No. 606,853. Patented July 5, 1898.

A. H. ALEXANDER.

INDEXING MACHINE.

(Application filed Aug. 2, 1897.)

(No Model.) 4 Sheets—Sheet 1.

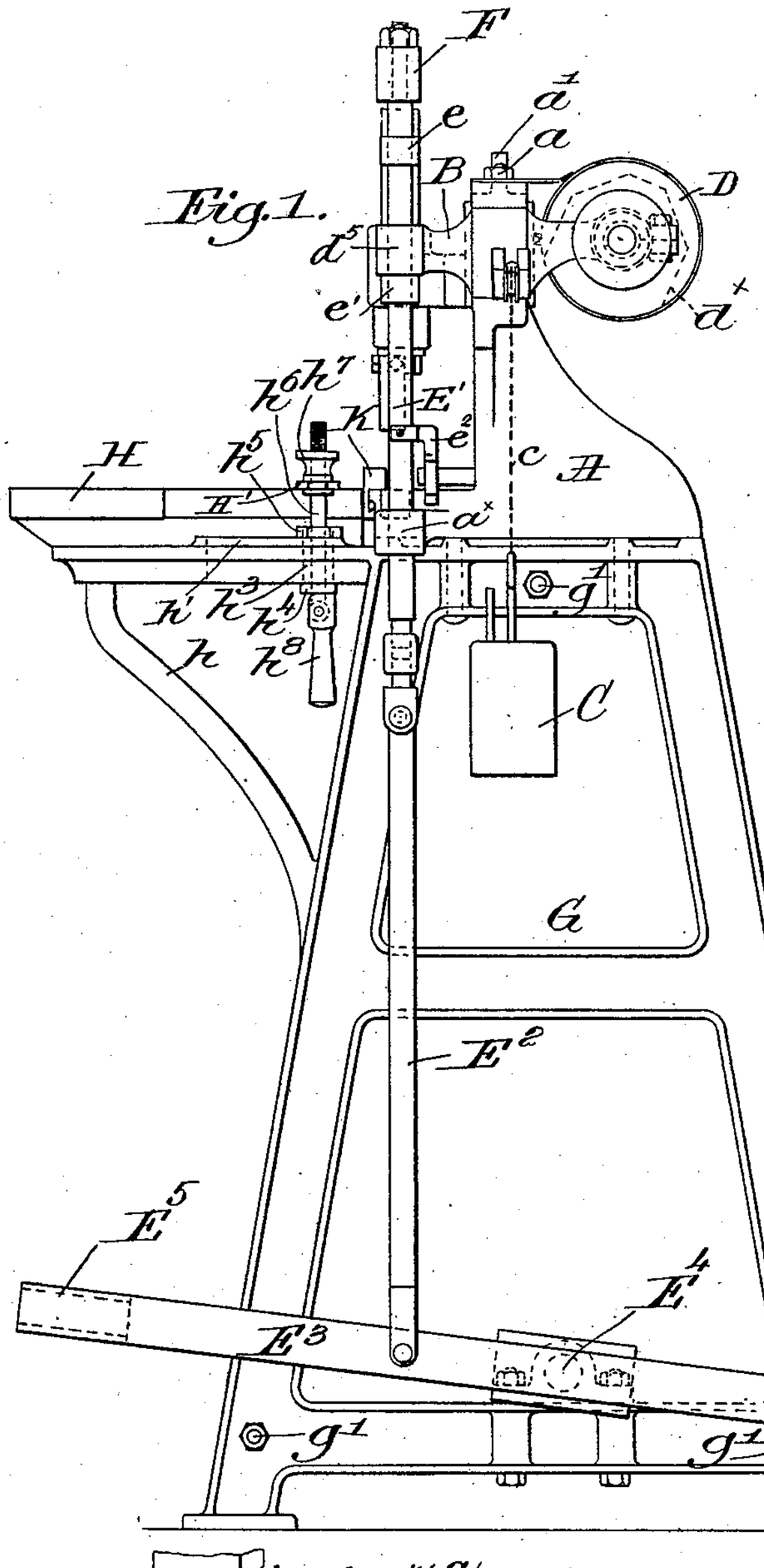


Fig. 1.

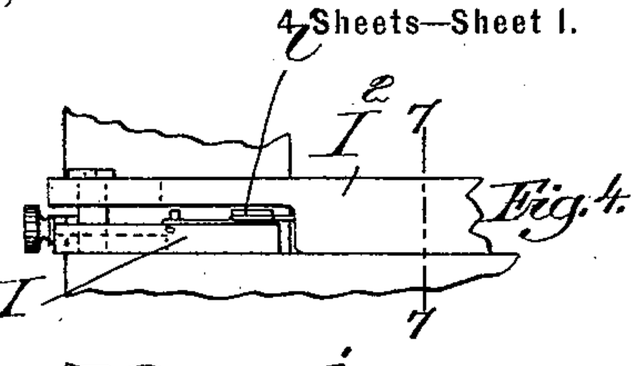


Fig. 4.

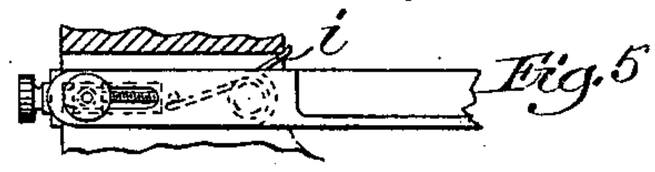


Fig. 5

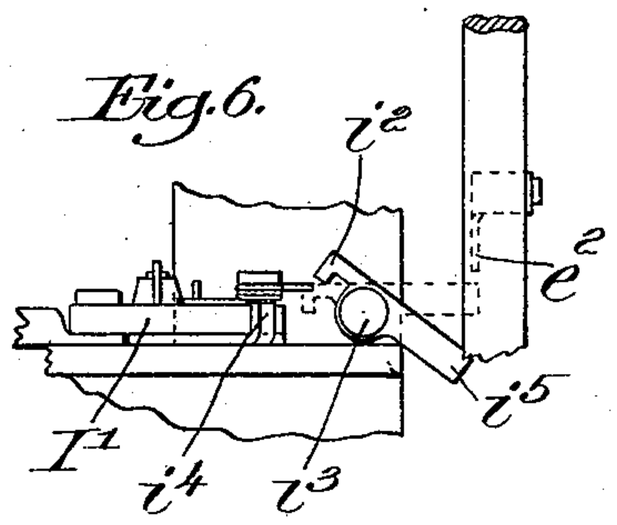


Fig. 6.

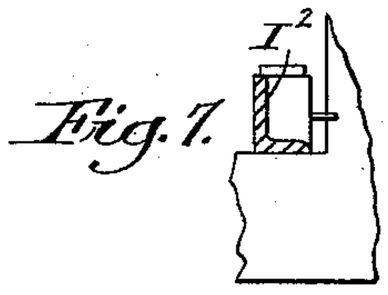


Fig. 7.

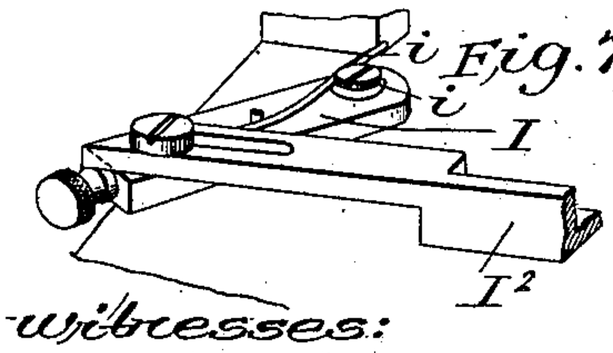
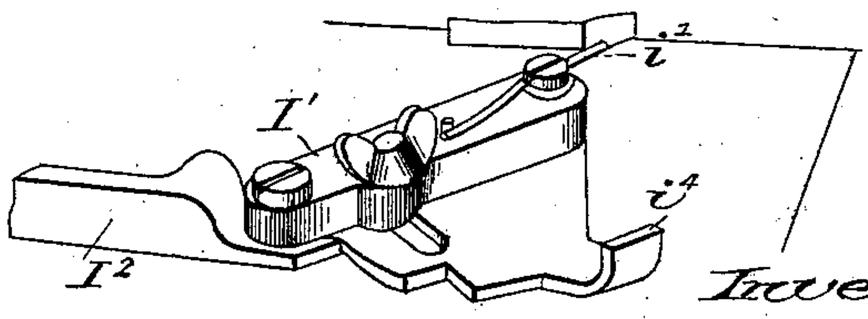


Fig. 7a



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No. 606,853. Patented July 5, 1898.

