cage having a sufficient opening in the front to allow the periphery of the wheel to be seen. The wheel is graduated, and the marks thereon presenting themselves at the aperture in the cage A⁷ as the wheel turns one way or the other in adjusting the back gage, indicate to the eye how many inches or other units of space the back gage, D, is set from the line of the knife.

We can employ a screw or other more or less delicate means to adjust the connection of the cord D² to the arm D′, so as to keep the indications of the wheel O in correct adjustment.

The engagement of the operating-shaft W to operate the screw M and its connections is effected by a movement of the hand-lever U, which turns on the center *u*, and operates the slide-rod Y with the effect to engage the clutch B′ and its wheel C′. The clutch is a modification of a construction set forth in an application for patent recently filed by one of us, George R. Clarke, and need not be particularly described further than to say that it is a convenient and easily-operated friction-clutch.

So soon as the screw M has turned in the required direction to the full extent necessary to depress, first, the clamping-bar, and then the knife-bar and their respective attachments, and sever the paper, as has been explained, a stop, *h′*, on the link H′ comes in contact with the lower arm of a bell-crank lever, V, and, tilting the latter, pulls on the rod Y⁴ attached to the hand-lever U, and gives it the proper motion to disengage the clutch B′. This liberates the screw M from the control of the clutch B′.

It remains to describe the further mechanism which instantly throws the clutch B² into operation, and reverses the action.

X is a lever pivoted on the fixed point *x*, and forked to engage in a groove in the sliding part of clutch-piece B². Its lower arm extends farther, and fits in a notch in the transverse sliding rod Y. The hand-lever U extends past its junction with the clutch B′. Its extreme end acts against the shoulder *y* on the slide Y, and whenever the hand-lever U is operated to set the mechanism in operation, the slide-rod Y is thereby moved to the left, insuring the disengagement of the positive clutch B² before the friction-clutch B′ can come into operation. A bent lever, Z, turning on a center, *z*, and operated by a spring, engages in the notch *y²*, and holds the slide-bar Y in that position. When this state of things has continued until the knife-bar P has severed the paper, and the stop *h′* has, through its connections, turned the hand-lever U back to its original position, a cam, *b′*, on the clutch B′ depresses the lever Z, and sets the slide-rod Y at liberty, whereupon the latter is returned to its original position by the force of a spring, Z′, acting on the front arm of the lever X.

A bent lever, Y′, turning on a center, *y′*, is pivoted to the same bar Y, and a rod, Y², connected to the other arm of Y′ leads upward and plays loosely through a hole in an arm, L⁶, from the main clamping-bar L. An adjustable stop, Y³, fitted on this rod Y², comes into use whenever, by the action of the machine, the clamping-bar L has risen to its full extent, and communicates to the slide-rod Y the necessary motion to again engage it with the first notch, *y²*, in which condition the machine remains at rest, with the operating-shaft W turning idly, but with all the parts in condition ready to serve whenever the hand-lever U is moved again to the right.

Modifications may be made in many of the details. Instead of employing a link, N, and centering the inner end of the lever H directly on the lower nut, I², we can employ a fixed center for the lever, and introduce links to connect it flexibly to the nut; or, if the present construction is employed, we can connect the link N to a fixed point instead of to one of the levers J. But we prefer the arrangement shown.

The weight of the lever H and its connections, by depending from the lever J a little inside of the fulcrum, depresses the screw M and its connections, and increases the force with which the clamping-bar presses on the paper in advance of the increase of force which follows the action of the knife.

We claim as our invention—

1. In a paper-cutting machine, a screw and

gearing for turning it in opposite directions, in combination with and operating both the clamping-bar and the cutting-knife, as herein specified.

2. In a paper-cutting machine, a screw, with means, substantially as described, for turning it, in combination with a movable nut and with connections to the clamping-bar, whereby that on the bearing of the clamp-bar the nut will become suspended, and cause the screw to climb through it and perform the cutting by connections substantially as described, leading to the knife, as herein specified.

3. In a paper-cutting machine having a continuously-revolving shaft, the combination of the knife and clamping-bar with a right and left hand screw and nuts, and connections for operating them respectively, as herein specified.

4. The operating screw-shaft M, bevel-gears C′, C², and G, and means for operating by power, at will, through the clutches B′ B², in combination with each other, and with the hand-wheel G′, adapted to serve as and for the purposes herein specified.

5. In a paper-cutting machine, the combination of the clutch mechanism, the adjustable stop mechanism with the knife and the clamping-bar, whereby the vertical movement of the knife and clamp can be adjusted, substantially as shown.

6. In a paper-cutting machine, the feathered wheel G, running in fixed bearings, and its driving means, in combination with a screw, M, and connections for operating the clamp-bar and the cutter-bar, as herein specified.

7. The combination of the knife, the clamp and screw, with their connecting levers and links, arranged as described, whereby they all contribute by their weight to the pressure of the clamping-bar on the paper, substantially as shown.

8. The combination, with the cutting-knife, of the connecting-rod H′, lever H, fulcrumed on the swinging link N, and pivoted to the nut I², and the screw *m*, substantially as described.

9. In combination with the clamp-bar, the auxiliary spring-clamp, adjustable, by means substantially as described, to different lengths of paper.

10. In a paper-cutting machine, the hand-lever F and bars S S, in combination with the gage-slide D³, and means, substantially as described, for engaging and disengaging the gage with said bars, substantially as shown.

11. The combination of the back gage, the spring-indicator, and the connection D² S, substantially as and for the purposes herein specified.

In testimony whereof we have hereunto set our hands this 17th day of January, 1879, in the presence of two subscribing witnesses.

GEO. R. CLARKE.
CHARLES CRANSTON.
EZRA J. STERLING.

Witnesses:
EDWARD D. STAFFORD,
H. A. JOHNSTONE.