(No Model.) 3 Sheets—Sheet 1.

G. A. GOODSON.

MATRIX MAKING MACHINE.

No. 414,400. Patented Nov. 5, 1889.

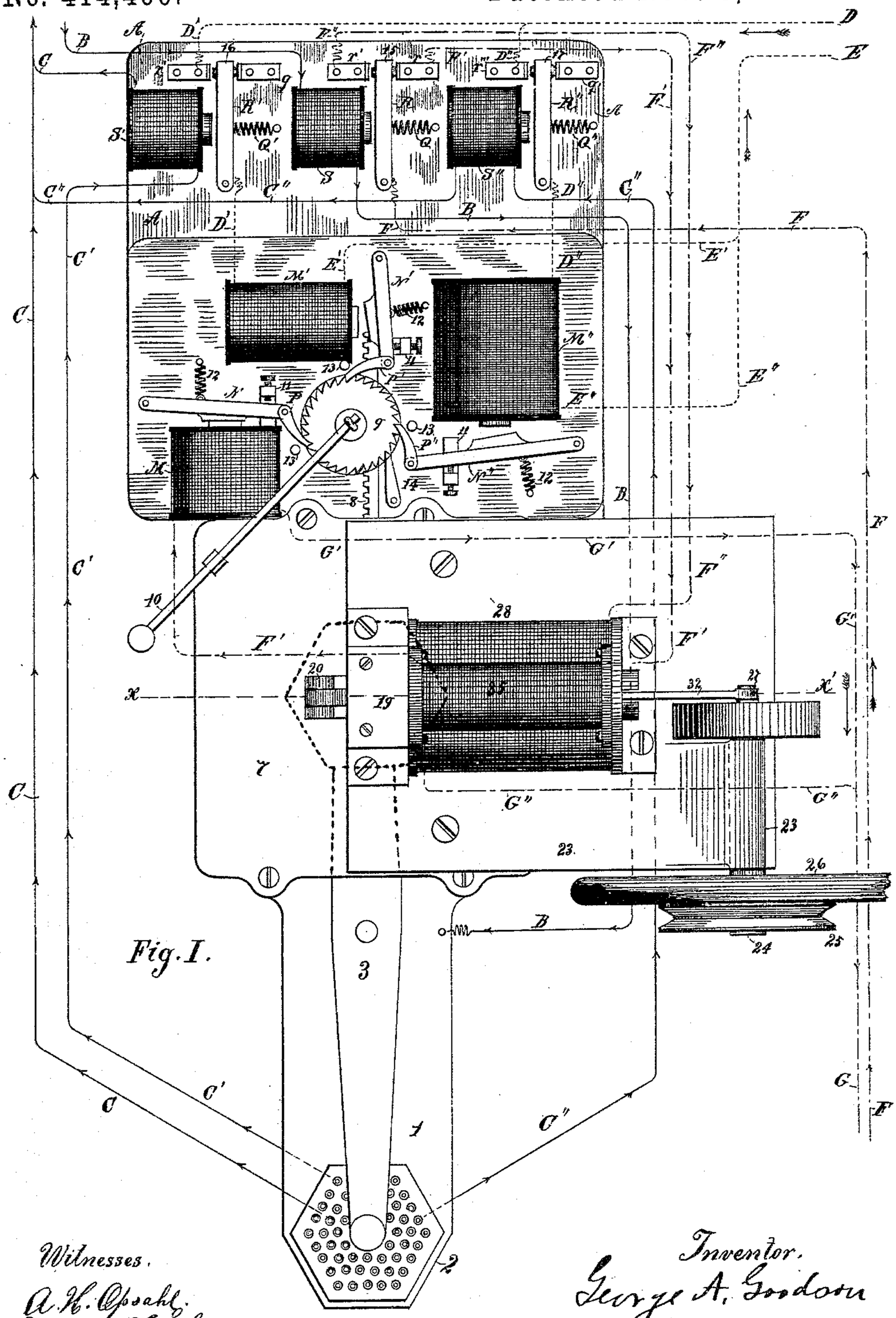

Fig. I.

Witnesses.
A. K. Ossahl.
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Inventor.
George A. Goodson
By his Attorney.
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(No Model.) 3 Sheets—Sheet 2.