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INDEXING MACHINE.

(Application filed Aug. 2, 1897.)

(No Model.) 4 Sheets—Sheet 2.

Fig. 2.

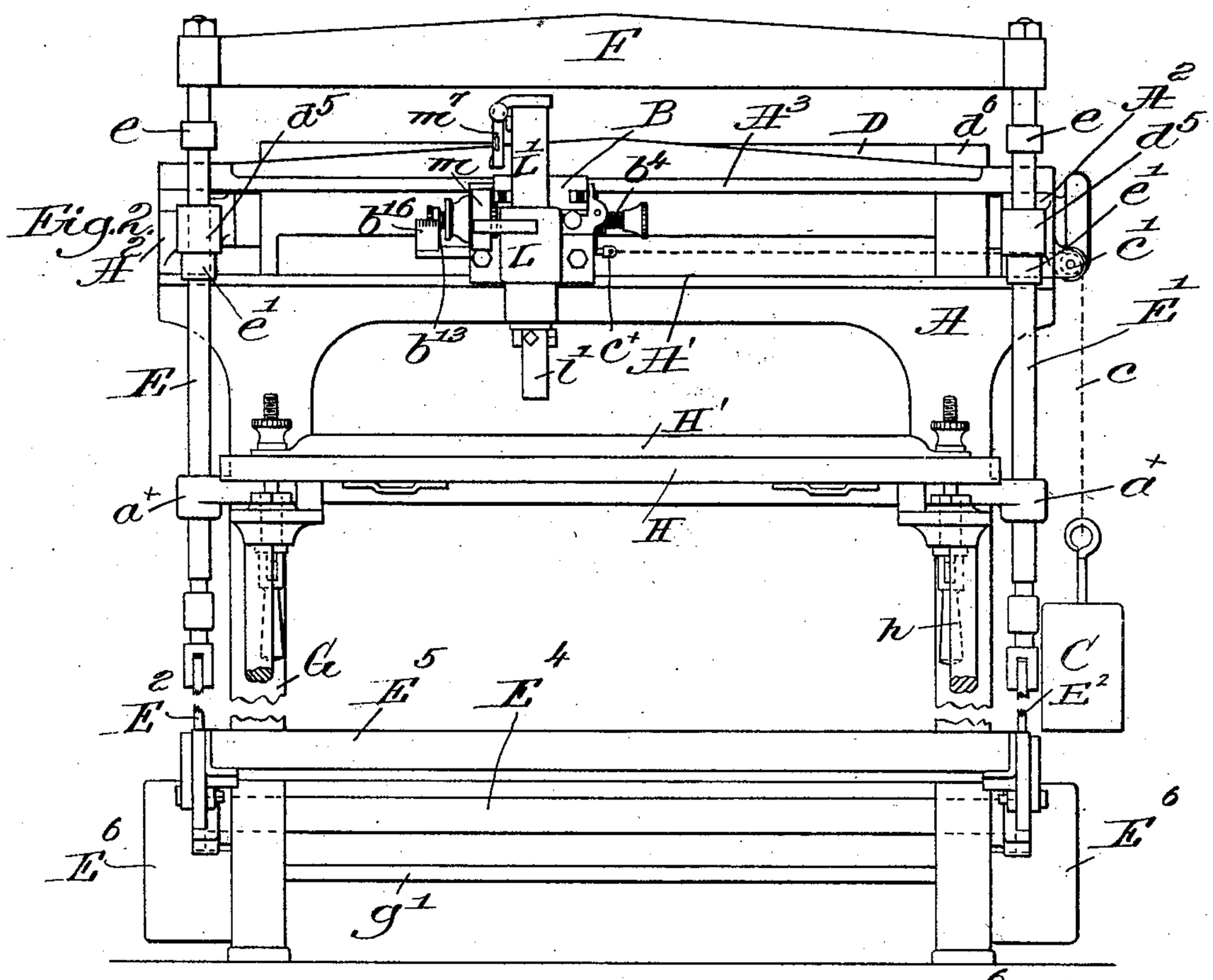
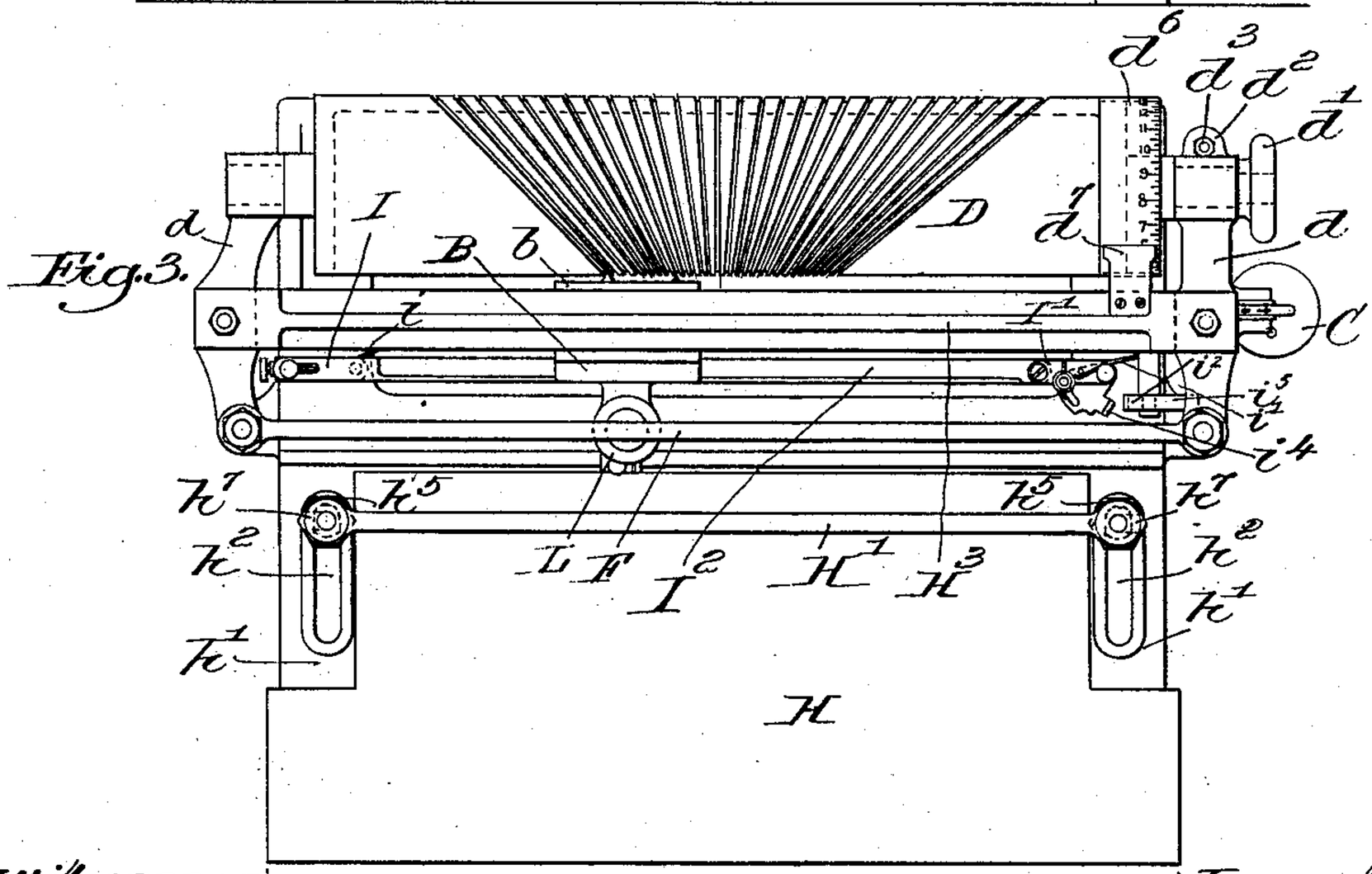


Fig. 3.



