(No Model.) 5 Sheets—Sheet 1.

J. E. MUNSON.

ELECTRICAL PERFORATOR.

No. 328,600. Patented Oct. 20, 1885.

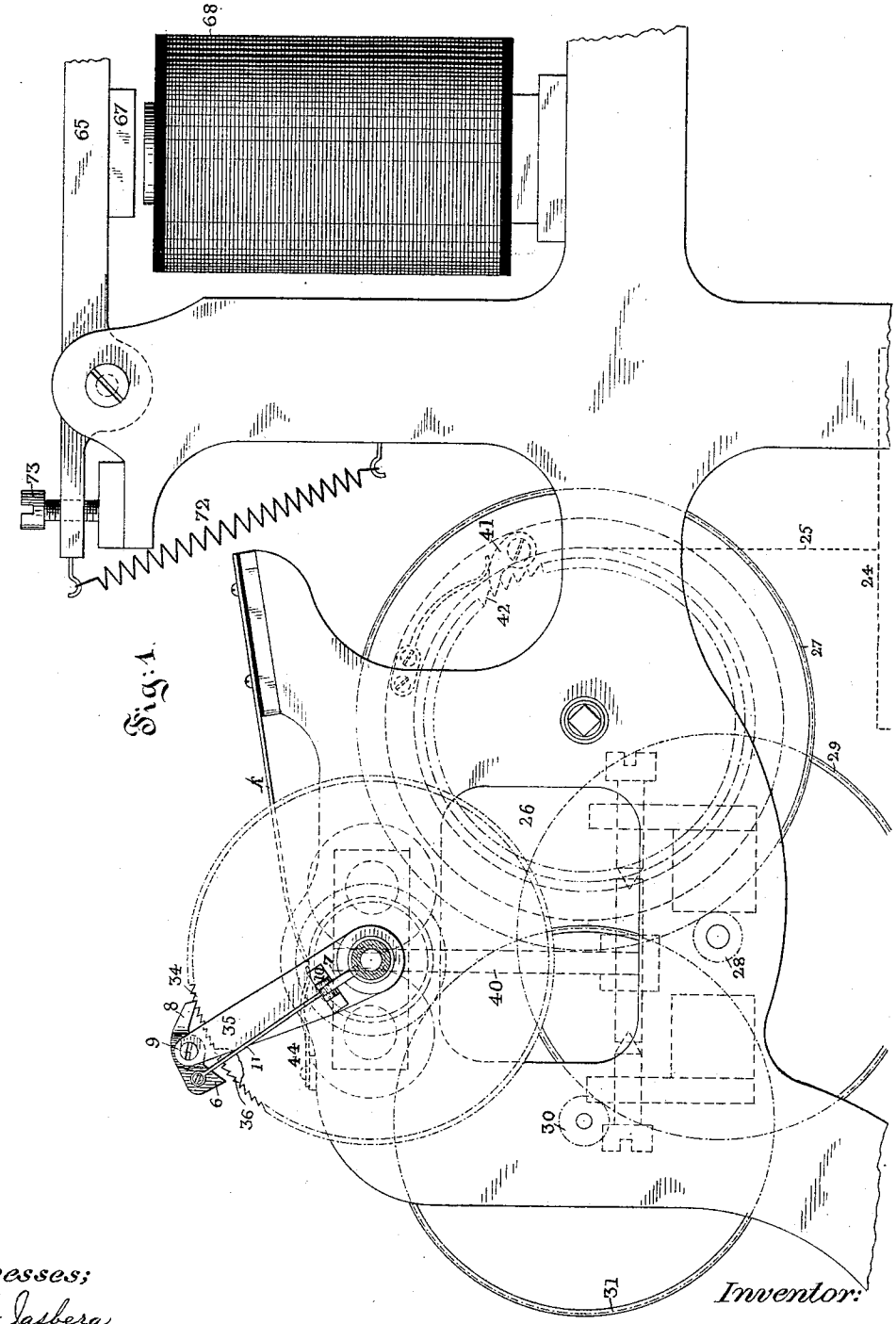


Fig. 1.

