(No Model.) 3 Sheets—Sheet 1.

G. A. GOODSON.

ELECTRO MATRIX MACHINE.

No. 427,681. Patented May 13, 1890.

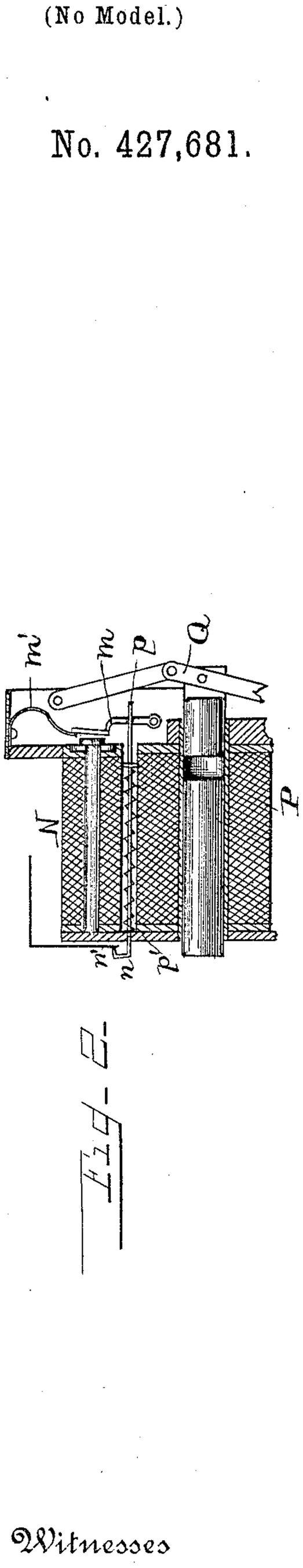

Fig. 2.

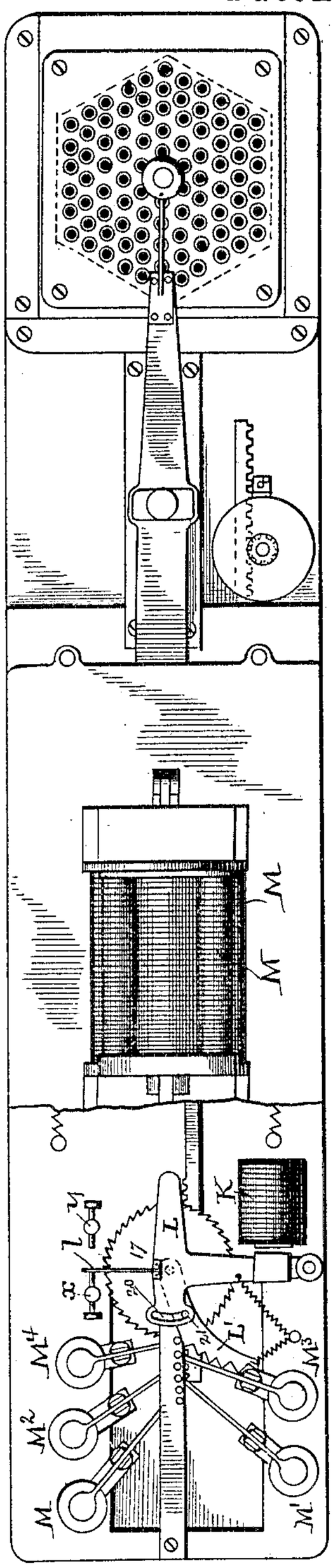

Fig. 1.

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Whitaker & Prindle

No Model.)

3 Sheets—Sheet 2.

G. A. GOODSON.

ELECTRO MATRIX MACHINE.