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No. 606,853. Patented July 5, 1898.

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INDEXING MACHINE.

(Application filed Aug. 2, 1897.)

(No Model.) 4 Sheets—Sheet 3.

Fig. 8.

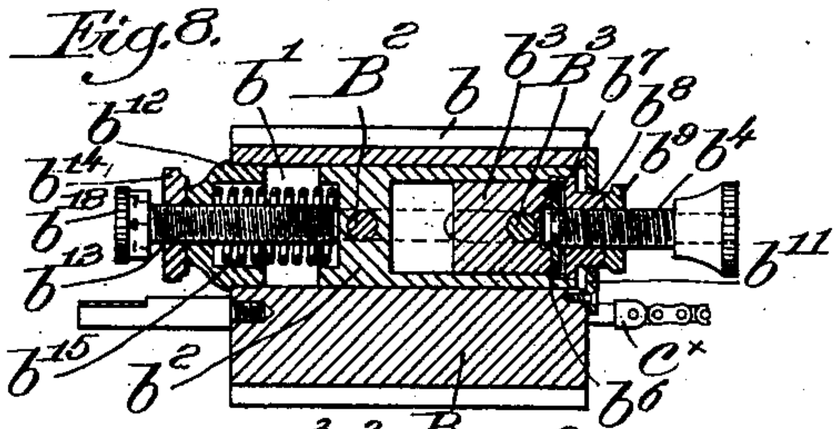


Fig. 9.

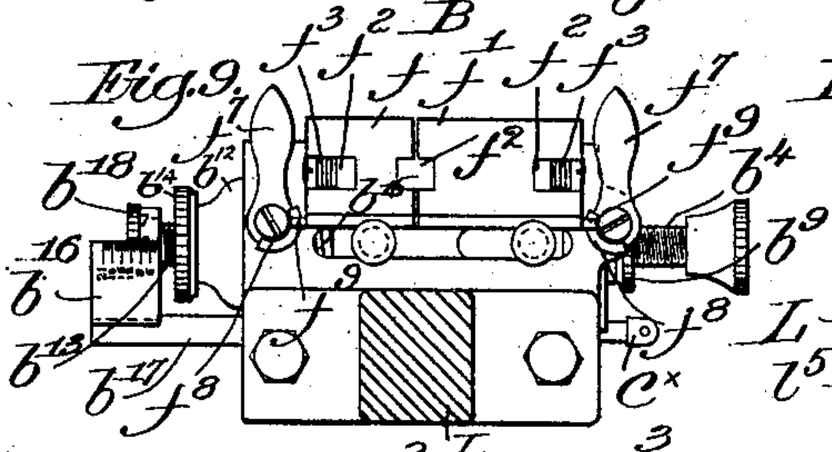


Fig. 10.

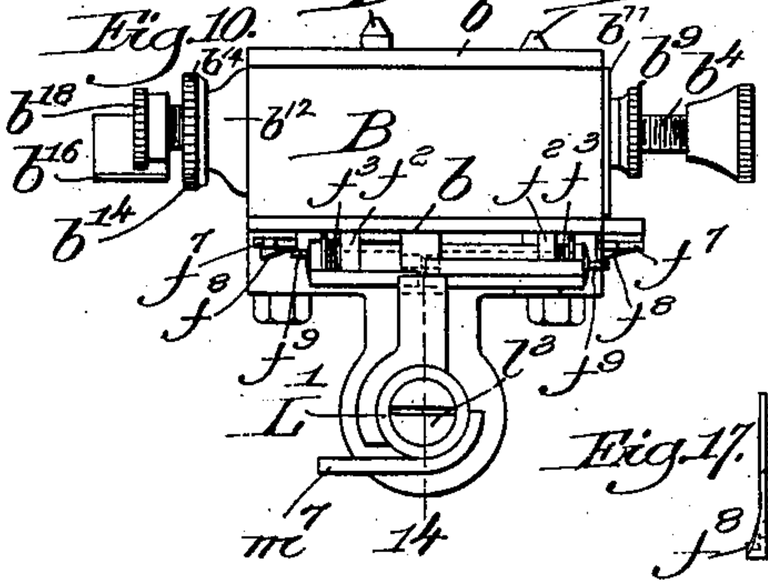


Fig. 11.

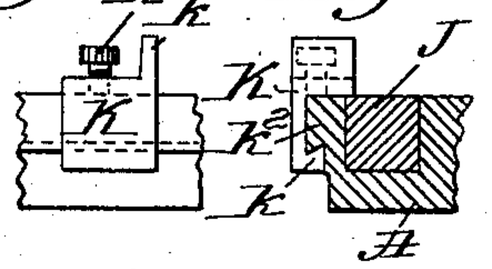


Fig. 12.

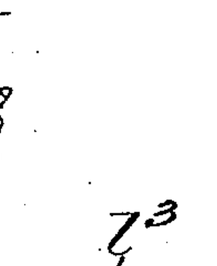


Fig. 13.

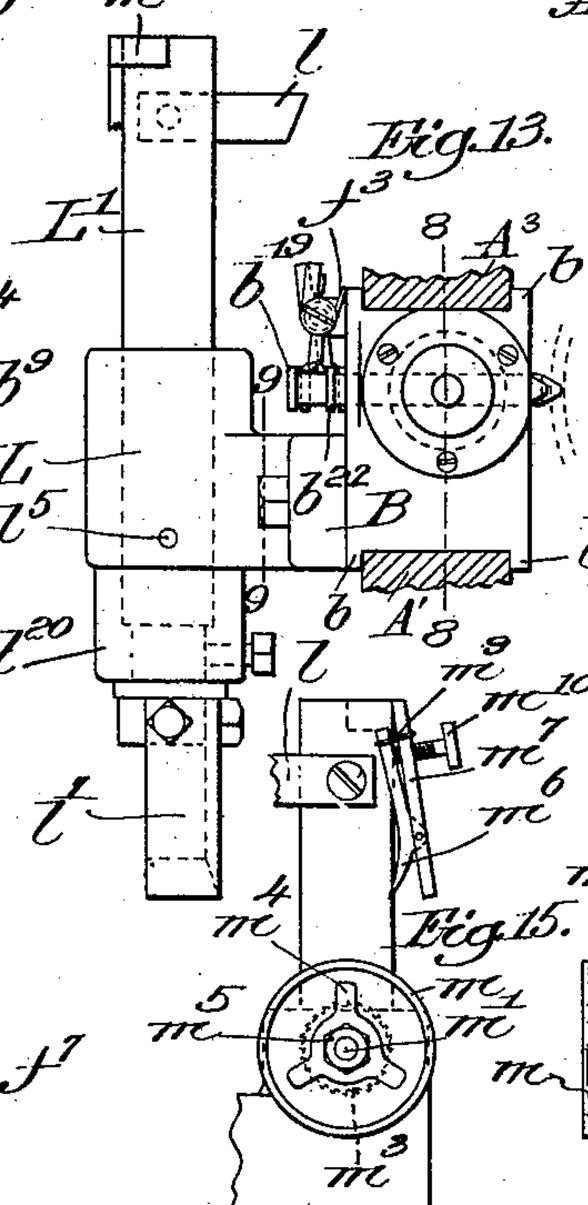


Fig. 14.