Witnesses;
A. N. Jasbera
T. H. Palmer

Inventor:
James E. Munson,
By his Attys, Munson & Philipp

N. PETERS. Photo-Lithographer, Washington, D. C.

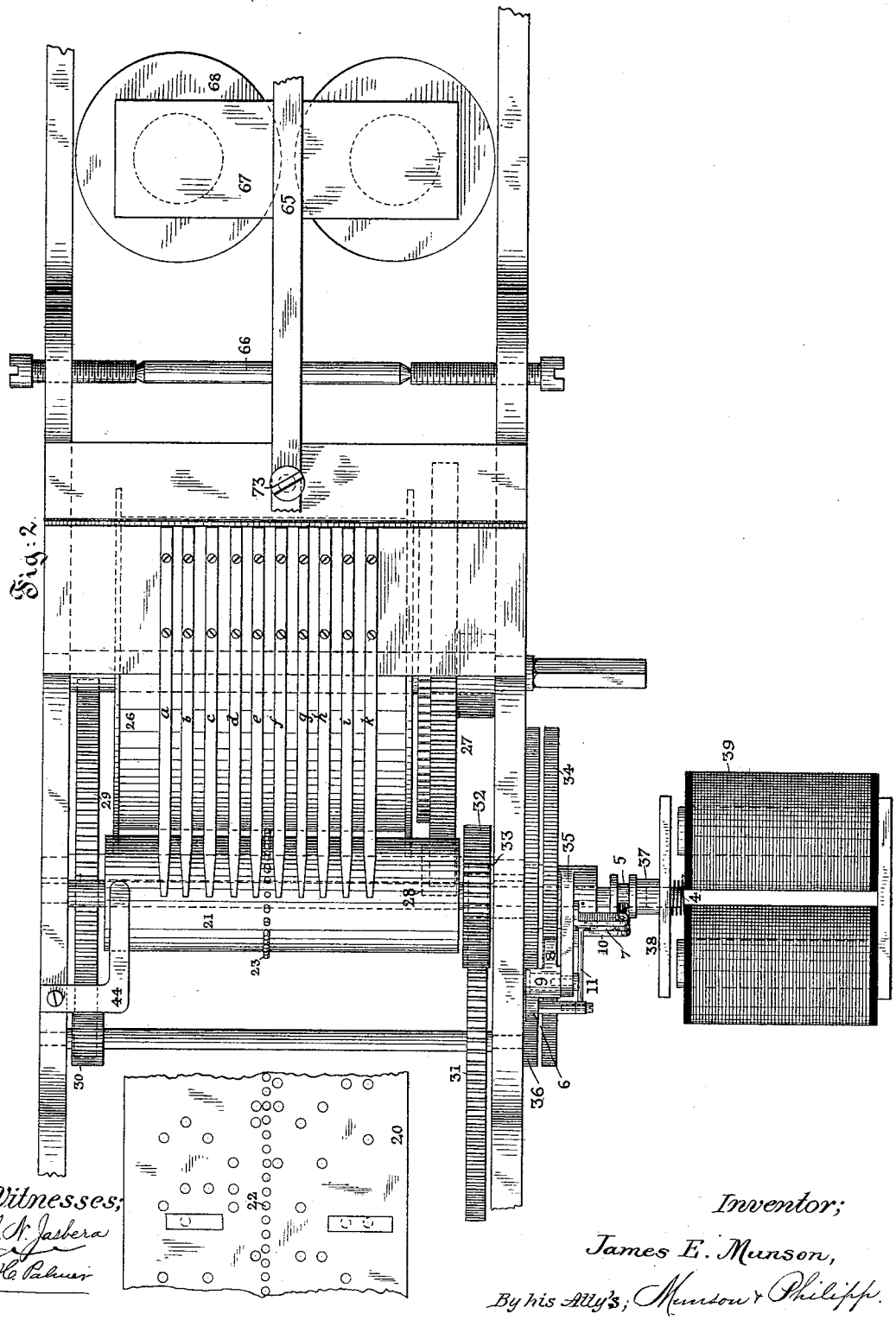
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Fig. 2.



Witnesses;
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(No Model.) 5 Sheets—Sheet 3.

J. E. MUNSON.

ELECTRICAL PERFORATOR.