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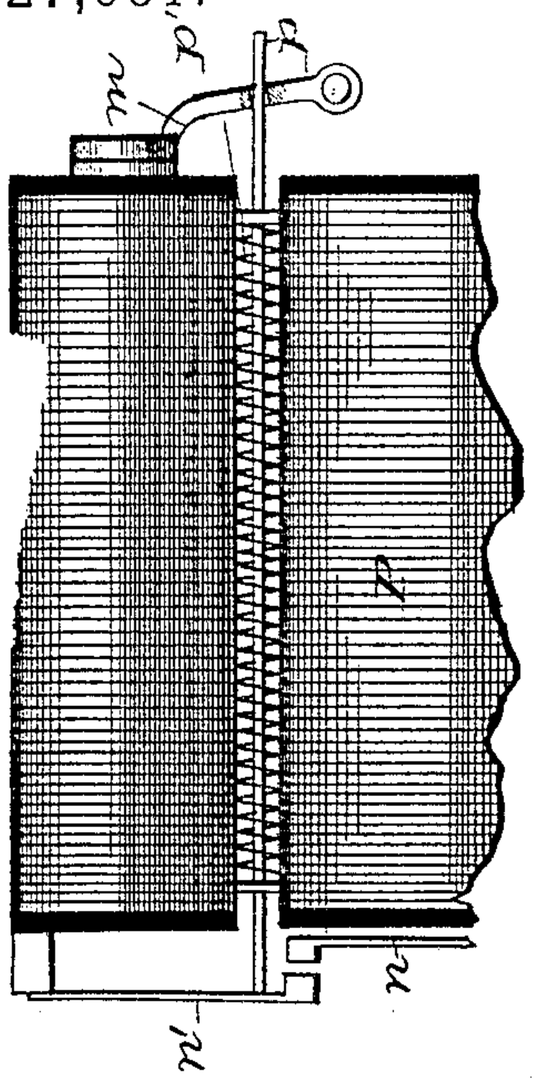

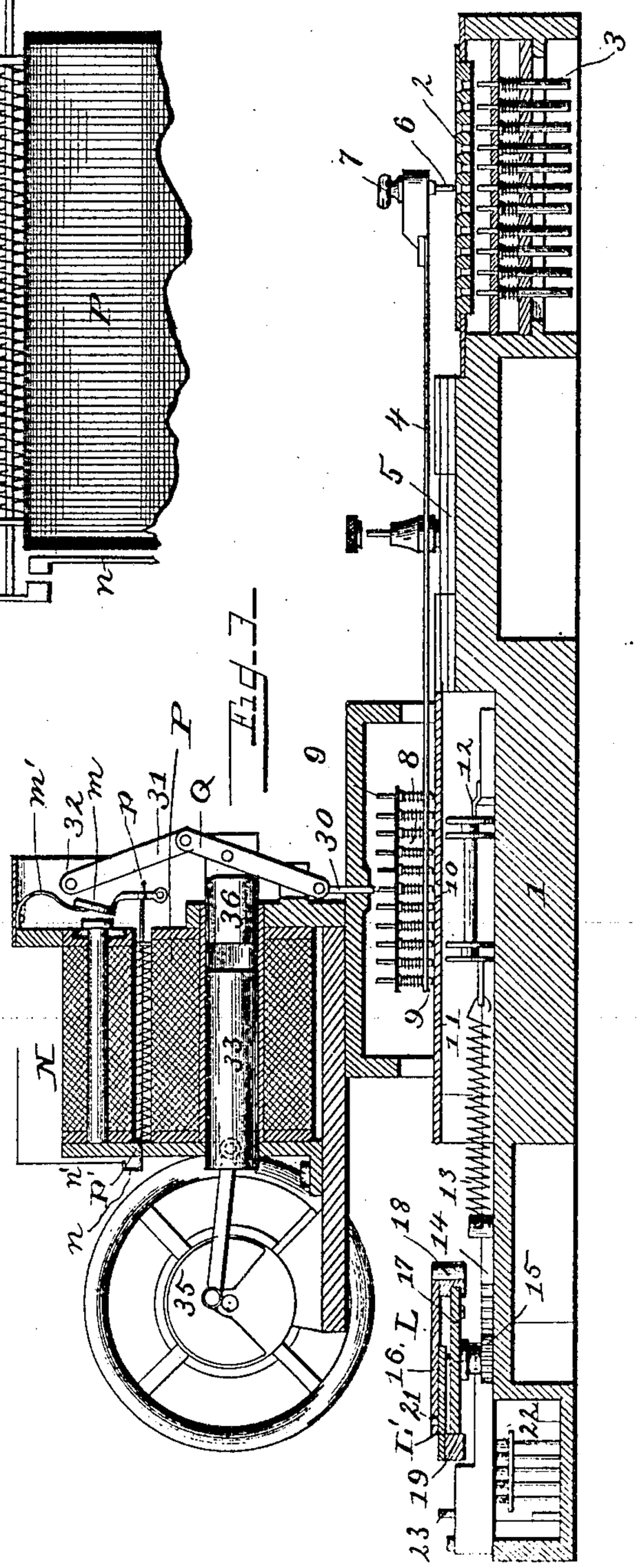

Witnesses

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S. G. Whitaker.

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(No Model.) 3 Sheets—Sheet 3.

