(No Model.) 2 Sheets—Sheet 1.

G. A. GOODSON.

DEVICE FOR CONVERTING MOTION.

No. 414,637. Patented Nov. 5, 1889.

Fig. 1.

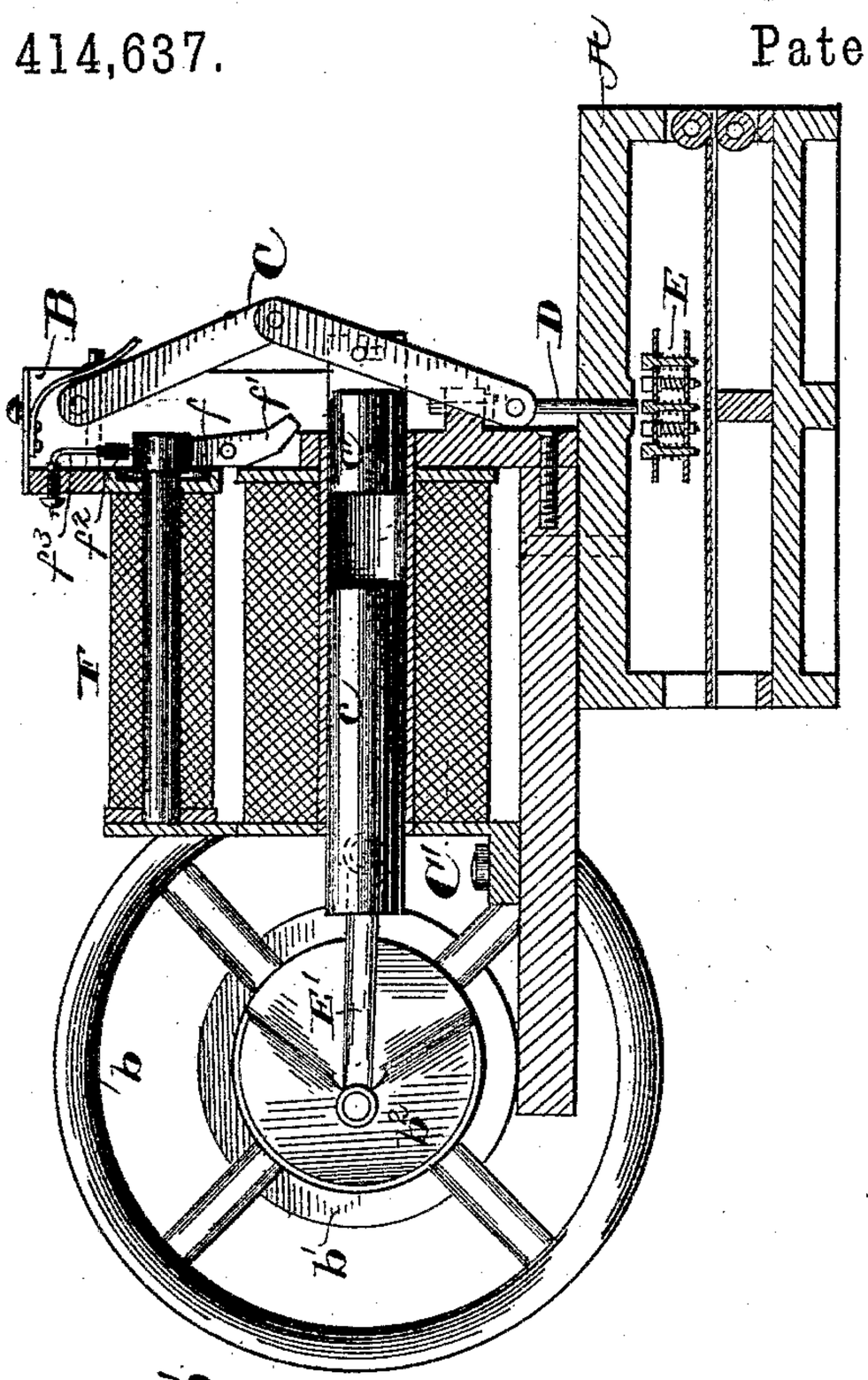


Fig. 2.

Fig. 3.