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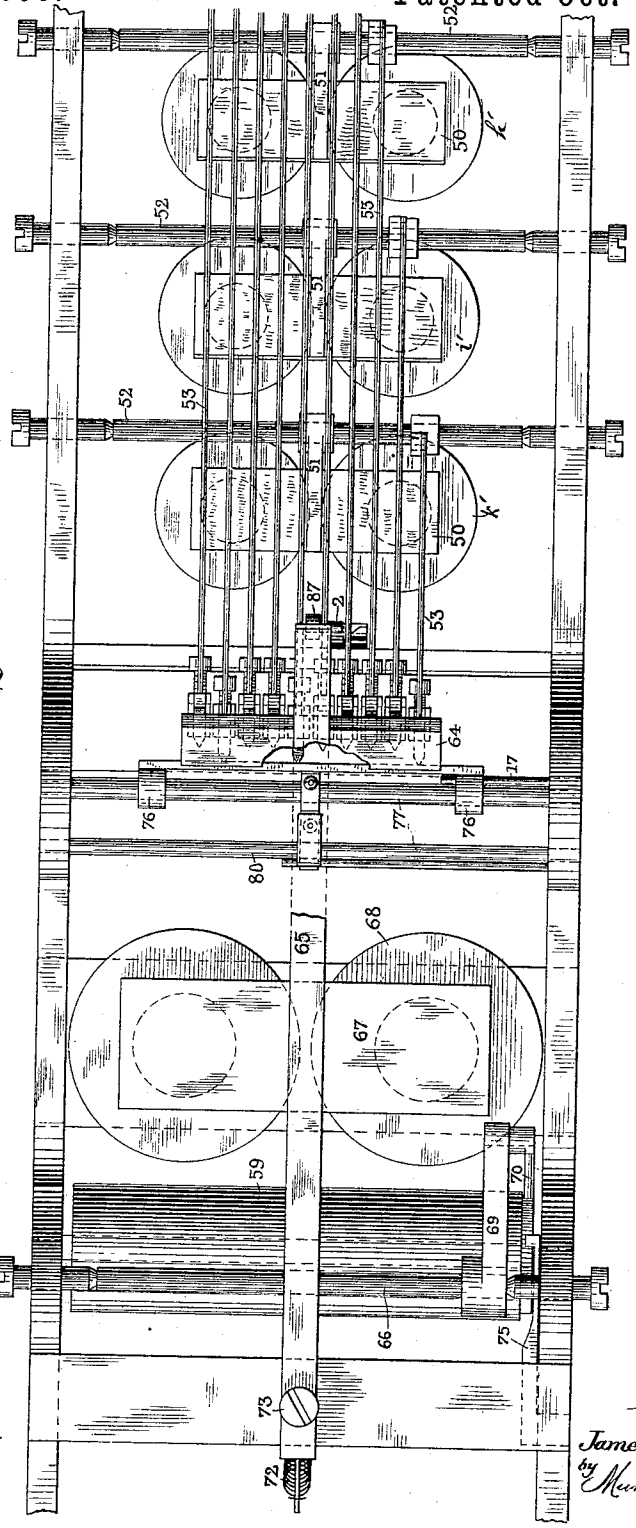


Fig. 3.

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(No Model.) 5 Sheets—Sheet 4.

J. E. MUNSON.

ELECTRICAL PERFORATOR.

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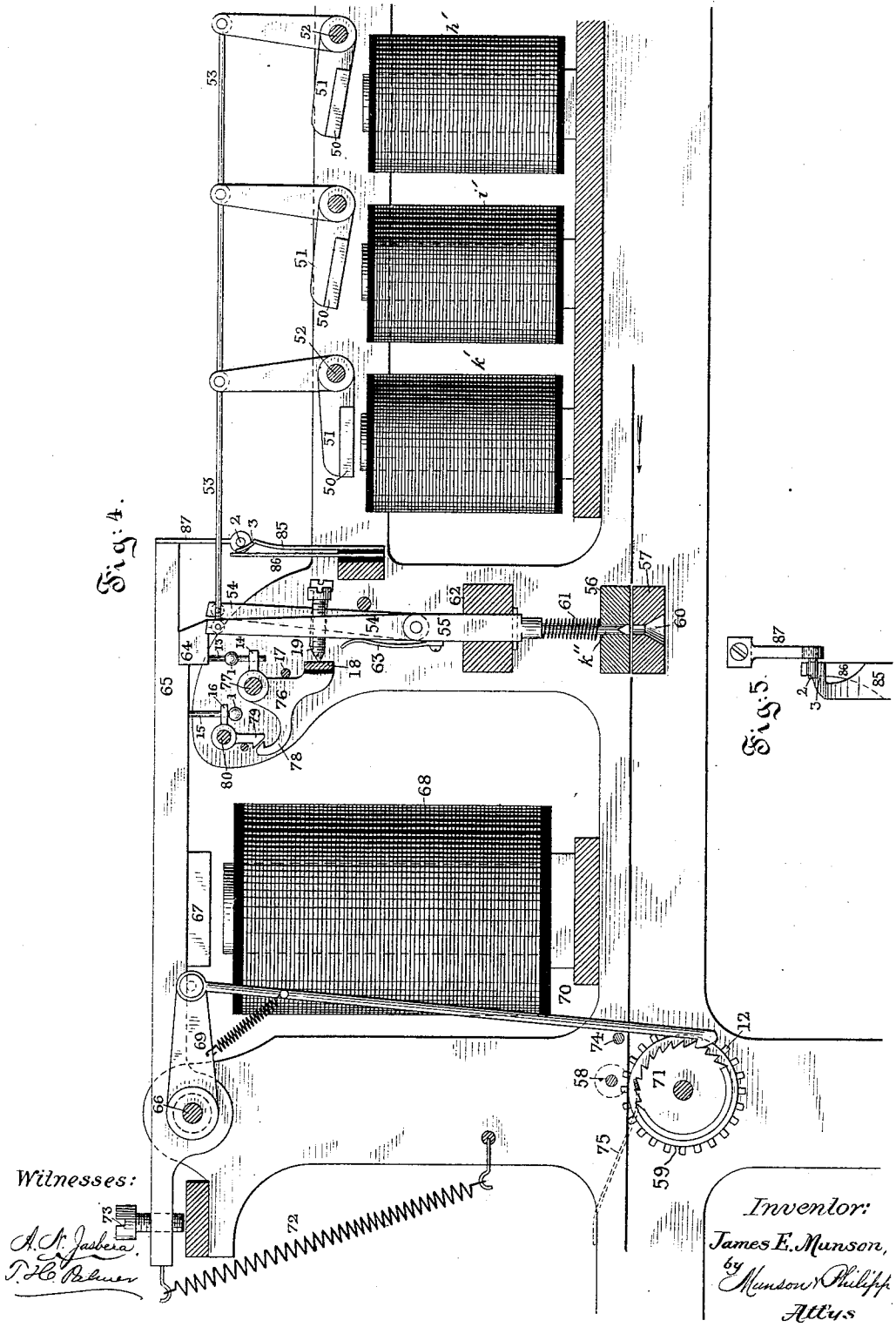