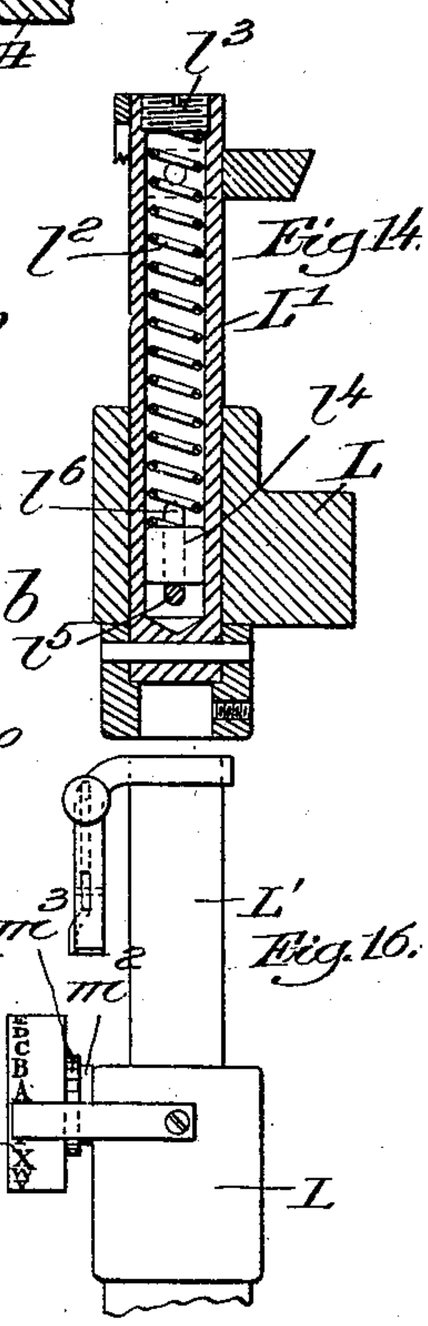
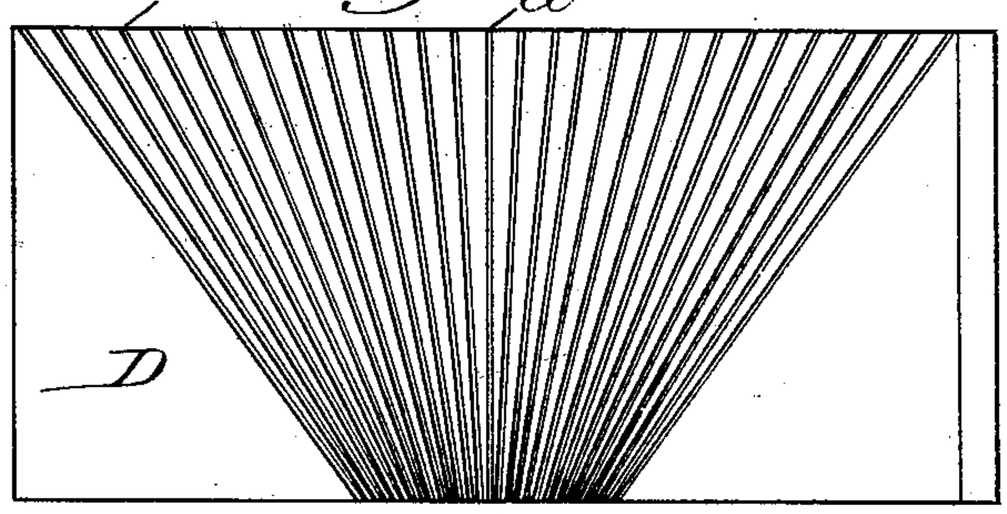


Fig. 15.

Fig. 16.

Fig. 17.

Fig. 18.



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No. 606,853. Patented July 5, 1898.

A. H. ALEXANDER.

INDEXING MACHINE.

(Application filed Aug. 2, 1897.)

(No Model.) 4 Sheets—Sheet 4.

Fig: 19.

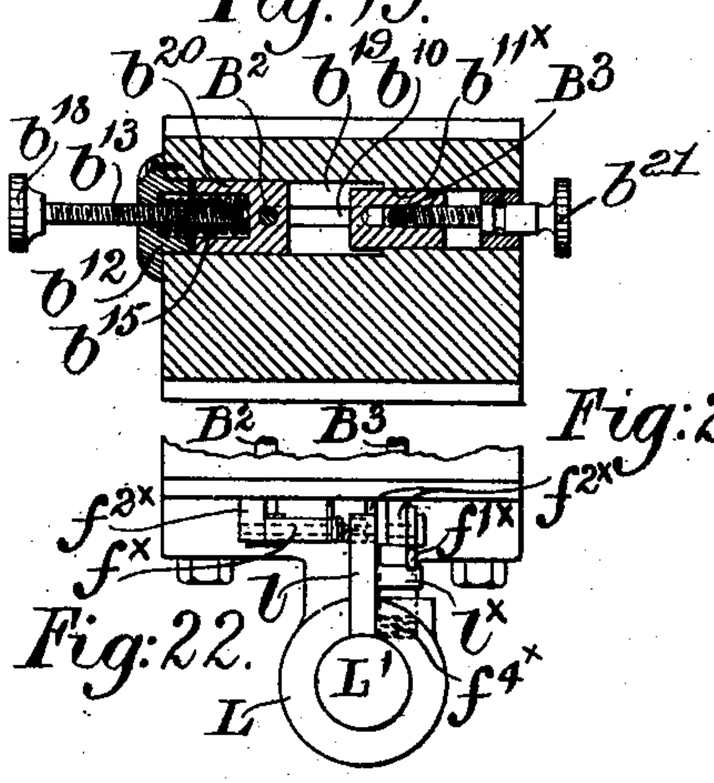


Fig: 21.