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Fig. II.

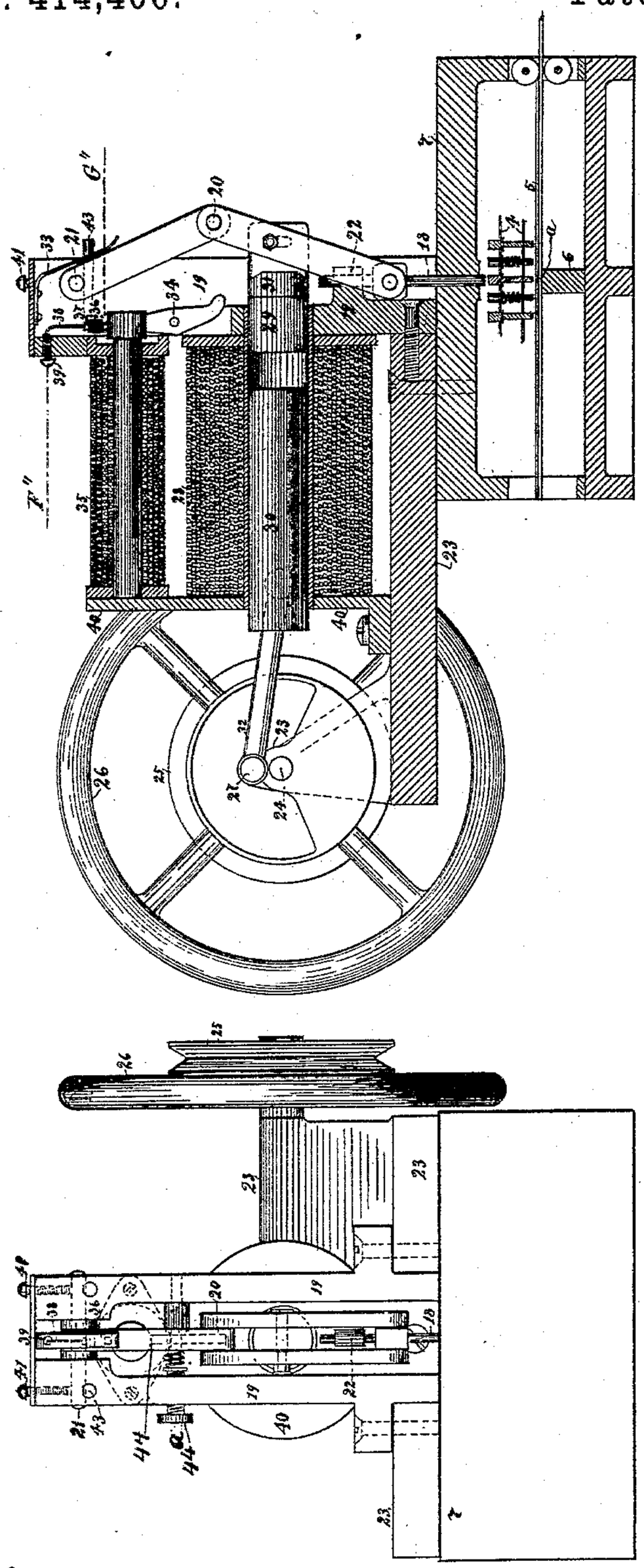


Fig. III.

Fig. V.