Fig. 4.

Fig. 5.

Witnesses:
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(No Model.) 5 Sheets—Sheet 5.

J. E. MUNSON.

ELECTRICAL PERFORATOR.

No. 328,600. Patented Oct. 20, 1885.

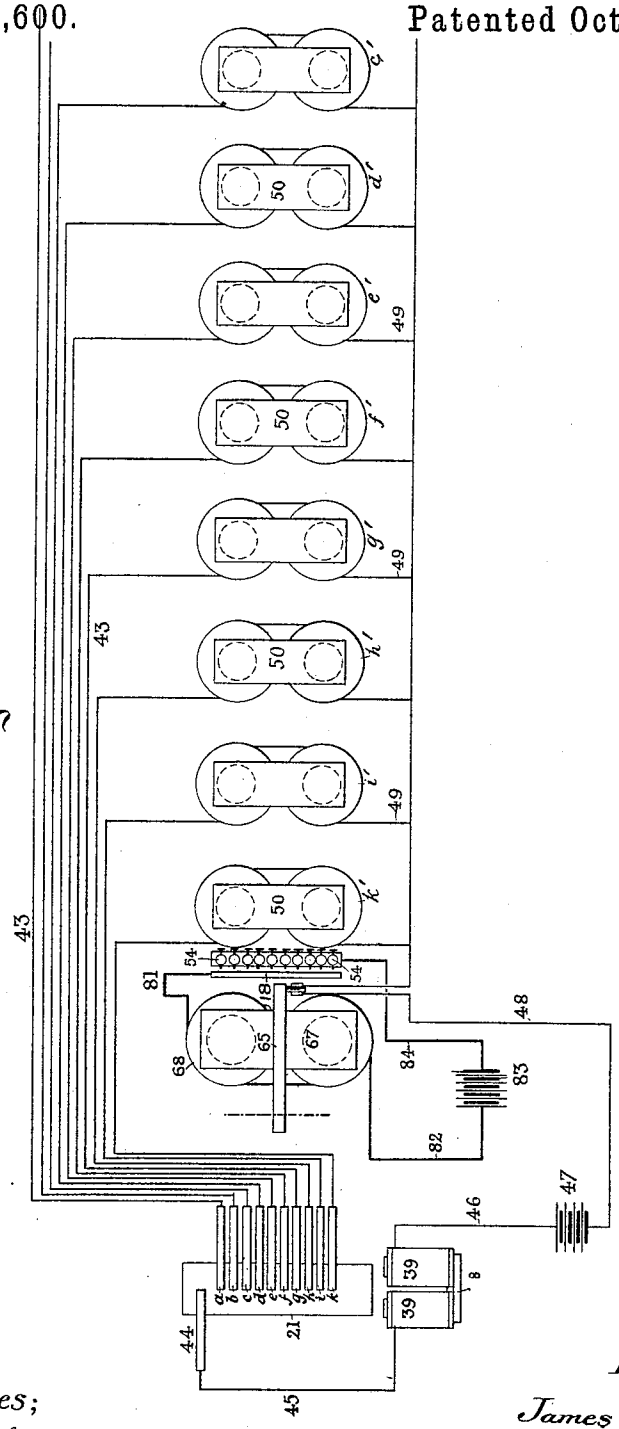


Fig. 6.

Witnesses;
A. N. Jasbera.
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UNITED STATES PATENT OFFICE.

JAMES E. MUNSON, OF NEW YORK, N. Y.

ELECTRICAL PERFORATOR.

SPECIFICATION forming part of Letters Patent No. 328,600, dated October 20, 1885.