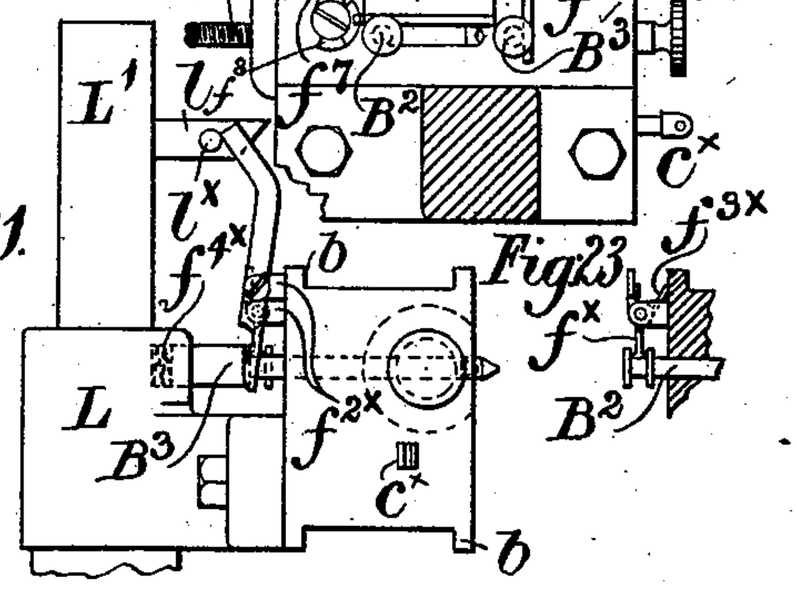
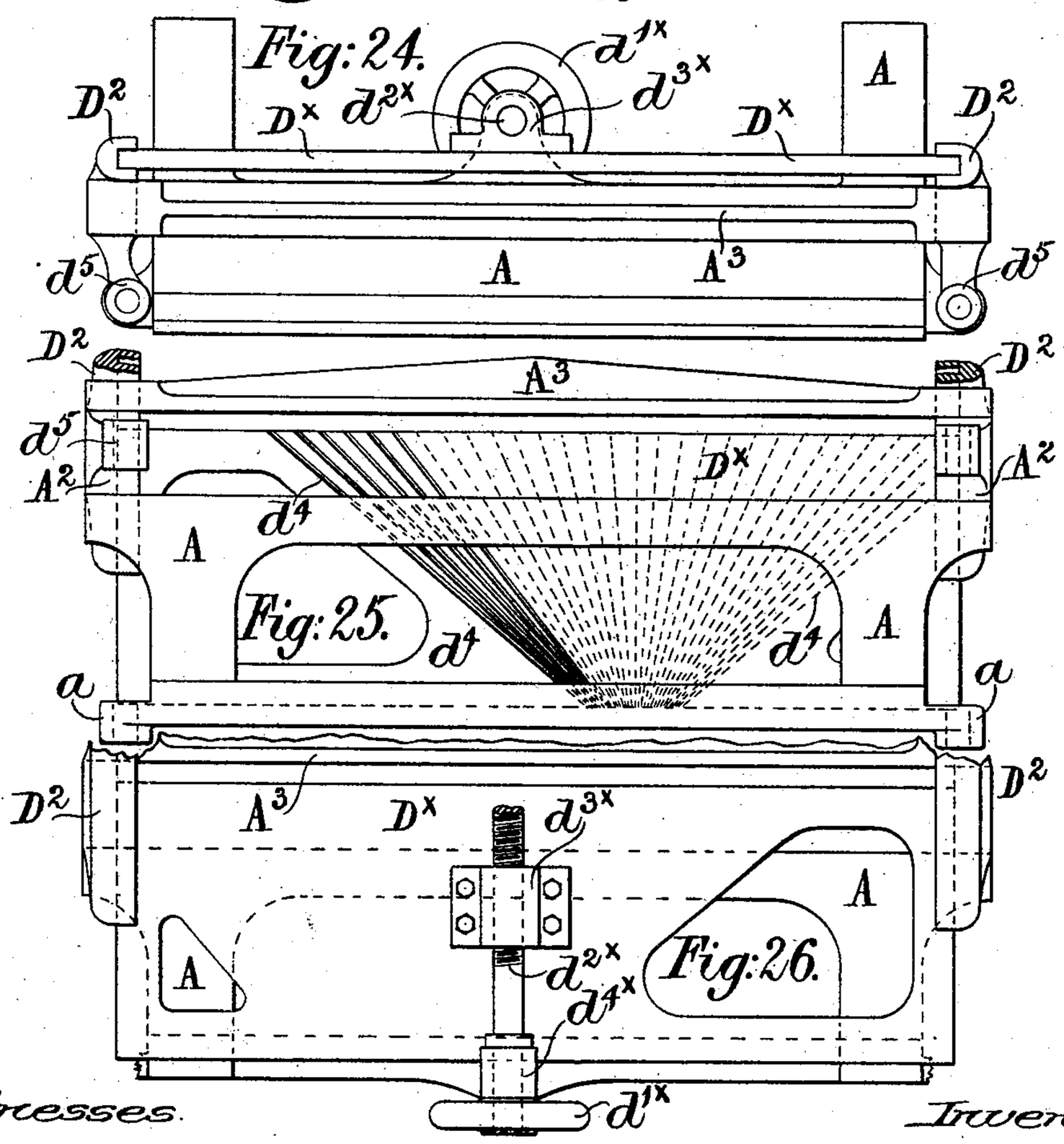


Fig: 20.

Fig23

Fig: 22.

Fig: 24.



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UNITED STATES PATENT OFFICE.

ARTHUR HERBERT ALEXANDER, OF LONDON, ENGLAND.

INDEXING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 606,853, dated July 5, 1898.

Application filed August 2, 1897. Serial No. 646,721. (No model.) Patented in England August 10, 1895, No. 15,067, and in Germany April 23, 1897, No. 91,672.

To all whom it may concern:

Be it known that I, ARTHUR HERBERT ALEXANDER, a subject of the Queen of Great Britain, and a resident of London, England, have invented an Improvement in Indexing-Machines, (for which I have secured patents in Great Britain, No. 15,067, dated August 10, 1895, and in Germany, No. 91,672, the date of application being July 8, 1896, and the date of issue being April 23, 1897,) of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to improvements in indexing-machines, or machines for cutting through a plurality of thicknesses of paper, being particularly intended for use in properly indenting or cutting the edges of books that are to be lettered as indexes or otherwise marked for the purposes of accounts, memoranda, letter-copying, tables, or alphabetical or other arrangements of subject-matter.

My improvements relate to machines in which the book or material to be cut is clamped fixedly in position and the cutting-tool is made to travel step by step along the desired line of cutting and in which mechanism is provided to actuate the cutting-tool to make a cut at each step, my improvements being especially intended to simplify the mechanism and to render the step-by-step movement accurate, expeditious, and capable of perfect adjustment with any degree of nicety and accuracy desired. In machines of this class as heretofore devised there has not only been a considerable complexity of mechanism, but also an attendant inaccuracy or uncertainty of operation, particularly with reference to the intermittent travel or forward movement of the cutting-tool. Accordingly with a view to obviating these objections I have invented a guide member or pattern-surface to coöperate with the tool-carrier, so as to make the step-by-step movement absolutely uniform and unvarying for a given index or succession of cuts.

My invention also includes a tool-carrier or slide, also various details of improvement, including a width-gage and other coöperating gages for positioning the work, clamping mechanism to hold the work, positive operating devices to actuate the cutter, and improvements in gage-indicating attachments.

All these and other improvements of my invention, as well as the details of operation and advantages arising therefrom, will be hereinafter more particularly set forth, and the invention will be defined in the appended claims, forming a part of this specification, reference being had to the accompanying drawings, illustrative of the preferred embodiments of my invention.

In the drawings, Figure 1, in side elevation, represents my improved machine, the far details of construction thereof being omitted for the sake of clearness. Figs. 2 and 3 similarly represent my improved machine, showing the same respectively in front elevation and top plan. Figs. 4 and 5 are details respectively in front elevation and top plan, parts being broken away, showing the left-hand end of the width-gage. Fig. 6 is a front elevation of the opposite or right-hand end of the width-gage, indicating in dotted lines the operation of the tripping arrangement. Fig. 7 is a vertical transverse section of Fig. 4 on the line 7 7, looking toward the left. Fig. 7ª is a perspective view of the width-gage. Fig. 8 is a vertical longitudinal section of the tool-carrier or slide, taken on the line 8 8, Fig. 13. Fig. 9 is a vertical section on the line 9 9, Fig. 13, showing the external details of construction of the slide in front elevation. Fig. 10 is a top plan view of the tool-carrier and slide. Figs. 11 and 12 are respectively broken details in front elevation and section, showing the end gage in front elevation and end view mounted in operative position. Fig. 13 represents in side elevation the tool-carrier and slide in operative position on its guideways, the latter being shown in broken section and the pattern-surface being indicated in dotted lines at the right. Fig. 14 is a central vertical section of the forward end of the tool-carrier, taken on the dotted line 14, Fig. 10. Figs. 15 and 16 are respectively fragmentary views, in side and front elevation, of the letter-indicating attachment carried by the tool-carrier. Fig. 17 is a detail in side

elevation of one of the cam-levers for lifting one of the flaps of the tool-carrier or slide. Fig. 18 is a front elevation of the pattern-surface, showing the plan of arrangement thereof. Figs. 19, 20, and 21 are respectively similar to Figs. 8, 9, and 13, showing modified constructions of the corresponding parts. Fig. 22 is a fragmentary detail, in top plan, of Fig. 21. Fig. 23 is a fragmentary detail in vertical section, showing the controlling device for one of the pins of the tool-carrier. Figs. 24, 25, and 26 are respectively details in top plan view, front elevation, and rear elevation of a modified form of pattern-surface and its operating mechanism and adjacent parts.

In the present embodiment of my invention, G designates a suitable standard or support, shown as consisting of end legs held together by tie-rods g' and having brackets h projecting forward at its front side to support a work-table H.