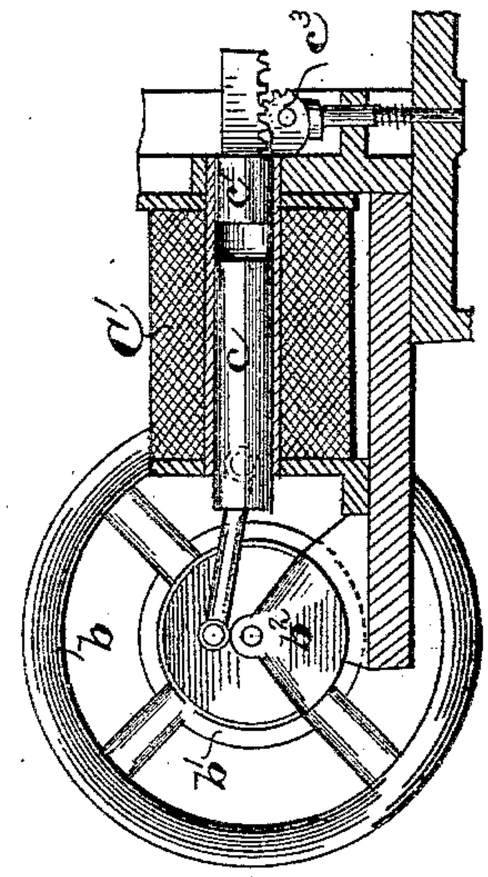
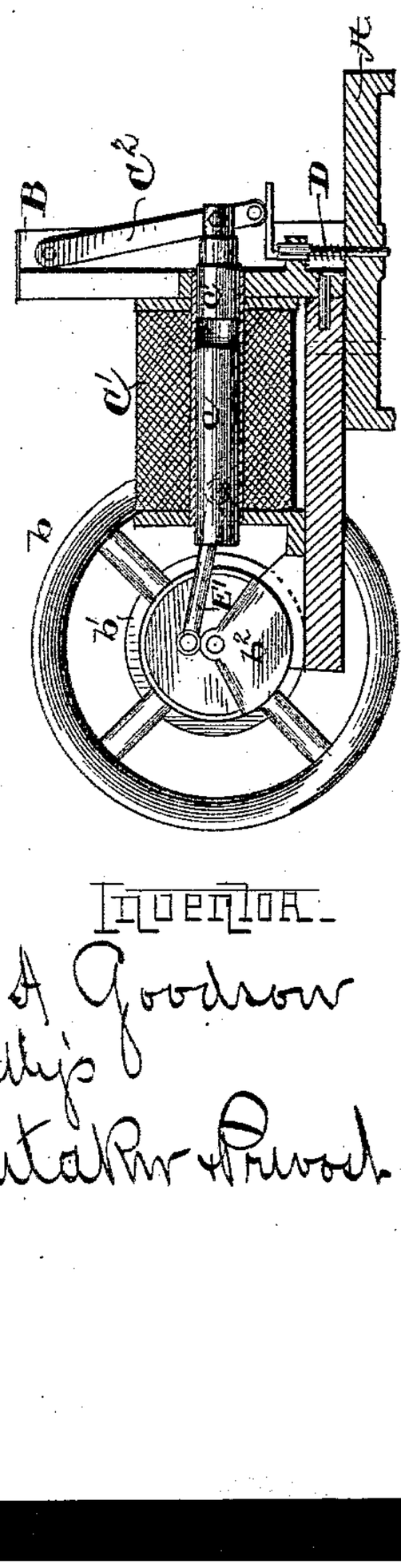


Fig. 4.



Witnesses—

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L. B. Whitaker.

Inventor—

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Whitaker & Prout.