Application filed January 18, 1883. Renewed March 18, 1885. Serial No. 159,307. (No model.)

To all whom it may concern:

Be it known that I, JAMES E. MUNSON, a citizen of the United States, residing in the city of New York, county of New York, and State of New York, have invented certain new and useful Improvements in Electrical Perforating Mechanism, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

In a former application for United States Letters Patent, I have described a method of setting type by machinery in which the matter to be composed is indicated upon a ribbon or strip of paper, or similar material, by perforations representing the different types, "spaces," &c., the ribbon or strip thus prepared being afterward used to control the type-selecting devices, thereby making the operation of the type-setting mechanism entirely automatic. In said application I have also described a method of correcting and justifying the composition upon the perforated ribbon before the same is used to operate the type-setting mechanism.

The present invention relates to an apparatus for performing one of the operations involved in said methods; and to aid in a ready understanding of its object and operation the manner of preparing and using such ribbon will be first briefly described.

The matter which is to be put in type is first indicated upon a ribbon of paper or similar material of suitable width to be conveniently manipulated by transverse rows of perforations, each of which rows represents one of the types, spaces, or quads to be set the particular type or space, &c., being determined by the positions of the perforations. The number of perforations in each row may be the same, or it may vary. Thus, some of the types, &c., may be represented by a single perforation, while others are represented by combinations of two, three, or more perforations; but, as set forth in said former application, it is preferable that the same number should be used for each of the types, &c., and that this number should be three, and also that the number of possible perforations in each row should be ten.

For the purpose of enabling the composition to be justified upon the perforated ribbon, the rows of perforations are separated from each other by spaces proportioned to the running thicknesses of the types, &c., which they represent. The ribbon may be thus prepared by hand or by any suitable form of mechanism for that purpose—such, for example, as that shown in an application for Letters Patent heretofore filed by me. After the ribbon has been thus prepared it will be examined by the proof-reader, who will note thereon the necessary corrections, after which the ribbon will pass to the justifier.

By reason of the proportionate spacing before mentioned the proper points for dividing into lines can be readily ascertained by the use of a suitable scale or measure—due allowance of course being made for the corrections noted by the proof-reader. In the process of correcting and justifying the composition the changes noted by the proof-reader will be made by punching additional rows of perforations to represent types, &c., to be added, or eliminating (by covering, filling, or otherwise) rows of perforations representing improper types, &c., or both, and additional rows of perforations will be made at the proper points to represent the spaces or quads to be added to fill out short lines, or rows of perforations representing spaces, &c., which must be removed to shorten long lines, will be eliminated, or both. When a word is divided at the end of a line, a row of perforations representing the hyphen will of course be inserted and properly allowed for in the justification. At the end of each line the justifier will add a row of perforations representing a large quad, which will serve to indicate the line-divisions after the matter is put in type.

The ribbon thus prepared may be used to control the operation of the type-selecting devices; but in order to permit the setting mechanism to operate uniformly and at its maximum speed it is necessary that the rows of perforations upon the operating-ribbon should be uniformly spaced. The ribbon, therefore, after having its matter corrected and justified, is reproduced with its lines of perforations uniformly spaced, and this reproduction is used to control the type-selecting devices.

In using the ribbon to control the type-selecting devices it is advanced beneath a series of feelers located in an electric circuit and forming circuit-closers, so that when they are permitted to pass through the perforations in the ribbon, circuits are formed which operate the proper selecting devices and permit or cause the types, spaces, &c., to be ejected from the type-reservoirs in the order in which they are represented upon the ribbon, thus making the operation of the setting mechanism entirely automatic.

It is of course apparent that the rows of perforations may be evenly spaced upon the ribbon in the first instance, and this ribbon used for controlling the selecting devices, the matter being corrected and justified after it is in type in the usual manner. It is preferable, however, that the correcting and justifying be done upon the ribbon.

The advantages of this method of operating a type-setting mechanism and of correcting and justifying the composition will at once be recognized by those familiar with this art, and need not be here specified. They are, however, fully set forth in my application for Letters Patent filed September 9, 1882, and my former application, hereinbefore referred to, to which applications reference is made for these facts, as well as for a more detailed description of the operation of the mechanisms.

The present invention relates to an apparatus for automatically effecting the reproduction of the ribbon hereinbefore referred to; and it consists in various devices, singly and in combination, by which the corrected and justified ribbon is automatically reproduced, with its rows of perforations uniformly spaced, all of which will be hereinafter fully explained, and particularly pointed out.

The apparatus embodying the present invention consists, essentially, of two mechanisms—one for controlling the irregularly-spaced ribbon which is to be reproduced, and the other for effecting the reproduction.

Referring to the accompanying drawings, these mechanisms will now be described in the order named.