G. A. GOODSON.

ELECTRO MATRIX MACHINE.

No. 427,681. Patented May 13, 1890.

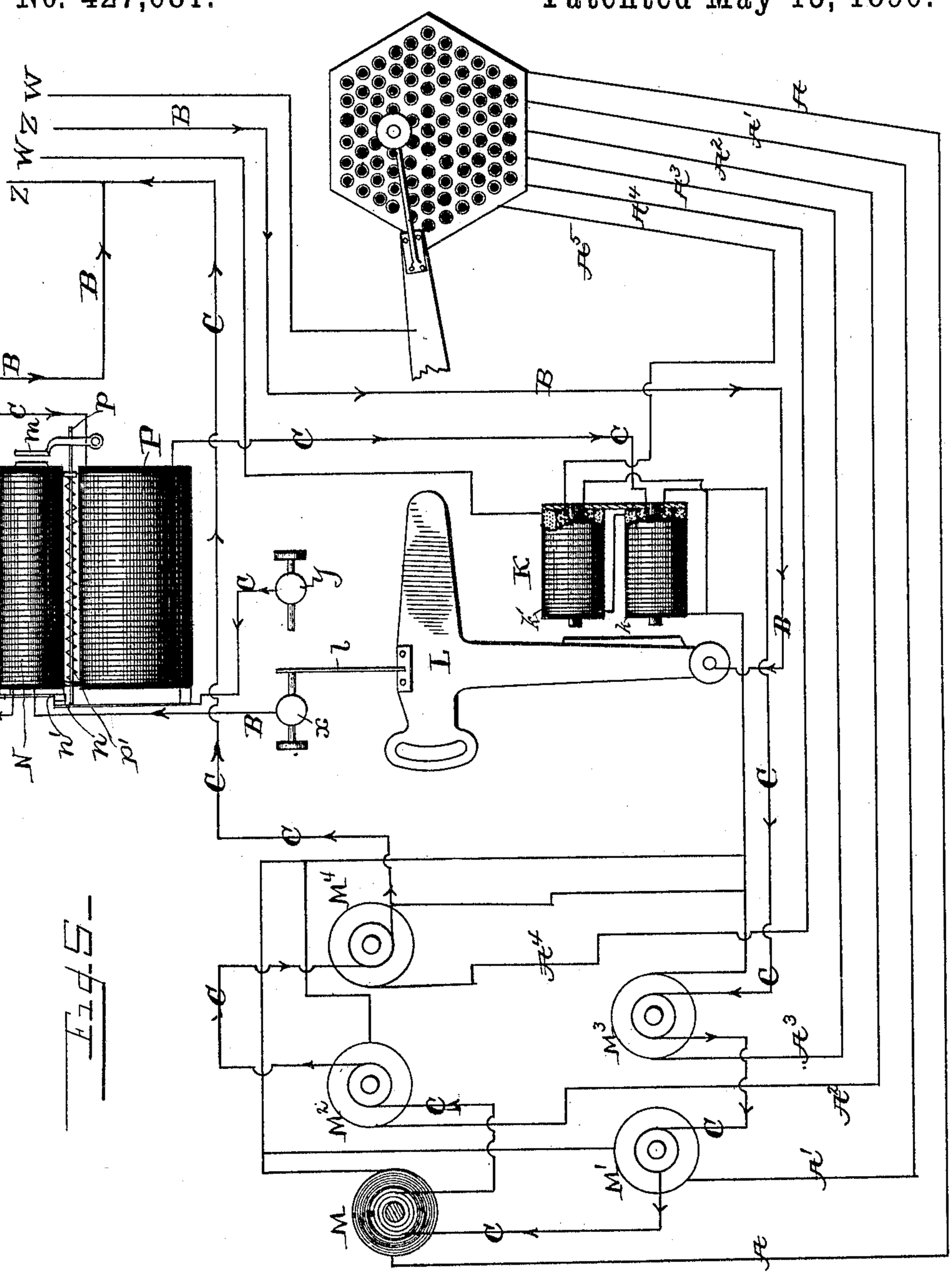

FIG. 5.

Witnesses
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UNITED STATES PATENT OFFICE.

GEORGE A. GOODSON, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR TO THE MINNEAPOLIS ELECTRO-MATRIX COMPANY, OF SAME PLACE.

ELECTRO MATRIX-MACHINE.

SPECIFICATION forming part of Letters Patent No. 427,681, dated May 13, 1890.