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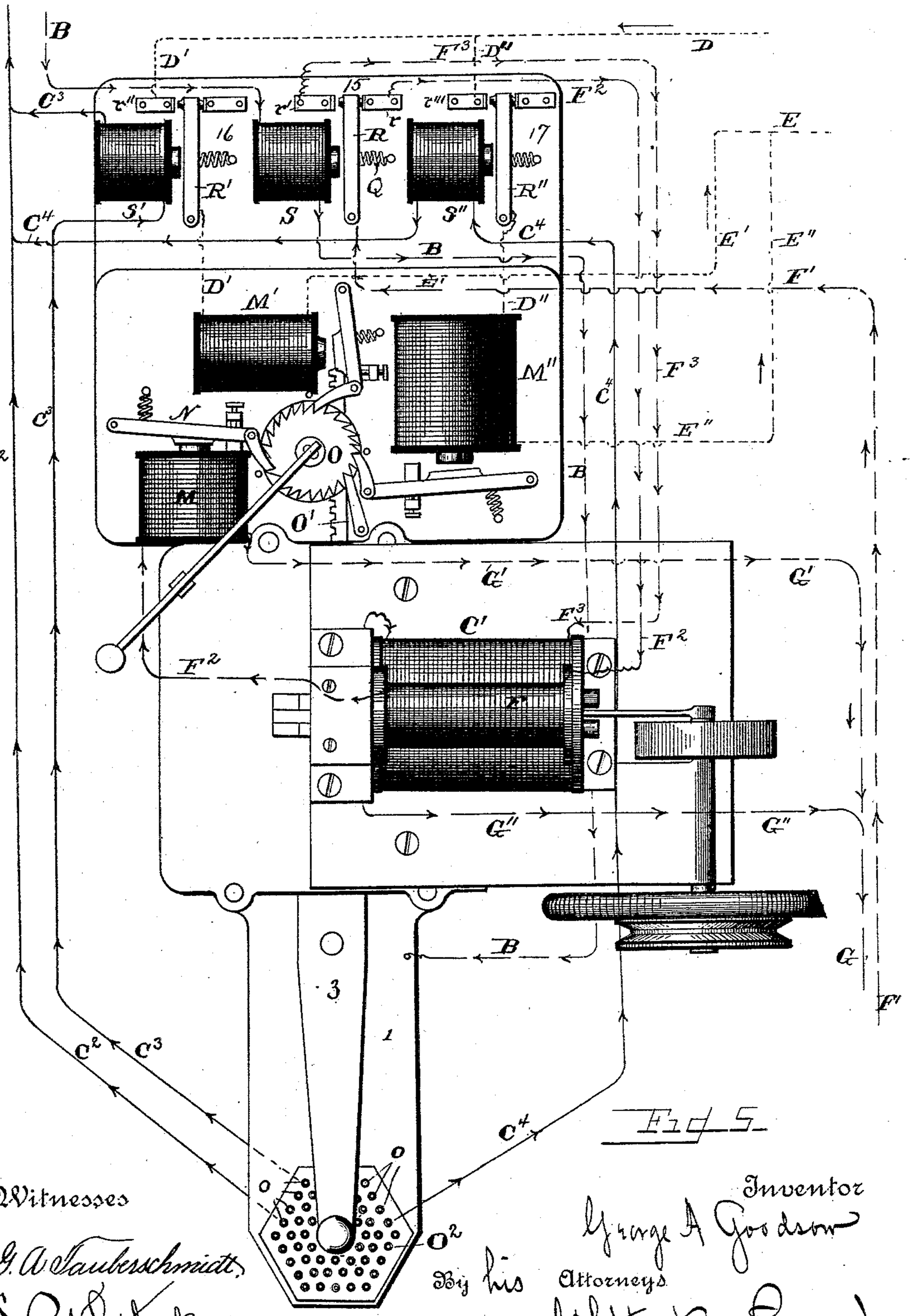

Witnesses

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UNITED STATES PATENT OFFICE.

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

DEVICE FOR CONVERTING MOTION.

SPECIFICATION forming part of Letters Patent No. 414,637, dated November 5, 1889.

Original application filed March 20, 1888, Serial No. 267,795. Divided and this application filed February 7, 1889. Renewed October 8, 1889. Serial No. 326,327. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. GOODSON, a citizen of the Dominion of Canada, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Devices for Converting Motion; 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 mechanism for obtaining a reciprocating motion at intervals for depressing dies, punches, and other tools, and for any purposes for which it may be found available; and it consists in certain constructions whereby this result is accomplished, and also whereby the movement to effect the depression of the die, punch, or other tool or machine is controlled by electro-magnetic devices, so that the closing of a circuit through the controlling devices effects one or more reciprocatory movements for the purposes desired.

It also consists in combining with the electro-magnetic controlling device an appliance whereby a circuit is broken and the reciprocating motion stopped at the point desired.

In the present application, which is a division of an application for a matrix-making machine filed by me March 20, 1888, Serial No. 267,795, I have shown this my present invention as employed for the purpose of effecting the impression of the dies of said machine.

In the drawings, Figure 1 is a longitudinal section through the electro-magnetic controlling devices. Fig. 2 is an end view of the electro-magnetic controlling devices. Figs. 3 and 4 are partial sections, similar to Fig. 1, of other species of constructions. Fig. 5 is a diagrammatic view showing the circuits.