In said drawings, Figure 1 is a side elevation of the mechanism for controlling the pattern-ribbon, showing also a portion of the reproducing mechanism; Fig. 2, a plan view of the same; Fig. 3, a plan view of the reproducing mechanism; Fig. 4, a longitudinal vertical section of the same; Fig. 5, a detail, to be hereinafter referred to, and Fig. 6 a diagram illustrating the electrical connections.

Referring to Figs. 1 and 2, it will be observed that the pattern-ribbon 20, after having had the composition indicated upon it, and corrected and justified, as set forth, is led from a reel or other suitable support (not shown) to the feeding-roll 21, and is passed between said roll and a series of spring-feelers, *a b c*, &c., equal in number to the possible perforations in each transverse row upon the ribbon, which bear gently upon its upper side with their ends in such position as to pass through the perforations and come in contact with the roll when permitted.

In order to insure the positive and accurate feeding of the pattern-ribbon it may be provided, in addition to the perforations indicating the composition, with one or more longitudinal rows of feeding-perforations, 22, which will be engaged by suitable sprockets, 23, upon the feeding-roll.

The feeding-roll 21 receives motion from a weight, 24, suspended from a cord, 25, wound upon a drum, 26, this drum being connected by a train of gears, 27 28 29 30 31, with a gear, 32, fast to a sleeve, 33, which is mounted loosely upon the shaft of the feeding-roll. The outer end of the sleeve 33 carries a ratchet-wheel, 34, which is engaged by a pawl, 8, pivoted upon a stud, 9, projecting from an arm, 35, rigidly secured to the shaft of the feeding-roll. From this construction and arrangement it will be seen that so long as the pawl 8 is kept in engagement with the ratchet 34 the ribbon 20 will continue to be advanced by the roll 21.

The arm 35 is provided with a bracket, 10, in which is pivoted a bell-crank lever, 7, one arm of which is connected by a rod, 11, with a pawl, 6, made integral with the pawl 8, and so positioned as to be capable of engagement with a stationary ratchet, 36. The other arm of the lever 7 rests in a groove, 5, of a sleeve, 37, which is made capable of sliding upon the shaft of the feeding-roll, and is attached at its outer end to the armature 38 of an electro-magnet, 39, said armature being supported upon an oscillating arm, 40, pivoted in brackets secured to the frame of the instrument, as indicated in dotted lines in Fig. 1, and normally held away from its magnet by a spring, 4, as shown in Fig. 2.

To provide for the rewinding of the cord upon the drum 26, the gear 27 is mounted loosely upon the shaft of the drum, and is connected thereto by a pawl and ratchet, 41 42, in the well-known manner.

The feelers *a b c*, &c., are insulated from the frame of the instrument, and are connected by a series of wires, 43, one for each feeler, (see Fig. 6,) with one pole of a series of electro-magnets, *a' b' c'*, &c., corresponding in number with the feelers. The roll 21 is also insulated from the frame of the instrument, and is connected by a contact-spring, 44, and wire 45 with one pole of the magnet 39, the opposite pole of said magnet being connected by a wire, 46, with one pole of a battery, 47, the opposite pole of which is connected by a wire, 48, and branch wires 49 with the magnets *a' b' c'*, &c.

The operation of the mechanism thus far described is as follows: The cord 25 having been wound upon the drum, so as to elevate the weight 24, the pattern-ribbon will be advanced by the roll 21 until the first row of perforations is beneath the ends of the feelers *a b c*, &c., when the feelers corresponding to

the perforations in said row will pass through said perforations and come into contact with the roll.

It has already been stated that the number of perforations in each row upon the pattern-ribbon is not material, but that, for reasons elsewhere explained, it is preferable that each row should consist of three perforations. For convenience, therefore, it will be assumed that each row contains this number, and that those forming the first row correspond to the feelers *b e k*, so that said feelers have come into contact with the roll. As soon as this happens, a circuit will be completed through the roll 21, spring 44, wire 45, magnet 39, wire 46, battery 47, wire 48, magnets *b' e' k'*, and feelers *b e k* and their wires 49 and 43, so that the magnets 39 and *b' e' k'* will become energized. As soon as the magnet 39 is energized, the armature 38 will be attracted so as to rock the lever 7, and thereby disengage the pawl 8 from the ratchet 34 and engage the pawl 6 with the ratchet 36, which will instantly stop the feed of the ribbon and cause it to remain at rest until the circuit thus formed is broken. As soon as the circuit is broken, which will be accomplished in a manner to be hereinafter described, the spring 4 will throw the armature 38 away from the magnet 39, thereby re-engaging the pawl 8 with the ratchet 34 and causing the ribbon to be advanced until the next row of perforations arrives beneath the ends of the feelers, when the operation just explained will be repeated.