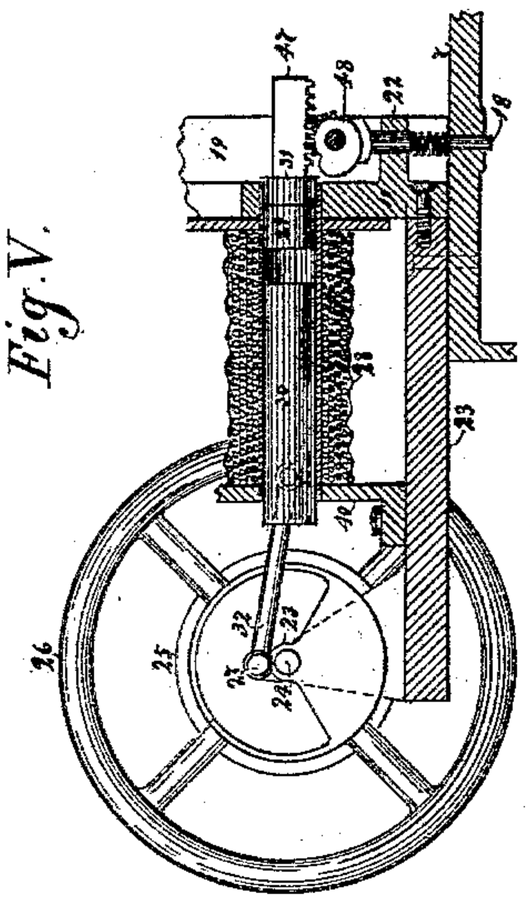
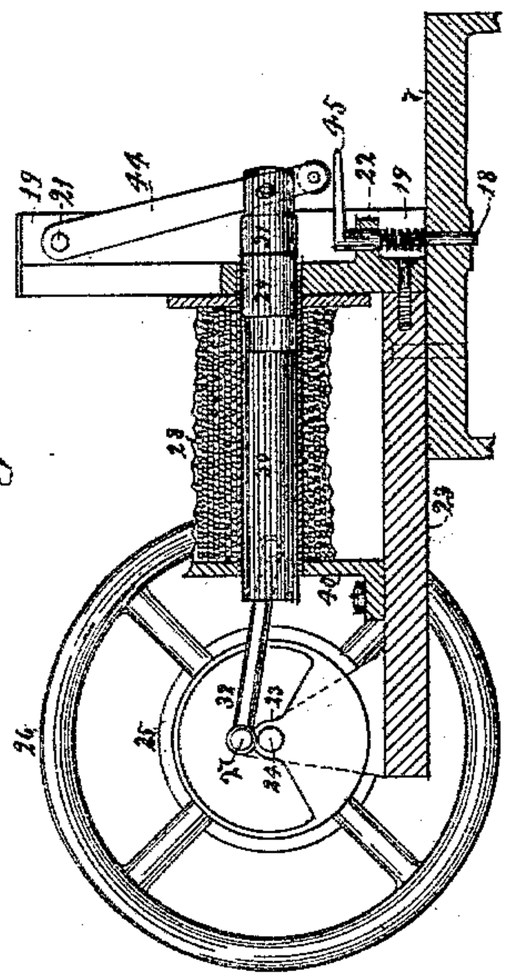


Fig. IV



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

G. A. GOODSON.

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Fig 7.

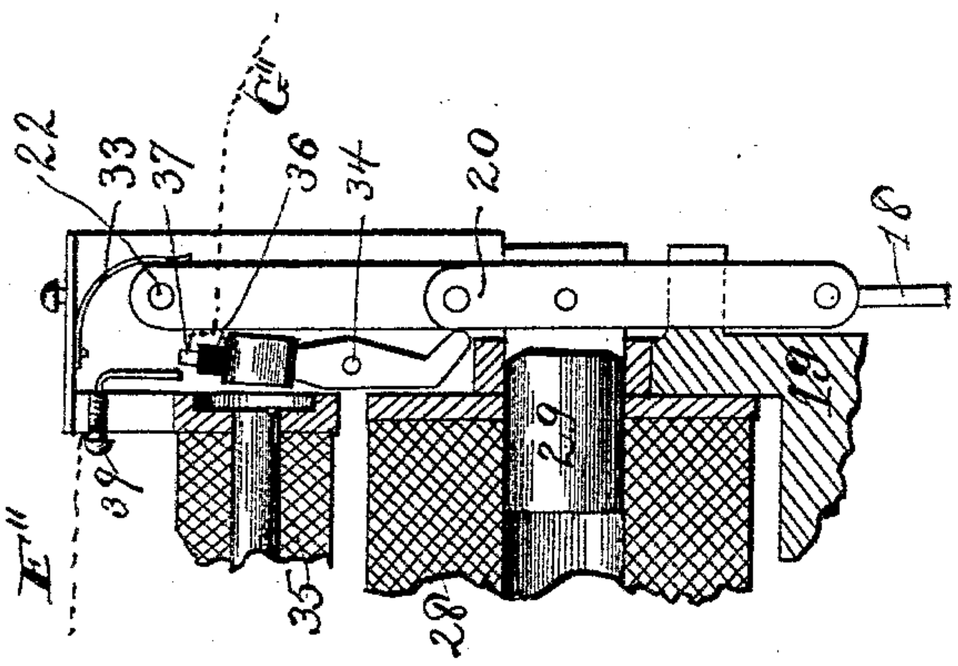

Fig 6.