A is a portion of the bed or main supporting-frame of a matrix-machine. To the top of this main supporting-frame I secure in any suitable way a support B for a toggle-lever C. The lower end of one arm of this lever is secured pivotally to the rectilinearly-reciprocating plunger D, and the upper end of the lower arm is pivotally secured to the standard B. This upper point of pivoting constitutes the base of resistance for the toggle-lever, the other end being free to move, carrying with it the plunger D. This plunger moves in suitable guides, and a die-carriage E is placed so that any one of the dies can be brought beneath the plunger D. The standard B must be made so as to permit of a free movement of the toggle-lever. A shaft B′ is mounted in a suitable bearing or bearings, and is provided with a fly-wheel *b* and also a pulley *b′*, by which a constant rotary motion may be imparted to the shaft. This shaft B′ is also provided with a crank or eccentric (a crank-disk is shown) b^2. Between the crank-shaft and the toggle-lever, with one end placed in proximity to the toggle-lever when in its vertical position, is placed a solenoid C′. The core of the solenoid consists of two parts *c c′*, of which the part *c* is the core proper, and *c′* an armature therefor. The part *c′* is comparatively short, and at its outer end is directly or indirectly connected with the toggle-lever C. This connection is such that a movement of the armature *c′* will draw the toggle-lever C toward the end of the solenoid and also permit of a downward movement of the same. The core is comparatively long, and its outer extremity is connected by the connecting-rod E′ to the crank-pin of the disk b^2. When the crank and the toggle-lever are in their extreme positions and at their greatest distance apart, the inner ends of core *c* and armature *c′* are separated by a distance about equal to the throw of the crank, and when the crank is at its extreme of movement nearest the toggle-lever the two parts *c c′* will be in contact or in such close proximity with each other that they will be within the field of each other's attraction. It is evident that if a current of electricity be passed through the solenoid the core *c* and armature *c′* will adhere to each other and together be reciprocated by the crank on the shaft B′. The toggle-lever will thus be drawn toward the end of the solenoid, thus depressing the plunger D and causing it to make a single stroke.

A spring may be employed to retract the toggle-lever C and hold it normally away from the solenoid, if desired; but this is not essential, since the reciprocation of the core *c* will restore the armature *c'* and the toggle-lever to their normal positions. In order to insure the release of the armature *c'* and the toggle-lever at the end of a single stroke, I provide a suitable circuit-controlling device, by means of which the movement of the toggle-lever is made to break its actuating-circuit as soon as it has reached the extremity of its operative movement. If, however, a number of successive strokes are desired, the circuit may be broken at the same point at which it was closed, or at any convenient point in the main circuit through solenoid C'.

In Fig. 5, in order to show the circuits used in connection with this device, I have shown this device in operative relation to the other parts of the matrix-making machine which forms the subject-matter of the application of which this is a division. In this figure, M M' M^2 are the feed-magnets, which are made through their armature-levers N N' N^2 and their attached pawls to actuate the ratchet O, with which is connected a pinion gearing with the rack O', extending from a matrix-material carriage. (Not shown.) These magnets are operated independently to feed the matrix material forward through the intervention of key-lever 3, which has at the end seen a contact-point and at the other a die-carriage (not shown) above the matrix-material carriage. The index-plate or character-board O^2 is provided with openings or key-seats *o*, corresponding with the characters on the dies in the die-carriage, and such key-seats are provided with contact-points, so that on inserting the point of the key-lever in any one of them one of the branches of a normally-open local circuit is closed. In the branches of this local circuit are located magnets S S' S^2, provided with armature-levers R R' R^2, having contact-points, and the armature-lever R forms a part of an independent circuit normally closed through magnets M and F.

For enabling the toggle to break its actuating-circuit an armature-lever *f* is pivoted in the supporting-frame, having an arm *f'* extending into the path of the toggle-lever and adapted to be struck thereby at its extreme of movement toward the solenoid. A magnet F on the local circuit is supported in position to attract the armature of lever *f* and impart a motion to the arm *f'* in a direction opposite to that imparted by the toggle-lever. This lever *f* is provided with a contact-point f^2, which is normally in contact with a suitable contact-point f^3 on the supporting-frame, which is connected with the main circuit. When the contact-points f^2 f^3 are in contact, the main circuit extends through them to the solenoid C', and a suitable circuit-controlling device is located in said main circuit. A different circuit passes through the magnet F, and this circuit is also provided with a circuit-controlling device.