A designates a casting or frame mounted on the standard G and provided with suitable parallel ways A′ A^3, between which the tool-carrier or slide B slides in its intermittent travel from left to right across the machine.

As herein shown, the upper way or guide-surface A^3 is supported above the lower way A′ by means of blocks A^2, one at either end thereof, secured by nuts a and studs a', the latter being screwed through the blocks A^2 into the casting or frame A for convenience of manufacture and rigidity of construction.

The work-table is cut away at h' (see Fig. 3) to expose the slotted openings h^2, formed in the upper ends of the brackets h to permit the required adjustment therein of the work-clamp H′ for properly positioning the work adjacent the cutting-tool. The means of adjustment for this clamp are best shown in Figs. 1 and 2, where it will be seen that I have mounted sleeves h^3 in the slots h^2, these sleeves being provided with flattened sides, as indicated in Fig. 3, and having flanges h^4 at their lower ends and provided with clamping-nuts h^5 at their upper ends, by means of which they may be fixedly positioned as desired in said slots. Through these sleeves bolts h^6 are passed, prevented from turning by means of a transverse pin (not shown) entering a slot in the sleeve, the said bolts carrying at their upper ends the work-clamp H′ by means of the nuts h^7 and having quick-clamping attachment by means of cam-levers h^8, pivoted thereto at their lower ends.

By reason of the attachment above described it will be evident that the work-clamping bar H′ may be accurately adjusted up or down and toward or from the cutting-tool, as required, for any variety of work, large or small, and may then be quickly operated without further adjustment simply by turning the cam.

A width-gage i^2 to control the width of the indexing—or, in other words, to regulate the depth of the cut into the edges of the book which is being indexed—is pivotally mounted by means of links I I′ at its respective ends to a projecting ledge or base of the casting A, springs $i\,i'$ being provided, wound around the pivots, to automatically throw the width-gage out of the path of the tool as the latter is caused to descend. For this purpose a catch i^2, pivoted on a pin i^3 to the casting or frame A, is provided, adapted to engage an ear i^4 of the link I′ to hold the same normally against the removing action of the springs i and i', the tail end i^5 of this catch being engaged by an arm e^2, fixedly mounted on a moving part of the tool-operating mechanism, so that when the tool is actuated its arm e^2 will depress the tail end i^5 of the catch i^2 and thereby release the width-gage I^2 just before the cutting edge of the tool reaches it in its descent and permit the width-gage to be automatically removed by its springs out of the way of the said cutting-tool, the width-gage, however, is retained in its proper adjustment to hold the work as required until the tool begins to bear upon the latter in its cutting operation.

In addition to the work-clamp and width-gage already described I provide an end gage K, (shown in detail in Figs. 11 and 12,) against which one end of the book or other article to be operated upon is placed or registered preparatory to being clamped beneath the clamping-bar H′ on the work-table. This end gage is shown as consisting of a dovetailed slide k, provided with a fence k' and capable of adjustment along a rib k^2 on the frame A, on which it can be clamped by a set-screw k^3, preferably adjacent a suitable lead or stick J provided in the path of the cutting-tool and against which the latter may cut in its descent.

The cutting-tool may be of any configuration desired to form the required notch or other cut in the book or article being indexed, this tool being shown at l' in Fig. 13 as removably secured at the lower end of a head l^{20} on a hollow tool-bar L′, normally held in raised position by a contained spring l^2, bearing at its upper end against a retaining screw-plug l^3 and at its lower end against a shoulder l^4, fixedly supported in a guide-arm L by means of a bolt l^5, the tool-bar L′ moving freely up and down over the latter in the guide-arm L by means of vertical slots l^6, formed in its opposite side walls, as indicated in Fig. 13. The reciprocating or cutting movement of the tool and its tool-bar is accomplished by the engagement with the latter of a transverse pressure-bar F, (see Figs. 1 and 2,) supported at the upper ends of rods E E′, sliding vertically in suitable guides $a^\times$ at the base of the casting or frame A and guides d^5 projecting from the blocks A^2, the movement of the rods E E′ being limited by collars $e\,e'$, secured thereon. The pressure-bar F is reciprocated by means of a treadle

E³, carried by a shaft E⁴ and having at its front end a treadle-board E⁵ and at its rear end counterbalance-weights E⁶ E⁶, the forward end of the treadle being connected by means of links E² to the vertically-sliding bars E E′, so that when the operator depresses the front end of the treadle he thereby brings the pressure-bar F into engagement with the tool-bar L′ wherever the latter may be in its travel across the face of the machine beneath the pressure-bar, and upon releasing the treadle the counterweights E⁶ E⁶ at once raise the pressure-bar and permit the tool and its tool-bar to be lifted from the work by the contained spring l^2.

The guide-arm L constitutes a part of the tool-carrier to which I have already alluded and is mounted on a sliding portion B thereof, (indicated in side elevation in Fig. 1 and shown in further detail in Figs. 8, 9, and 10,) the details of this part of the tool-carrier being provided to enable the tool to be definitely moved forward step by step as required by a predetermined pattern D, the latter being shown in detail in Fig. 18, where it will be seen that it comprises in its preferred form a symmetrically-arranged divergent series of grooves or ribs d^4, these grooves being shown as diverging symmetrically on either side of a central, vertical, or transverse groove d^5.

The pattern-surface will preferably be in the form of a cylinder, as shown in Fig. 1, although it may equally well be in the form of a plate, as shown at D× in Figs. 24 to 26. The surface of the cylinder or roll D, Fig. 1, will be provided with a series of grooves d^4, one of which, preferably the central one, lies wholly in a plane at right angles to the axis of the roll D, while the other grooves d^4 diverge at such angles as to equally divide lines drawn upon the surface of the roll parallel to its axis.

The slide B operates between the guideways A³ A′, as before stated, being provided with retaining-flanges b, and has one or more pins operated transversely therethrough to engage the grooves d^4 of the pattern-surface, two pins being herein shown, (marked, respectively, B² B³,) so that in the preferred operation thereof one or the other will be in engagement with the pattern-surface, these pins having lateral movement relatively one to the other, as will presently be described, so that when the tool-carrier is released it may be intermittingly pulled forward by its weight C, connected thereto by a chain c, passing over a pulley c' and secured thereto at $c^\times$.

In order to permit the relative lateral movement of the pins B² B³ just alluded to I have mounted these pins in sliding portions, the pin B² being mounted in a hollow plunger b^2 and the pin B³ being mounted in a plug b^3, capable of longitudinal adjustment within the plunger b^2 by means of a thumb-screw b^4, the latter having threaded engagement with a nut b^8, mounted on the outer end of the plunger, a check-nut b^9 serving to fix the parts in any desired adjustment, and the thumb-screw being held against removal from the plug b^3 by means of a plate b^6, attached to the end of the plug and receiving in a recess therein a reduced portion or neck b^7 of the screw, whereby the latter is free to rotate, but is prevented from moving longitudinally relatively to the plug.

The plunger b^2 and its contained plug b^3 are mounted to reciprocate from side to side within the slide B in a recess or bore b' formed therein, and are held within this bore by means of a plate b^{11}, permanently secured at one end thereof, and by a nut b^{12}, also permanently secured at the other end thereof, an adjustment-screw b^{13} being centrally mounted in the latter nut and fixed in its adjustment by a check-nut b^{14} to limit the travel of the plunger b^2 to the left, viewing Fig. 8, a spring b^{15} being provided normally tending to force the plunger b^2 in an opposite direction against the plate b^{11} at the other end of the bore b'.

A graduated scale b^{16} is supported by a pin b^{17} on the slide and coöperates with a divided or graduated head b^{18} of the screw b^{13} to enable the operator readily to adjust the stop accurately as required.