Witnesses

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Inventor

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By his Attorneys

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UNITED STATES PATENT OFFICE.

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

MATRIX-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 414,400, dated November 5, 1889.

Application filed March 20, 1888. Serial No. 267,795. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. GOODSON, a citizen of Canada, and a resident of the city of Minneapolis, county of Hennepin, State of Minnesota, have invented a certain new and useful Improvement in Matrix-Making Machines, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to matrix making, and is in the nature of an improvement on the invention set forth in an application, Serial No. 239,735, filed May 31, 1887, and my former application, Serial No. 259,257, filed December 28, 1887. The general principle of the construction and operation is substantially the same as in my former applications; but the mechanism for forcing the type-die into the matrix material when at the common printing-point is radically different, an electrically-actuated depressing device having been substituted for the eccentric cam shown in my last preceding application. There are also some minor changes in the other electrical features.

My invention consists in the construction hereinafter fully described, and particularly pointed out in the claims.

In the drawings, like letters referring to like parts throughout, Figure I is a plan view of the entire machine. Fig. II is a vertical cross-section on the line X X′ of Fig. I. Fig. III is an end view of Fig. II, and Figs. IV and V are sectional views of modifications. Fig. VI is a partial longitudinal vertical section of the machine. Fig. VII is an enlarged view of the automatic circuit-controller.

1 is the bed-plate; 2, the character-board or index-plate, provided with a series of apertures having a contact-point *z* beneath each; 3, the combined key-lever and die-alignment bar, provided with a contact-point *y* at one end; 4, the die-carriage attached to said bar and having a series of type-dies *x* corresponding to the apertures of the character-board, the said bar being pivoted at *w* to a sliding block V, mounted in suitable guides on the bed-plate; 5, the die-carriage seat, provided with a countersunk hole *a* at the common center or printing-point; 6, the matrix-carriage; 7, the cap-plate; 8, the rack-bar attached to the matrix-carriage; 9, the cylindrical ratchet-wheel, provided with a pinion engaging said rack-bar; 10, the lever for raising the ratchet-wheel out of engagement with its operating-pawls; M M′ M″, the series of independent magnets; N N′ N″, their respective armatures; P P′ P″, their respective pawls; 11, the series of brackets for supporting the free ends of the armatures; 12, the series of retracting-springs; 13, the series of pawl-stops; 14, the locking-pawl; 15, the three-point switch normally closing a circuit through the magnet M; 16 and 17, the circuit-closers for closing circuits through the magnets M′ and M″, respectively, and 18 is the plunger, all substantially as in my last preceding application.

The switch 15 is composed of the pivoted armature-lever R, having contact-points on its free end, the electro-magnet S, contact-strips *r r′*, and the retraction-spring Q. The circuit-closer 16 is composed of the pivoted armature-lever R′, having a contact-point on one side of its free end, the electro-magnet S′, the retraction-spring Q′, the contact-strip *r″*, and the stop *q*, and the circuit-closer 17 is composed of pivoted armature R″, having a contact-point on one side of its free end, electro-magnet S″, the retraction-spring Q″, the contact-strip *r‴*, and the stop *q′*, all identical with my former machine.

The electric circuits and their connections are partly the same and partly different, as hereinafter described.

I will now describe my improvements.

To the cap-plate 7, I secure in any suitable way a proper support 19 for a toggle-lever 20. The lower end of one arm of this lever is pivotally secured to the plunger 18, and the upper end of the other arm is pivotally secured to a cross-rod 21 in the supporting-standard 19. This cross-rod constitutes the base of resistance for the toggle-lever, the lower end being free to move and carrying with it the plunger 18. The lower end of this plunger passes through a hole in the cap-plate 7, directly in line with the common printing-point, and its upper extremity is preferably held in a suitable guide, as 22, fixed to the standard 19.