The operation of the device will be readily seen. The main circuit through the solenoid is closed at its circuit-controlling device, and the parts *c c'* are thereby magnetized, so that when brought together by the reciprocation of the core *c* they will adhere and the toggle-lever will be drawn toward the solenoid C', thereby depressing the plunger A. As soon as the toggle reaches its extreme of movement it comes in contact with the arm *f'* of the armature-lever *f*, and by actuating it separates the contacts f^2 f^3, and thus breaks its own circuit. When, therefore, the armature *c'* of the core is returned with the toggle-lever to its normal position, the circuit being broken, there will be no attraction between the parts *c c'*, and the latter will remain in its operative position. A spring may engage the same to secure its retention, if desired, as before stated. After the toggle-lever has been returned to its normal position and the main circuit broken through its circuit-controller the circuit through magnet F may be made, when the core of said magnet will attract the armature on lever *f* and restore the contacts f^2 f^3 to their normal or closed position.

I may prefer to construct the circuit-controllers in such a manner that the making of the one circuit will break the other, and vice versa; but the device could be operated by separate circuit-controllers, if desired.

In this case when the die-carriage E has been moved to bring one of the dies beneath the plunger D the circuit through the solenoid C' will be closed and the plunger depressed, as before described, striking the die and forcing it into the matrix material, thus forming an impression.

In case it should be desired to adjust the toggle-lever so as to vary the extreme position of the plunger when depressed, I may mount the upper supports of said toggle-lever so that they may be adjusted in the supporting-frame.

It is obvious that modifications of the devices already described for communicating motion from the armature to the plunger may be made without departing from the spirit of my invention.

In Fig. 3 I have shown an ordinary pivoted lever C^2, having its free end engaging an extended head *d* of plunger D, and in Fig. 4 I have shown the armature *c'* provided with a rack or other means for operating a cam C^3 for actuating the plunger, and in other particulars I do not wish to limit myself to my exact constructions herein shown and described.

In Fig. 5 the various electric circuits are illustrated. It may be noted, in explanation of the figure, that the solid arrow-head lines, the broken arrow-head lines, and the dotted lines respectively represent different circuits, the currents in each case passing in the di-

rection of the arrow. The full arrow-head lines represent a local circuit and its branches through the index-plate and the electro-magnets S, S′, and S″. Of these there is a common outgoing conductor B from a source of electricity (not shown) through the magnet S to the bed-plate 1, and through the same to the platinum point on the key-lever 3, and there are as many return-wires as there are different classes of type-dies, the platinum points in the respective key-seats on the index-plate connecting with one or the other of these return-wires, according to the number of units of space required, as is fully set out in my former application. In the drawings three return-wires are shown C^2, C^3, and C^4, of which C^2 passes directly from the index-plate back to the source, C^3 leads from the index-plate to the magnet S′ and thence to the source, and C^4 leads from the character-board to the magnet S″ and thence to the source. The dotted lines represent circuits passing through the armature-levers or circuit-closers 16 and 17 for operating the feed-magnets M′ M″. Of these, D represents the the common outgoing wire from source of electricity, (not shown;) D′, the branch passing through r'' R′ to M′; D″, the branch through r''' R″ to M″; E, the common return-wire, and E′ E″ its branches from M′ and M″, respectively. The broken arrow lines represent an independent circuit always passing through the three-point switch 15, and which in the normal position of the switch is closed through the magnet F and the feed-magnet M, but which may be closed through the solenoid C′ and the circuit-breaking mechanism f' f^2 f^3. Of the wires making this circuit, F′ is the common outgoing wire from source of electricity (not shown) to the switch-lever R. F^2 is the branch from the contact r through the magnet F and the feed-magnet M; F^3, the branch from the contact r' through the solenoid C′ and the circuit-breaking mechanism f' f^2 f^3. G′ is the branch of the return-wire from the magnet M, and G″ is the return branch from the contact f^2 on the circuit-breaker.