Referring now particularly to Figs. 3 and 4, the reproducing perforating mechanism will be described. In this case the ribbon upon which the reproduction is to be made, having been previously prepared with feeding-perforations, is passed between a pair of plates, 56 57, and has its end entered between a pair of feeding-rolls, 58 59, the latter of which is provided with suitable sprockets, 12, to engage with the feeding-perforations. The plates 56 57 are provided with openings 60, through which work a series of punches, *a'' b'' c''*, &c., corresponding in number to the series of magnets *a' b' c'*, &c., and provided with springs 61, for holding them in their raised position. These punches are attached to heads 55, which reciprocate in head-blocks 62, and are provided at their upper ends with hinged arms 54, which are acted upon by springs 63, so as to normally occupy a slightly-inclined position.

The armatures 50 of the magnets *a' b' c'*, &c., are attached to a series of bell-crank levers, 51, mounted upon rock-shafts 52, and having their upwardly-extending arms connected by a series of rods, 53, to the series of arms 54 of the punch-heads. When the arms 54 are in a vertical position, their upper ends will lie beneath a transverse bar, 64, secured to the end of a rock-arm, 65, mounted upon a transverse shaft, 66, and to which is also secured the armature 67 of an electro-magnet, 68. The shaft 66 is also provided with an arm, 69, to the end of which is attached a pawl, 70, which engages with the ratchet 71 of the feeding-roll 59. The armature 67 and pawl 70 are normally held in a raised position by means of a spring, 72, which acts upon a forwardly-extending portion of the arm 65.

The arms 54 of the punch-heads are each provided with a contact-point, 19, which, when its arm is pressed forward into a vertical position, presses against a contact-plate, 18, suspended upon oscillating arms 76, extending from a rock-shaft, 77, the rearward movement of said arms being limited by a stop, 17. One of the arms 76 is provided with a forwardly-extending hook, 78, arranged to engage with a like oscillating hook, 79, extending downward from a shaft, 80. The hook 79 is provided with a rearwardly-extending arm, 16, through which passes a rod, 15, extending downward from the arm 65. One of the arms 76 is also provided with a rearwardly-extending arm, 14, through which passes a rod, 13, extending downward from the bar 64, the rods 13 15 being provided with collars 1, which, as the arm 65 moves up and down, act upon the arms 14 16. The purpose of this arrangement will be made clear when the operation of the machine is explained.

The contact-plate 18 is insulated from its support, and is connected by a wire, 81, (see Fig. 6,) with one pole of the magnet 68, the opposite pole of said magnet being connected by a wire, 82, with one pole of a battery, 83. The contact-points 19 are also insulated from the other parts of the instrument, and are connected by a wire, 84, with the opposite pole of the battery 83. From this arrangement it results that when any one or more of the points 19 is or are brought into contact with the plate 18 a circuit will be completed through the magnet 68.

The wire 48, which connects the battery 47 with one pole of the magnets *a' b' c'*, &c., is cut at a point beneath the end of the arm 65, and its ends are connected by a pair of insulated contact-springs, 85 86, arranged as shown in Figs. 4 and 5. The end of the arm 65 is provided with a downwardly-extending arm, 87, from the end of which projects a stud, 2, which, as the arm 65 descends, passes upon the outside of an inclined lip, 3, projecting laterally from the spring 85, and as the arm 65 ascends passes upon the inside of said lip so as to separate the springs 85 86 and break the circuit through the magnets *a' b' c'*, &c., as shown in Figs. 4 and 5.

The operation of the perforating mechanism is as follows: The magnets *b' e' k'* having been energized, as already explained, the armatures 50 of these magnets will be drawn downward, thereby rocking the arms 54 of the punches *b'' e'' k''* forward into position beneath the bar 64, as shown in Fig. 4, and at the same time bringing the points 19 of said arms into contact with the plate 18, and closing the circuit through the magnet 68. As soon as this takes place the armature 67, arm 65,

and bar 64 will be drawn downward, thereby forcing the punches *b″ e″ k″* through the recording-ribbon and reproducing the row of perforations beneath the ends of the feelers *a b c*, &c. When the bar 64 has nearly completed its downward movement, the collar 1 of the rod 13 will strike the arm 14 and rock the arms 76, so as to swing the plate 18 away from the points 19, and at the same time cause the hook 78 to engage with the hook 79, so as to hold the plate 18 in the position to which it has been swung. As soon as the plate 18 is swung away from the points 19, the circuit through the magnet 68 will be broken, so that the spring 72 will at once raise the arm 65 and bar 64. As the arm 65 is raised the stud 2, passing upward along the inside of the inclined projection 3, will separate the springs 85 86, thereby breaking the circuit through the magnets *b′*, *e′*, *k′*, and 39, and permitting the arms 54 of the corresponding punches to resume their normal position and the pawl 8 to re-engage with the ratchet 34, so as to advance the ribbon 20 and bring a new row of perforations beneath the ends of the feelers. As the arm 65 nears the limit of its upward movement, the stud 2 will pass off the projection 3, so as to permit the springs 85 86 to resume contact, and the collar 1 of the arm 15 will act upon the arm 16, so as to rock the hook 79 and release the hook 78, thereby permitting the plate 18 to swing rearward into position to be met by the points 19 of any of the arms 54 which are next pushed forward. As the punches *b e k* are raised by the springs 61 the pawl 70 will act upon the roll 59 and advance the recording-ribbon one step, so as to bring it into proper position to receive the next row of perforations, and so the operation will continue to be repeated.