By reason of the construction just described it will be evident that when the pin B² is in engagement with a groove d^4 the weight C will pull the slide over to the right until it is stopped by the stop-screw b^{13}, the amount of this movement of course being capable of various degrees of adjustment simply by turning the screw forward or backward, and it will be evident that when the pin B² is out of engagement with a groove d^4 and the pin B³ is in engagement with a groove d^4 the weight C will pull the slide to the right until the plug b^3, its thumb-screw b^4, nut b^8, and the plunger b^2 are all in close relation in resisting engagement with the adjustment-screw b^{13}, which regulates the amount of reciprocal action or lateral movement of the pins relatively to the slide B as the latter is intermittently pulled along by its way when once the machine has been set for the purpose of cutting a certain-sized step. The slide b^2, plunger b^3, and pins B² B³ move as a whole in the slide B, but have no movement in relation to each other due to their said movement in slide B.

Referring to Fig. 19, a modified form of securing the relative adjustment above referred to may be seen, comprising a bore b^{19}, in which a plunger b^{20} and plug $b^{11\times}$ are reciprocable, the latter carrying the pin B³ and being capable of adjustment by means of a thumb-screw b^{21} and the former carrying the pin B² and being limited in its movement by a screw b^{13}, as before.

Referring to Figs. 9, 10, and 13, the preferred mechanism which I employ for oper-

ating the pins B^2 B^3 is shown as consisting of flaps f f', centrally hinged to studs f^2 and respectively engaging at their lower ends the pins B^2 B^3 between the heads b^{19} and shoulders b^{22} of the latter, (see Fig. 13,) the flaps being actuated by springs f^3, wound around their hinge-pins, which normally act to cause the flaps to insert the pins B^2 B^3 into the grooves d^4, these flaps being engaged at their upper ends by the inclined end of a projection l, carried by the tool-bar L', as the latter descends in its cutting operation, thereby turning the said flaps in an opposite direction to cause their lower edges to withdraw the pins B^2 B^3 from the grooves d^4 in opposition to the tendency of their springs to insert them therein.

It will be understood that at the same time that the tool-bar and its projection l withdraw the pins from the pattern-grooves the pressure-bar F by its pressing engagement on the end of the tool-bar firmly holds it and the tool-carrier against any lateral movement which would otherwise be occasioned by the weight C, but although the tool-carrier itself cannot move the plunger b^2 moves at once as soon as its pins are released from the pattern-groove by reason of the pressure thereon toward the right of the compressed spring b^{15}, this spring having been compressed and the adjustment-screw b^{13} having been pulled against the plunger b^2 by the weight C when the pin B^2 was first engaged with its pattern-groove and before the pressure-bar F operated the cutter-bar, and therefore this forward movement of the plunger within the slide of the tool-carrier carries the plunger and its contained plug, and hence the other pin B^3, against the plate B^{11} and into position to permit the pin B^3 to engage another pattern-groove as soon as the cutter-bar has been allowed to rise sufficiently to disengage its projection l from the flap f', further upward movement of the pressure-bar until the cutter-bar is released then permitting the tool-carrier to be moved a step to the right by its weight C, this movement again compressing the spring b^{15}. The next downward movement of the pressure-bar holds the tool-carrier from lateral movement, as before, and at the same time disengages the pin B^2 from its holding relation with the pattern-surface, so that the compressed spring b^{15} at once shifts the plunger b^2 to the right, as before, bringing its pin B^2 into alinement with another pattern-groove, into which it is inserted by its spring upon the release of its flap by the upward movement of the tool-bar, as before, and, finally, upon the further upward movement thereof and of the pressure-bar F the tool-carrier is again free to slide forward a step to the right and again bring the pin B^3 into alinement with another pattern-groove, the process being thus repeated step by step until the book or other article is fully notched as desired.

In Figs. 20 to 23 I have shown other means for accomplishing the desired movement of the pins B^2 B^3, comprising a flap $f^\times$ and a lever $f'^\times$, pivoted on ears $f^{2\times}$, the former being actuated by the inclined end of the projection l, as before, on the descent of the tool-bar, and the latter being actuated on the ascent thereof by a pin $l^\times$, extending from the projection l and engaging the inclined upper end of the lever $f'^\times$, as clearly shown in Fig. 21. The flap $f^\times$ has a spring $f^{3\times}$ wound around its hinge-pin $f^{5\times}$, which operates to insert the pin B^2 into a groove d^4 of the pattern-surface, while the pin B^3 is forced into engagement with another groove of the pattern-surface by a spiral spring $f^{4\times}$, contained in a recess formed in the tool-bar guide L and bearing against the extended forward end of the pin B^3.

The arrangement just described permits one pin to enter a groove when the other pin is withdrawn from its groove of the pattern-surface. The object of the second pin is to divide the step in half and so get smaller steps without making the grooves closer together, which would leave the ribs between too thin to be strong.

For steps from one-fourth of an inch to seven-eighths of an inch each in length (that is, books from six inches to twenty-one inches long) I use the left-hand pin only, the other remaining held back by its cam-lever. This makes the setting considerably simpler for ordinary sizes.

In order to permit the pins above described to be held out of engagement with a pattern-groove whenever desired, I have provided cam-levers f^7, pivotally mounted adjacent to the pins or preferably adjacent to their actuating-flaps, these cam-levers having inclined lower faces f^8 to engage a lug f^9 on the flap, and thereby permanently tip the latter to withdraw its pin when the levers are turned down and hold the pins in inoperative position until the said cam-levers are returned to their upright position, as shown in the drawings. The provision of these cam-levers permits my improved step-by-step mechanism to be operated when desired by means of one pin.

In order to indicate to the operator the progress that he is making in cutting the book or other article being notched or indexed, I have mounted on one side of the guide-arm L a flanged wheel m on a suitable pin m', and between this wheel and a shoulder m^2 I place a ratchet-wheel m^3, the flanged wheel m being tightly placed thereagainst by a spring-plate m^4, set up by a suitable nut m^5, the periphery of the wheel m being provided with letters, figures, or other indications corresponding to the index being cut, a space being preferably left by the side of each letter for the insertion of the number of pages that letter or character is to have in the index. A pawl m^6 is pivoted on an arm m^7, carried by the reciprocating tool-bar L', being adjustable thereon by means of a spring or rubber band m^9 and set-screw m^{10}, so that

each time the tool-bar descends it will turn the ratchet-wheel more or less, according to the adjustment of the pawl, and the rubber band or spring m^9 will permit the pawl to yield in its upward movement and click over the ratchet without rotating it backward.

In Figs. 1, 2, and 3 I have shown the pattern-surface as cylindrical in shape, being cut away at $d^{\times}$ (see dotted lines, Fig. 1) for the purpose of making the pattern-cylinder lighter. This cylinder or roll is journaled in brackets d, projecting in a rearward direction from the blocks A^2, and is provided at one end with a suitable hand-wheel d', with which to turn it in its bearings, one of the latter being split and provided with ears d^2 and a bolt d^3, with which to clamp the roll in any desired position, the roll being provided with one or more graduated scales d^6, which may be read over the edge of a reader-plate d^7, secured to a fixed part of the frame, these scales being so arranged that the numeral or numerals alined with the reader-plate indicate the data for the horizontal line across the pattern-grooves in alinement with the pins of the tool-carrier.

In Figs. 24 to 26 I have shown the pattern-surface in the form of a plate $D^{\times}$, movable up and down in guides D^2 by means of a hand-wheel $d'^{\times}$, mounted to rotate in a perforated lug $d^{4\times}$ and having threaded engagement at $d^{2\times}$ with an ear $d^{3\times}$ on the back of the pattern-plate, as clearly shown in Fig. 26, so that the pattern-grooves, moving up and down in a vertical plane past the pins of the tool-carrier, coöperate with the latter precisely the same as the curved pattern-surface of the form thereof shown in Fig. 1.