The support 19 must be made in such a manner as to allow the free movement of the toggle-lever.

On some suitable support, as 23, is mounted a constantly-running shaft 24, arranged at right angles to the vertical plane of the toggle-lever movement. To this shaft is fixed a fly-wheel 26 and a driving-pulley 25, coupled to a source of motion. (Not shown.) The shaft is kept in constant motion. On the shaft 24 is also a crank or eccentric (a crank-disk being shown) 27. As shown, the support 23 for this crank-shaft 24 is a heavy plate secured to the cap-plate 7 and the lower part of the standard 19. Between the crank-shaft and the toggle-lever, with one end in proximity to the toggle-lever when in its vertical position, is placed a solenoid 28, having a hollow axis. As shown, this is secured to the plate 23 and the standard 19, and an opening or hole is formed through this standard in line with the axis of the magnet. Two separate pieces of soft metal 29 and 30 constitute the core and armature of this magnet. The armature 29 is comparatively short, and its outer end is directly or indirectly pivotally connected to the toggle-lever 20. As shown, this connection is made through a brass section 31, which is screwed into the soft-metal block 29 at one end and pivotally attached to the toggle-lever at the other. The core 30, as shown, is comparatively long, and its outer end is connected by the connecting-rod 32 to the crank-pin on the crank-disk 27. When the crank and the toggle-lever are in their extreme positions at their farthest distance apart, the inner ends of the parts 29 and 30 are separated a distance about equal to the throw of the crank, and when the crank has moved around one hundred and eighty degrees into its nearest position to the toggle the inner ends of the two parts are either together or in close proximity. It is necessary at least that they should come within the field of each other's attraction when the crank is nearest to the toggle. It is evident that if a current of electricity be passed through the solenoid 28 the parts 29 and 30 will cling together and be reciprocated by the crank on the shaft 24.

33 is a spring, which may be attached at one end to some fixed support, as the standard 19, and at the other to the toggle-lever, for the purpose of retracting it to its normal position after a stroke. This spring, however, is not necessary, as the movement imparted to the part 30 by the crank will force the toggle back to its normal position.

To make sure that the part 29 will be set free and the toggle be allowed to return to its normal or inoperative position after every stroke, the toggle is made to break its own actuating-circuit when it reaches its vertical position by operating a suitable circuit-breaker. A mechanism for the purpose is shown at 34, 35, 36, 37, and 38, of which 34 is a pivoted armature-lever having an arm projecting into the path of the toggle in the proper position to be struck by the same when it reaches its vertical position. 35 is an electro-magnet on a different circuit in the proper relative position to draw the armature-lever in a direction contrary to the movement imparted by the toggle-lever. 36 is a piece of hard rubber or other insulating material secured to the upper end of the armature-lever. 37 is a contact-strip secured to the outer end of the hard rubber, and 38 is a conductor fixed to the binding-post 39 and having contact with the contact-strip 37. The magnet 35 may be supported in any suitable way and in any convenient position. As shown it is supported from the standard 19 and the end support 40 of the solenoid 28.

It is desirable to have the base of resistance 21 of the toggle adjustable to a limited extent for varying the depth of die-impression. I do this by making the holes or seats in which the rod 21 rests slightly greater in vertical diameter than the diameter of the rod and providing set-screws 41, which will work in screw-threaded seats in the top of the standard 19, for varying the points of resistance, and I provide wedges 43 for holding up the rod. This construction for depressing the dies forms the subject-matter of another application, filed February 7, 1889, and given Serial No. 299,023, in which it is fully described and claimed, and is claimed only in combination with other elements in this application. The operation of this mechanism will be clear as soon as the various electric circuits and their connections have been described.

The three-point switch 15 and circuit-closers 16 and 17 are mounted on a wooden slab A, which may be a part of the supporting table or frame on which the machine rests for convenient insulation.

It may be noted in explanation of the figures 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 direction of the arrows.