Application filed March 23, 1889. Serial No. 304,388. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. GOODSON, a citizen of Canada, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Electro Matrix-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to electro matrix-machines, and has for its object the improvement of the machines shown and described in my application for Letters Patent No. 267,796, filed March 20, 1888; and it consists of certain peculiarities of construction in the electro-magnetic devices for controlling the stops for the escapement-lever and the other electro-magnetic devices employed in such machine, whereby the action of the die-depressing device is so controlled that a die will be depressed after the matrix material has been advanced the requisite distance to secure the proper relative impression of said die in respect to the other impressions in the same line, and also retain the stops and escapement in their proper positions, holding them from movement until the impression has been made.

In the drawings, Figure 1 is a top plan view of one form of apparatus embodying my invention, a part being broken away. Fig. 2 is a detail view of a portion of the apparatus. Fig. 3 is a longitudinal vertical section of the entire machine, and Fig. 4 is an enlarged view of a portion of the machine. Fig. 5 is a diagrammatic view showing the course of the circuits.

In the drawings, 1 represents the bed-plate of a matrix-machine, provided with suitable raised portions and depressions to support and contain the parts of the apparatus.

2 is a character-board or index-plate provided with suitable contacts 3.

4 is a die-alignment bar pivotally mounted on a sliding block 5, permitting universal movement of said bar in a horizontal plane. The die-alignment bar is provided with a contact-point 6 and head-piece 7 adjacent to the index-plate, and at its opposite end with a die-carriage 8, in which are mounted the dies 9, arranged in such manner that by placing the contact 6 of the die-alignment bar over the contact of the character-board corresponding to any character the die of such character will be brought over an aperture 10, called the "common center" or "printing-point," in the printing-plate 11. Beneath the printing-plate is a matrix-material carriage 12, provided with means for supporting said material in position to be struck by a die when the same is pressed through the aperture 10 at the common center and with means for feeding the matrix material to form a new line. This matrix-material carriage is provided with one or more springs 13, attached to a base of resistance on the bed-plate 1, which tends to draw the said carriage with a steady tension. The carriage 12 is also provided with a rack-bar 14, which engages a pinion 15 on a stud 16 at the rear end of the machine. Upon this stud is mounted a ratchet-disk 17, over which swings an escapement-lever L, to which is pivoted a stop-lever L′ above the center of the disk. The lever L is provided with a pawl 18, which engages the disk and holds it from rotation, and the lever L′ has a similar pawl 19, which is in position to engage the disk when the pawl 18 of lever L is withdrawn from engagement with said disk. On lever L is an armature, and a magnet K is located in position to attract said armature and withdraw the pawl 18 from the disk and engage pawl 19 with the same. The lever L is provided with a T-arm, in which is located a slot 20, and the lever L′ is provided with a pin 21, playing in the slot. When the lever L′ is engaged with the disk and the said disk disengaged by lever L, the tension of the springs 13 causes said disk to revolve, carrying with it the lever L′. The lever L′ is provided adjacent to its free end with step-like notches, which are adapted to engage a number of stops 22, arranged in line and each adapted to permit a different movement of the lever L and ratchet-disk. These stops 22 are adapted to be raised into position to engage the lever L′ by means of a series of magnets M M′ M^2 M^3 M^1, the armature-levers of which are connected at one end with said stops. These magnets and stops correspond to groups into which the characters of the

character-board are divided, one magnet being connected with each of said groups of contacts except one. The characters of the character-board are divided into groups, according to the printing-space required for each character, and the contacts of the characters requiring the greatest space are not connected with any magnet; but when such character is printed the lever L′ is permitted to swing to its full extent and strikes against a stationary stop 23. When a character requiring a certain number of printing-units of space is selected by the character-selecting devices, the magnet connected to the contacts of that group is energized and the proper stop thrown up to engage the lever L′ and permit the carriage to be fed the required distance, the circuit in each case passing through the magnet K, as hereinafter fully described, and releasing the lever L and the ratchet-disk.

The dies may be depressed after they have been brought over the common center in any desired way. I have shown a construction for depressing the same, consisting of the plunger 30, mounted in suitable guides above the common center and connected to a vertically-disposed toggle-lever, the upper end of which is pivoted in the standards 32, secured on the frame of the machine. Adjacent to this toggle-lever is a solenoid P, provided with a movable core 33, reciprocated longitudinally by means of a crank 35 on a constantly-rotating shaft, to which power is applied. An armature 36 is located in the forward end of said solenoid in position to be attracted to the movable core 33 and reciprocated with it when said core is energized by passing a current of electricity through the same. The toggle Q is connected to the armature 36, and it will thus be seen that when the solenoid is energized the toggle-lever will be drawn toward the same, depressing the plunger 30 and forcing the die, which has been brought beneath the same, into the matrix material.