The operation of my machine is as follows: The pattern-surface is first set, and to do this the pins are withdrawn and the slide moved to the extreme right of the machine and afterward brought up to the left-hand groove. The machine is first set to cut the desired-sized index by moving the tool-carrier to the extreme left of the machine, so as to engage its pin B^2 with the last pattern-groove d^4, the spring b^{15} being compressed by the action of the weight C, so as to hold the stop b^{13} in contact with the plunger b^2. The tool-carrier is then held against movement, the pin B^2 being released from its groove by hand, and the thumb-screw b^4 and adjustment-screw f^{13} are properly adjusted to bring the pin B^3 in front of the next pattern-groove—that is to say, the adjustment is so made that when the pin B^2 is in a groove and the plunger is at the same time against the stop b^{13}, and thereafter the pin B^2 is withdrawn from its groove, so as to be projected to the right by its spring b^{13}, the pin B^3 will be brought directly in front of another groove. This is the method of adjustment for short books.

To set the machine to cut an index of a given length of book or article of six inches or over, the pin B^2 only is used, the other one being rendered inoperative by turning its flap-lifting cam-lever f^7 downward, and then, the pattern-surface having been adjusted until the graduated scale registers the desired size against the reader d^7, the tool-carrier is slid over to the extreme left of the machine, as before, until its pin B^2 enters the last groove d^4, when the adjustable stop b^{13} is then set by its graduated scale b^{16} b^{18} to the same adjustment as was indicated by the reader d^7. The pin will then be withdrawn from the pattern-grooves each time the tool descends, and the spring b^{15} will move it along to the next groove, while the pressure-bar holds the tool-carrier against lateral movement in a manner which will be readily understood.

I have arranged and described my machine to cut twenty-four steps—that is, the cutting is arranged to correspond to the usual alphabetical indexes; but of course it will be understood that any other number or arrangement can be readily substituted or added.

The machine having been properly set to provide the requisite step-by-step movement when it is being operated, the book is clamped beneath the clamping-bar H′ simply by turning the cam-levers h^8, the said bar having been adjusted to the correct thickness by means of the nuts h^7, and the width-gage I^2 is swung by hand against the front edges of the book, being moved until its ear i^4 is engaged and held by the catch i^2, to properly position the same for the cutter-tool, the book being also alined at its end accurately with the end gage K. Having thus properly positioned and secured the book, the operator depresses the end E^5 of the treadle, thereby causing the pressure-bar F to descend on the upper end of the tool-bar L′, the bracket e^2 in the meantime having engaged the end i^5 of the catch i^2, thereby releasing the width-gage and permitting it to be moved out of the way of the tool by its actuating-springs. The tool descends and cuts the required notch or perforation, the projection l meanwhile having released the pin or pins B^2 B^3 from the pattern-surface, so that just before the tool reaches the bottom of its stroke the said pins will be moved along to the right the required distance to coöperate with the pattern-surface in permitting the tool-carrier to be moved by its weight C as soon as it is released by its pressure-bar and permitted to do so. The first cut having been made, the last section in the index will be lifted out of the way of the tool by the operator and the second cut will be made. The next section of the index will then be raised or turned out of the path of the tool and the third cut will be made, and so on with the successive cuts, the entire indexing being quickly accomplished in progressive order with absolute evenness and precision of cut and of spacing without the possibility of any mistake or inaccuracy.

While I have herein described the preferred embodiments of my invention and

have explained all the details of construction thereof in order that the same might be clearly apprehended, yet I wish it understood that I do not limit myself in any way to the precise details of construction herein set forth, inasmuch as many changes therein may be resorted to and the combinations and arrangements thereof may be considerably varied within the spirit and scope of my invention.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an index-cutting machine, the combination with a cutting-tool and mechanism to operate the same, of feeding mechanism intermittingly to move said cutting-tool forward for its successive cuts, and a pattern-surface coöperating with said feeding mechanism, to govern the said intermittent movement thereof, said pattern-surface comprising a series of grooves, said grooves being divergent from each other, and means to change the relative positions of the traveling tool-carrier and said pattern-surface for regulating the intermittent movements of the former, substantially as described.

2. In an index-cutting machine having an intermittingly-traveling tool-carrier, a pattern-surface having directing-grooves extending transversely to the direction of travel of said tool-carrier, said grooves diverging from each other in one direction, and means to adjust said pattern-surface relatively to said tool-carrier to coöperate therewith in regulating the intermittent travel thereof, substantially as described.

3. In an index-cutting machine, a pattern-surface, a tool-carrier, said tool-carrier being provided with a reciprocable pin, said pin being mounted in said carrier to move laterally therein, and means alternately to move said tool-carrier and said pin laterally relatively to said pattern-surface to permit said pin to successively engage the pattern-surface, substantially as described.

4. In an index-cutting machine, a pattern-surface, a tool-carrier, said tool-carrier being provided with a longitudinally-reciprocable pin, said pin being mounted in said carrier to move laterally therein, and means alternately to move said tool-carrier and said pin laterally relatively to said pattern-surface to permit said pin to successively engage the pattern-surface, said means including a spring mounted on said carrier and engaging said pin, substantially as described.

5. In an index-cutting machine, a pattern-surface, a tool-carrier, said tool-carrier being provided with a reciprocable pin, said pin being mounted in said carrier to move laterally therein, and means alternately to move said tool-carrier and said pin laterally relatively to said pattern-surface to permit said pin to successively engage the pattern-surface, and adjusting mechanism to regulate said relative lateral movement, substantially as described.

6. In an indexing-machine having a pattern-surface and a tool-carrier to coöperate therewith, feeding mechanism to move said tool-carrier step by step across said pattern-surface, said feeding mechanism comprising two pins carried by said tool-carrier, means to reciprocate said pins in said carrier in the direction of their length and means to move said pins in said carrier transversely of their length, substantially as described.

7. In an indexing-machine, having a pattern-surface and a tool-carrier to coöperate therewith, feeding mechanism to move said tool-carrier step by step across said pattern-surface, said feeding mechanism comprising two pins carried by and reciprocable in said tool-carrier transversely thereof, means to reciprocate said pins, means to move said pins laterally relatively to said carrier, and adjusting devices to regulate the amount of said lateral movement, substantially as described.

8. In an indexing-machine having a pattern-surface and a tool-carrier to coöperate therewith, feeding mechanism to move said tool-carrier step by step across said pattern-surface, said feeding mechanism comprising two pins carried by and reciprocable in said tool-carrier transversely thereof, means to reciprocate said pins, means to move said pins laterally relatively to said carrier, and independent adjusting devices for each of said pins to regulate the lateral movement thereof, substantially as described.

9. In an indexing-machine, a work-table, having slots therein, sleeves movable in but non-removable from said slots, means to fix said sleeves immovably in any desired adjustment in said slots, bolts freely movable longitudinally in said sleeves, a work-clamp extending from one bolt to the other and carried thereby, said bolts being threaded at their upper ends and provided with nuts for setting or adjusting the work-clamp for any particular thickness of work, and having quick-clamping means at their lower ends for drawing said bolts and guide down in the sleeves for clamping the work, substantially as described.

10. In an indexing-machine, a tool and its carrier, a work-table, a work-clamp, an end gage, a width-gage, means to automatically move said width-gage into inoperative position upon operation of said tool, and means to adjust said clamp and said gages, substantially as described.

11. In an indexing-machine, a width-gage pivotally mounted on the machine, springs normally tending to move said gage out of gaging position, a tool and its carrier, and mechanism to operate said tool, said mechanism being provided with a tripping device to engage said width-gage and release the same to permit said springs to move said gage

out of the way of said tool as the latter descends, substantially as described.

12. In an indexing-machine, a pattern-surface provided with a graduated scale, a reader fixed on the machine to coöperate therewith, a tool-carrier, mechanism to intermittingly feed said carrier along said pattern-surface, adjusting devices to regulate the feed of said mechanism, and a graduated scale for said adjusting devices arranged to indicate when said feeding mechanism is adjusted to correspond to the position of said pattern-surface, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARTHUR HERBERT ALEXANDER.

Witnesses:

WALTER SELF,

ARTHUR L. GREEN.