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 as many return-wires as there are different classes of type-dies, the platinum points in the respective character-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 applications. In the drawings three return-wires are shown, of which C represents the return-wire for the one-unit group of characters and passes directly from the index-plate back to the source. C′ represents the return-wire of the two-unit group and leads from the characters to the magnet S′, and thence to the source, and C″

represents the three-unit wire, leading from the character-board to the magnet S″, and thence to source.

The dotted lines represent circuits passing through the circuit-closers 16 and 17 for operating the feed-magnets M′ and M″. Of these, D represents 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′ and 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 35 and the feed-magnet M, but which may be closed through the solenoid 28 and the circuit-breaking mechanism 37, 38, and 39. Of the wires making this circuit, F is the common outgoing wire from source of electricity (not shown) to the switch-lever R. F′ is the branch from the contact *r* through the magnet 35 and the feed-magnet M; F″, the branch from the contact *r*′ through the magnet 28 and the circuit-breaking mechanism 37, 38, and 39. G′ is the branch of the return-wire from magnet M, and G″ is the return branch from the contact 37 on the circuit-breaker.

The operation is as follows: The normal condition of the branch F′ G′ of the local circuit F G is closed at *r* through the magnets 35 and M, while the normal condition of the branch F″ G″ through solenoid 28 and the circuit-breaking mechanism 37, 38, and 39 is open at *r*′. The normal condition of the local circuit and its branches B C, &c., through the character-board is open at the contact-points on the character-board. The armature N is therefore drawn to its magnet M, and the armature 34 is drawn to the magnet 35, and the contacts 37 and 38 are together. Now, when the local circuit through the magnet S is closed by the selection of a character on the character-board, the branch F′ G′ through 35 and M is broken at the contact *r*, setting free the armatures 34 and N and closing the branch F″ G″ through the solenoid 28 and the circuit-breaking mechanism 37, 38, and 39. The solenoid 28 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 34, separating the contacts 37 and 38 and breaking the circuit F″ 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, the circuit F′ G′ is again closed at *r*′, and the magnets 35 and M are magnetized, drawing up the armature 34 and N, and through the pawl P and its connections moving the matrix material along the line a distance of one space-unit. At the same time that the armature 34 is drawn to its magnet 35 the contacts 37 and 38 are brought together by the circuit F″ G″ through these contacts, and the solenoid 28 is, in its normal position, open at *r*′. The act of selecting the character on the index-plate or character-board brought the type-die to the common printing-point directly under the plunger 18, in virtue of the construction as fully set forth in my former application. As stated, the matrix-carriage is moved forward one unit by the normally-closed branch F′ G′ of the local circuit through the feed-magnet M whenever the key is withdrawn from the contact or the character-board. This occurs, therefore, while the hand is being moved to select the next character. If the character selected requires more than one unit of space, the branch through the proper circuit-closer will be closed and another feed-magnet will be brought into play, moving the matrix material the requisite additional distance. The feed-magnets, as shown, are three in number, the magnets M and M′ each throwing its respective pawl through a one-unit space, while the magnet M″ moves its pawl two units of space. If, therefore, a two-unit character is selected, the branch local circuit B C′ is closed through magnet S′, which draws the armature-lever R′ to contact *r*″ and closes the circuit D′ E′ through the feed-magnet M′, and in a similar manner a three-unit character closes B C″ through S″, drawing up R″ to *r*‴, closing the circuit D″ E″ through M″. Additional feed-magnets and circuit-closers may be used, if desired, but are unnecessary, as the three sets arranged as herein set forth make a complete system.

It must be understood that the gist of the the invention for producing the depression of the plunger and the die lies in the constantly-reciprocating core 30 and the independent armature 29. A stop-and-start motion, which is very quick to start and very quick to stop, is thus obtained. This is something very difficult to obtain. The power which reciprocates the core 30 is made to do the work of depressing the die. The magnetic power simply holds the core and armature together. A comparatively-small magnet and comparatively-small core and armature may therefore be used, and the time required to magnetize and demagnetize is correspondingly short. If attempt were made to operate the depressing device solely by magnetic attraction, the magnet and its armature would have to be so large as to make demagnetization very slow. It would take it too long to let go. By my construction contacts cannot be made so fast that the depressing device will not be actuated and let go after the stroke.