It will be observed from the foregoing that at each operation of the instrument the recording-ribbon is advanced a uniform distance, so that its rows of perforations will be uniformly spaced, no matter how irregular the spacing upon the pattern-ribbon.

The feed of the recording-ribbon is regulated by an adjusting-screw, 73, which controls the upward movement of the arm 65, and through it the throw of the pawl 70, and any retrograde movement of the roll 59 is prevented by an ordinary holding-pawl, 75, arranged as shown in Fig. 4.

In order to permit the punches to be withdrawn from the ribbon before the feed commences, the parts are so adjusted that the throw of the pawl 70 is somewhat in excess of what is required for effecting the proper feed of the ribbon, and a stud, 74, is arranged, as shown in Fig. 4, in such position as to hold the pawl out of contact with the ratchet during the first part of its upward movement.

Although the apparatus just described is especially adapted for reproducing the irregularly-spaced pattern-ribbon with the perforations evenly spaced, yet it is apparent that it can be also employed to reproduce the evenly-spaced ribbon when it is desired to provide duplicate copies of said ribbon, so as to set up the same matter at more than one place.

What I claim is—

1. The combination, with a gang of punches and means for supporting a recording-ribbon of paper or similar material within their range of action and for advancing said ribbon with a step-by-step movement the steps of which are equal, of means for advancing a pattern-ribbon with a step-by-step movement the steps of which vary according to the distance between the pattern-signs upon the ribbon and connections by which the said signs effect the proper selection of punches, all substantially as described.

2. The combination, with a gang of punches and means for supporting a recording-ribbon of paper or similar material within their range of action and for advancing said ribbon with a step-by-step movement the steps of which are equal, of means for advancing a pattern-ribbon with a step-by-step movement the steps of which vary according to the distance between the pattern-signs upon said ribbon, connections by which the said signs effect the proper selection of punches, and means for operating the selected punches, all substantially as described.

3. The combination, with a gang of punches and means for supporting a recording-ribbon of paper or similar material within their range of action and for advancing said ribbon with a step-by-step movement the steps of which are equal, of means for advancing a pattern-ribbon and for arresting the same at each pattern-sign, connections by which the signs upon the pattern-ribbon effect the proper selection of punches, means for operating the selected punches, and connections by which said means is put in operation only after a selection has been made, and means by which the operation of the punches sets in motion the pattern-ribbon, all substantially as described.

4. The combination, with the pattern-ribbon, of the feelers *a b c*, &c., feeding-roll 21, and magnet 39, located in the same electrical circuit, and means whereby said roll is arrested as each sign upon said ribbon passes beneath said feelers, all substantially as described.

5. The combination, with the feelers *a b c*, &c., of the pattern-ribbon 20, feeding-roll 21, ratchet 34, pawl 8, magnet 39, located in circuit with said roll and feelers, and connections, all substantially as described.

6. The combination, with the magnets *a′ b′ c′*, and punches *a″ b″ c″*, &c., and the hinged arms and contact-points of the latter, of the plate 18, magnet 68, bar 64, and connections, all substantially as described.

7. The combination, with the hinged arms 54, having points 19, of the plate 18, magnet 68, arms 65 87, springs 85 86, and connections, all substantially as described.

8. The combination, with the hinged arms 54, of the points 19, plate 18, hooks 78 79, magnet 68, arm 65, bar 64, and connections, all substantially as described.

9. The combination, with the feelers *a b c*, magnets *a' b' c'*, and punches *a'' b'' c''*, &c., of the roll 21, ratchet 34, pawl 8, magnet 39, arms 54, points 19, plate 18, magnet 68, arm 65, springs 85 86, and connections, all substantially as described.

10. The combination, with the pattern-ribbon and the feelers, magnets, and punches *a'' b'' c''*, &c., of means for advancing said ribbon and electrical connections whereby the signs upon said ribbon arrest its advancement, select and operate said punches, and cause said ribbon to again advance, all substantially as described.

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

JAMES E. MUNSON.

Witnesses:
T. H. PALMER,
JAS. A. HOVEY.