The operation is as follows: The normal condition of the branch F^2 G′ of the local circuit F′ G is closed at r through the magnets F and M, while the normal condition of the branch F^3 G″ through solenoid C′ and the circuit-breaking mechanism f', f^2, and f^3 is open at r'. The normal condition of the local circuit and its branches B C^2, &c., through the character-board is open at the contact-points on the character-board. The armature N is therefore drawn down to its magnet M, and the armature f is drawn to the magnet F, and the contacts f^2 and f^3 are together. Now, when the local circuit through the magnet S is closed by the selection of a character on the character-board, by the insertion of the point of the key in the key-seat corresponding to that character the branch F^2 G′ through F and M is broken at the contact r, setting free the armatures f and N and closing the branch F^3 G″ through the solenoid C′ and the circuit-breaking mechanism f', f^2, and f^3. The solenoid C′ is therefore magnetized for an instant and the toggle is drawn to its vertical position, making the stroke on the type-die. On reaching its vertical position the toggle strikes the projecting arm of the armature f, separating the contacts f^2 f^3 and breaking the circuit F^3 G″ at that point. This circuit then remains open until the local circuit through S is broken by retracting the key from the character-board. The instant that is done R is retracted by the spring Q and the circuit F^2 G′ is again closed at r', and the magnets F and M are magnetized, drawing up the armatures f and N. At the time that the armature f is drawn to its magnet F the contacts f^2 and f^3 are brought together, and the circuit F^3 G″ through these contacts and the solenoid C′ is in its normal position open at r'. The movement of the armature N moves the ratchet a certain distance, which, through its connections, advances the matrix-material carriage a corresponding amount. When the size of the character requires slightly greater space than that provided by the movement given the matrix-material carriage by the magnet M, inserting the key in the proper key-seat on the index-plate closes the circuit C^3 through the magnet S′. This closes the circuit D′ through M′ and breaks the circuit in magnet S and closes the circuit through the solenoid in the manner just described. When a still greater movement of the matrix material is required, the selection of the character on the index-plate in the manner heretofore stated closes the circuit through magnet M^2 and actuates the solenoid in an analogous manner, and the devices for feeding the matrix material. These devices are not herein claimed.

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

1. The combination, with a solenoid, of a constantly-reciprocating magnetic core, an independent movable armature within the magnetic field of said core, and a circuit-controller in the electric circuit of said solenoid, substantially as described.

2. The combination, with a solenoid and a magnetic core movable therein, of a source of motion to which said core is coupled, an independent movable armature within the magnetic field of said core, and a circuit-controller in the electric circuit of said solenoid, as set forth.

3. The combination, with a constantly-running crank-shaft, of a solenoid having a movable magnetic core, a connecting-rod from the crank on said shaft to said core, an independent movable armature within the field of said core, and means for making and breaking an electric circuit through said solenoid, substantially as described.

4. The combination, with a solenoid having a constantly-reciprocating core coupled to a

source of motion, of an independent movable armature within the magnetic field of said core, means for making and breaking an electric circuit through said solenoid, a depressing device, and a connection from said independent movable armature to said depressing device, substantially as described.

5. The combination, with a solenoid having a constantly-reciprocating core coupled to a source of motion, of an independent movable armature within the magnetic field of said core, means for making and breaking an electric circuit through said solenoid, a plunger mounted in a suitable guide, a depressing device for actuating said plunger, and a connection from said depressing device to said independent movable armature, substantially as described.

6. The combination, with a toggle-lever having one end secured to a base of resistance and the other end free to move in a definite path, of a solenoid having a constantly-reciprocating core coupled to a source of motion, an independent movable armature secured to said toggle, and means for making and breaking an electric circuit through said magnet, substantially as described.

7. The combination, with a solenoid having a constantly-reciprocating core coupled to a source of motion, of an independent movable armature within the magnetic field of said core, means for closing an electric circuit through said solenoid, and an automatic circuit-breaker in said solenoid-circuit, substantially as described.

8. The combination, with a solenoid having a constantly-reciprocating core coupled to a source of motion, of an independent movable armature within the magnetic field of said core, means for closing an electric circuit through said solenoid, and a circuit-breaker in said solenoid-circuit operated by motion communicated from said independent movable armature, substantially as described.

9. The combination, with a plunger mounted in a suitable guide, of a toggle-lever having one end secured to a base of resistance and the other to said plunger, an armature secured to said toggle-lever, a solenoid, a movable core within said solenoid, a constantly-running crank-shaft, a connecting-rod from the crank on said shaft to said movable core, means for closing an electric circuit through said solenoid, and a circuit-breaker in said solenoid-circuit operated by said toggle-lever, substantially as described.

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

GEORGE A. GOODSON.

Witnesses:

ROBT. F. GAYLORD,

PARKER W. PAGE.