Modifications can be readily made in the means of communicating the motion from the armature 29. For example, instead of a toggle-lever I may use an ordinary pivoted lever 44 and have its free end bear against an

extended head 45 on the plunger, as shown in Fig. IV; or I may dispense with a lever altogether and substitute a cam, as shown in Fig. V, the cam 48 being operated from the independent movable armature 29 through any suitable connection, as the rack 47. The toggle-lever 20, the pivoted lever 44, and the cam 48 may be broadly designated as "depressing devices," and are so referred to in some of the claims herein set forth. Other minor modifications in other features of the construction may be made without departing from the spirit of my invention.

44ª is a tension device consisting of a set-screw and coiled spring, which may be used, if desired, for applying a variable resistance to the circuit-breaker armature 34 by an increase or decrease of pressure upon one side of the lever 44 about its pivot.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In a matrix-making machine, the combination, with the dies, of a solenoid, a constantly-reciprocating core within the same, a movable armature within the magnet-field of said core and adapted to depress one of said dies when attracted by the reciprocating core, and means for making and breaking the circuit of said solenoid, as set forth.

2. In a matrix-making machine, the combination, with the dies, of a solenoid, a constantly-reciprocating core within the same, a toggle-lever provided with an armature within the magnetic field of the reciprocating core and adapted to depress one of said dies when operated by the attraction of the core, and a circuit-controller in the circuit of the solenoid, as described.

3. The combination, with a matrix-material carriage, of a die-depressing device, a die-carriage for aligning type-dies under said depressing device, a solenoid having a constantly-reciprocating core coupled to a source of motion, an independent movable armature within the field of said core and connected to said die-depressing device, and means for making and breaking an electric circuit through said solenoid, substantially as described.

4. The combination, with a matrix-material carriage, of a plunger mounted in a suitable guide, a die-carriage intermediate said carriage and plunger, a toggle-lever having one end secured to a base of resistance and the other to said plunger, a solenoid having a movable core, an independent movable armature within the field of said core and attached to said toggle-lever, a constantly-running shaft, a connecting-rod from the crank on said shaft to said 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.

5. The combination, with a matrix-material carriage, of electro-magnetically-controlled feeding devices for the same, a die-carriage, an electro-magnetically-controlled die-depressing device, electric connections for said feeding devices, including a circuit having one branch normally closed through one of said feeding devices and another branch normally open through the solenoid of the die-depressing device, and a switch for shifting the current from the feeding-magnet to that of the depressing device, substantially as described.

6. The combination, with a matrix-material carriage, of electro-magnetically-controlled feeding devices for the same, an electro-magnetic die-depressing device, electric connections for said feeding devices, including a circuit having one branch normally closed through one of said feeding devices and another branch normally open through the solenoid of the die-depressing device, an electric switch for shifting the current from the feeding-magnet to the solenoid of the die-depressing device, and a circuit-controller for making and breaking an electric circuit through said switch, substantially as described.

7. The combination, with a matrix-material carriage, of electro-magnetic feeding devices for the same, an electro-magnetic die-depressing device, including a circuit having one branch normally closed through one of said feeding devices and another branch normally open through said electro-magnetic die-depressing device, an electric switch for shifting the current from the feeding device to the die-depressing device, a bar provided at one end with a die-carriage and at the other end with a hand-key having a contact-point, an index-plate having key-seats corresponding to said type-dies and having contact-points adjacent thereto, and an electric circuit normally open through said switch and the contact-points on said index-plate, substantially as described.

8. The combination, with a matrix-material carriage, of electro-magnetic feeding devices for the same, a die-carriage, an electro-magnetic die-depressing device, an electric circuit having one branch normally closed through one of said feeding devices and another branch normally open through said die-depressing device, an electric switch for shifting the current from one branch to the other, a circuit-controller for making and breaking an electric circuit through said switch, a circuit-breaker in said normally-open branch operated by said die-depressing device, and an electric circuit-closer on said normally-closed branch operating to restore said circuit-breaker to its normal position, substantially as described.

GEORGE A. GOODSON.

In presence of—
JAS. F. WILLIAMSON,
EMMA F. ELMORE.