In the matrix-machine here shown I have a matrix-material carriage, which is under tension, as in my former application. This carriage is controlled by the escapement-lever L L′, which has different amplitudes of movement, according to the stop employed, to engage the notched lever connected with the escapement, and the stops are controlled by the magnets M M′ M^2 M^3 M^4. These magnets are of horseshoe or other usual form, and each one has one or both of the legs of the core provided with two coils, which are preferably placed one over the other upon the core, as indicated in the drawings. These double coils are made of wire of different sizes, so that the one will act upon the armature with greater force than the other, and the two are so proportioned in respect to each other and to the retracting-spring of the armature that the coarser coil will not be able to move the armature when it is retracted by the spring, but will hold it against the spring when it is in its position nearest the poles of the magnet. One or both of the legs of the magnet for operating the escapement-lever L L′ is also provided with two coils of like character having a like relation to the armature-retracting spring and to each other. The circuits of the finer coils of the stop-magnets and of the escapement-lever magnet are the same as those of my former application—that is to say, there is a different circuit from the index-board of the character-selecting devices to the finer coil of each magnet, and these circuits have a common return-circuit passing through the finer coils of the escapement-lever magnet.

The armature-lever L is provided with an elastic arm *l*, extending from the lever between the contact-points *x* and *y*. The contact-point *x* is connected with the coils of a magnet N, which is located in this instance, as in my former application, above the solenoid P of the die-depressing device. The contact-point *y* is connected with one of the contact-points *n* of a circuit-breaker located, as shown, near the magnet N. The other contact-point *n′* is connected with the coil of the solenoid P of the die-depressing device, and the return portion of the circuit passes through the coarser coils of the escapement-magnet K and each of the stop-magnets. The incoming part of these two circuits is by way of the escapement-lever L L′ and the elastic arm *l* connected thereto.

An armature *m* is supported within the field of force of the magnet N in any suitable manner. A rod *p* passes through an aperture in the armature *m*, which extends within the range of movement of the toggle-lever Q of the die-depressing device, and is connected to the contact-point *n* or *n′* in such a manner that when the said rod is struck by the toggle-lever and moved the contacts *n* and *n′* will be separated. A spring *p′* restores the rod *p* to its normal position after movement, and a stronger spring *m′* engages the armature *m* and holds it normally away from the magnet N, but not with sufficient force to cause it to resist the action of the magnet. In the drawings I have shown two forms of constructing the contacts *n n′* and rod *p*. In Fig. 2 the contact *n* is shown as made integral with rod *p* and held in contact with *n′* by the spring *p′*. In Fig. 3 the contact *n* is located on the free end of a flat spring, which holds it in contact with *n′*, and the rod *p* bears against said spring in position to separate the contacts. The aperture in the armature *m* is of such form that when the said armature is moved away from its magnet by the force of the spring *m′* the rod *p* will be firmly gripped by the walls of said opening and held from movement. When the armature is drawn up to the magnet N, the rod will be released. It will thus be seen that if the rod *p* is struck by the toggle-lever while the armature *m* is away from its magnet the rod will

be moved longitudinally, the contacts *n* and *n'* separated, and the rod held in such position by the armature *m* until the passage of a current through the magnet N draws the armature to it, when the rod will be released and restored to its normal position by the force of spring *p'*.

In Fig. 3 I have shown the arrangement of the circuits for operating the devices employed. A A' A^2 A^3 A^4 are circuits extending from the character-board through the outer coils of the magnets M M' M^2 M^3 M^4, through the escapement-magnet K, to the source of electrical energy W. (Not shown.) The other branch of this circuit extends from the source W to the contact-point of the character-board.

An independent circuit B (shown in arrow-head lines) extends from the source Z through the escapement-lever L, flexible arm *l*, contact *x*, and through magnet N to source. This circuit is normally closed; but when the escapement-lever L is drawn to its magnet K the arm *l* will break the circuit at contact-point *x* and make a branch circuit C (also shown in arrow-head lines) at *y*, which will pass through the contact *n n'*, through solenoid P, and thence through the inner coils of the leg *k* of magnet K and all of the escapement-magnets, thence back to the source.

A circuit A^5 extends from the character-board through the inner coil of the leg *k'*, magnet K, and then back through the outer coil of said magnet to the source of electricity for actuating the escapement-magnet and lever when the lever L' is permitted to engage the last stop, which is stationary and not actuated by any magnet. In order to provide the same resistance in the circuit A^5 as in circuits A A', &c., the circuit passes through the inner coil of magnet K, as before indicated. On closing one of the circuits A A', &c., at the index-plate a current is sent through one of the stop-magnets, raising the corresponding stop and energizing the escapement-magnet, moving the escapement-lever, and releasing the escapement. The ratchet-wheel of the escapement moves under the tension of the matrix-material carriage as far as permitted by the stop. The movement of the escapement-lever breaks the circuit through the magnet N, as before described, and closes the circuit C through the contacts *n n'* and solenoid P of the die-depressing device and the inner coarser coils of the escapement and stop magnets. As the force of the currents through these coarser coils is not sufficient to move the armatures of the stop-magnets when they are retracted by their retracting-springs, they will not be affected; but the armature of the magnet which is already depressed will be held from retracting, and the stop and escapement lever will remain stationary. When this current is thus closed through the die-depressing device, the toggle-lever will be actuated, thereby striking the rod *p*, separating the contacts *n n'*, and breaking the circuit. The circuit through magnet N having been previously broken, the armature *m* will hold the rod *p* in the position into which it is forced by the toggle-lever. As soon, however, as the circuit is broken, the stop and escapement lever L will be released, and the circuit B, through lever L and magnet N, will be made, thereby drawing back the armature *m* and releasing the rod *p*, which restores the contacts *n n'* to their normal position, and the circuits and connections are again in their normal conditions.

When the circuit A^5, through the escapement-magnet K, is closed, the armature L is drawn down, permitting the lever L' its greatest range of movement, the arm *l* breaking the circuit at *x* and making the branch circuit at *y*, as before described.

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

1. The combination, with a matrix-material carriage, of an electrically-controlled escapement, electrically-controlled stops, a circuit for the electric controlling devices of said sto s and escapement, and a supplemental circuit for said electric devices, substantially as described.

2. The combination, with the matrix-material carriage, of an electrically-controlled escapement, a circuit for the electric controlling devices, and a supplemental circuit therefor, substantially as described.

3. The combination, with the matrix-material carriage, of an escapement therefor, electrically-controlled stops for said escapement, independent electric connections for said stop-controlling devices, and a supplemental electric circuit common to all of said controlling devices, substantially as described.

4. The combination, with a matrix-material carriage, of an electrically-controlled escapement, electrically-controlled stops, the said controlling devices being each provided with one coarser or weaker coil independent of the other or main coil, a circuit through the main coils of the electric controlling devices of said stops and escapement, and a supplemental circuit through the coarser or weaker coils of said electric controlling device, substantially as described.

5. The combination, with a matrix-material carriage, of an electrically-controlled escapement, electrically-controlled stops for said escapement, a circuit for said electric escapement, having a branch for each of said stop-controlling devices, said circuit being provided with a circuit-closer for closing the circuit through any one of said branches, and a supplemental circuit through said escapement-controlling device and all of said stop-controlling devices, substantially as described.

6. The combination, with a matrix-material carriage, of an electrically-controlled escapement, electrically-controlled stops for said escapement, a circuit for said electric escapement, having a branch for each of said stop-controlling devices, said circuit being pro-

vided with a circuit-closer for closing the circuit through any one of the branches, a supplemental circuit through said escapement-controlling device and all of said stop-controlling devices, said supplemental circuit being provided with an automatic circuit-controller operated by the escapement, whereby the closing of a circuit through the escapement-controlling device and one of the branch circuits connected therewith automatically closes the supplemental circuit through the escapement-controlling device and all of the stop-controlling devices, substantially as described.

7. The combination, with a matrix-material carriage, of an electrically-controlled escapement therefor, an electrically-controlled die-depressing device, a circuit through the electric controlling device for the die-depressing device, normally open, said circuit being provided with an automatic circuit-closer operated by the escapement and a circuit-breaker operated by a moving part of the die-depressing device, and a gripping device for holding the circuit-breaker in open position, substantially as described.

8. The combination, with the solenoid P and the magnet N, of the contact-points n n', the armature m, the rod p, passing through the armature m, and the toggle-lever Q, adapted to engage the rod p, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE A. GOODSON.

Witnesses:
G. H. WHITAKER,
W. H. CHAPMAN.