(No Model.) 3 Sheets—Sheet 1.

G. A. GOODSON.

MATRIX MAKING MACHINE.

No. 479,773. Patented July 26, 1892.

Fig. VII.

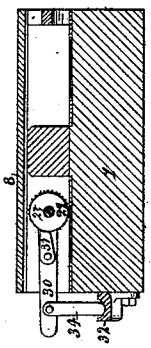
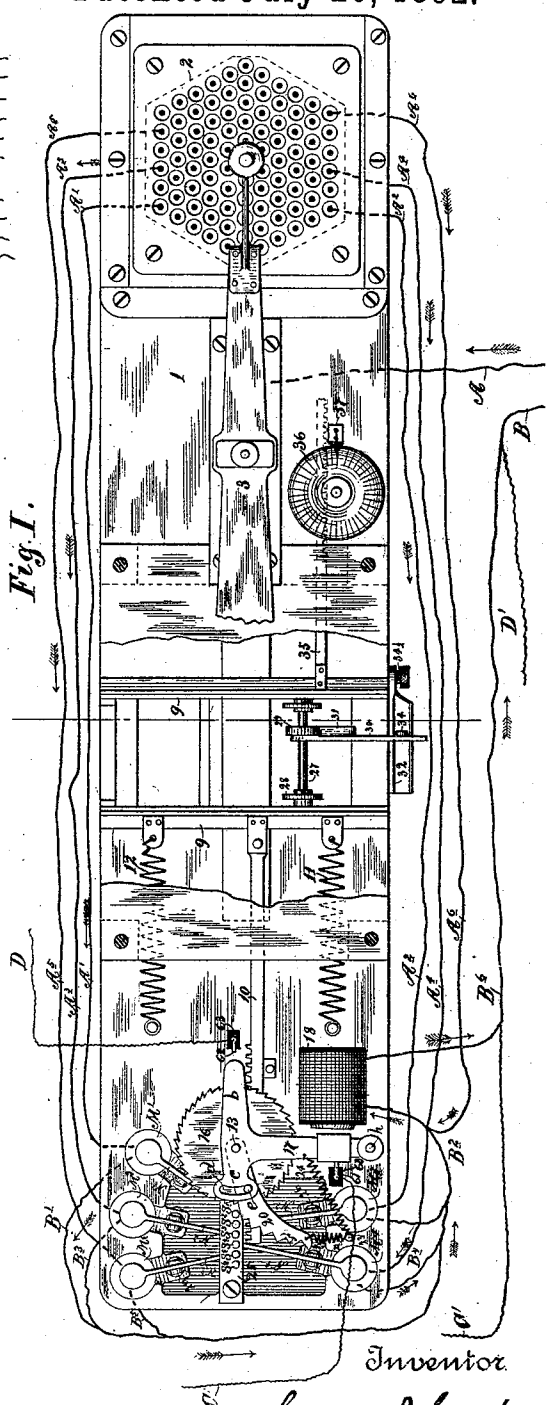


Fig. II.

Fig. I.



Witnesses

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Emma F. Elmore.

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(No Model.) 3 Sheets—Sheet 2.

G. A. GOODSON.

MATRIX MAKING MACHINE.

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Fig. V.

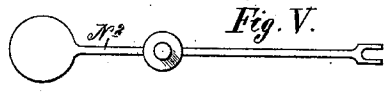


Fig. IV.

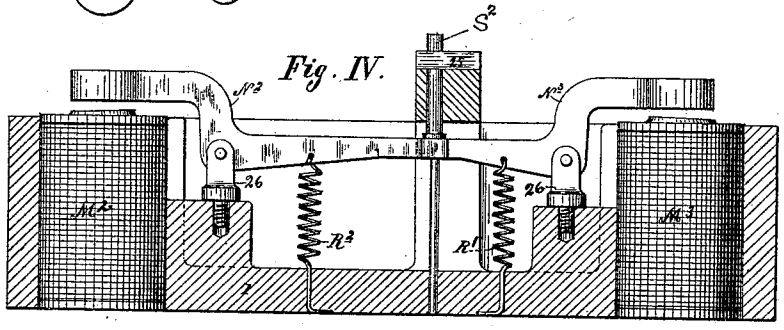
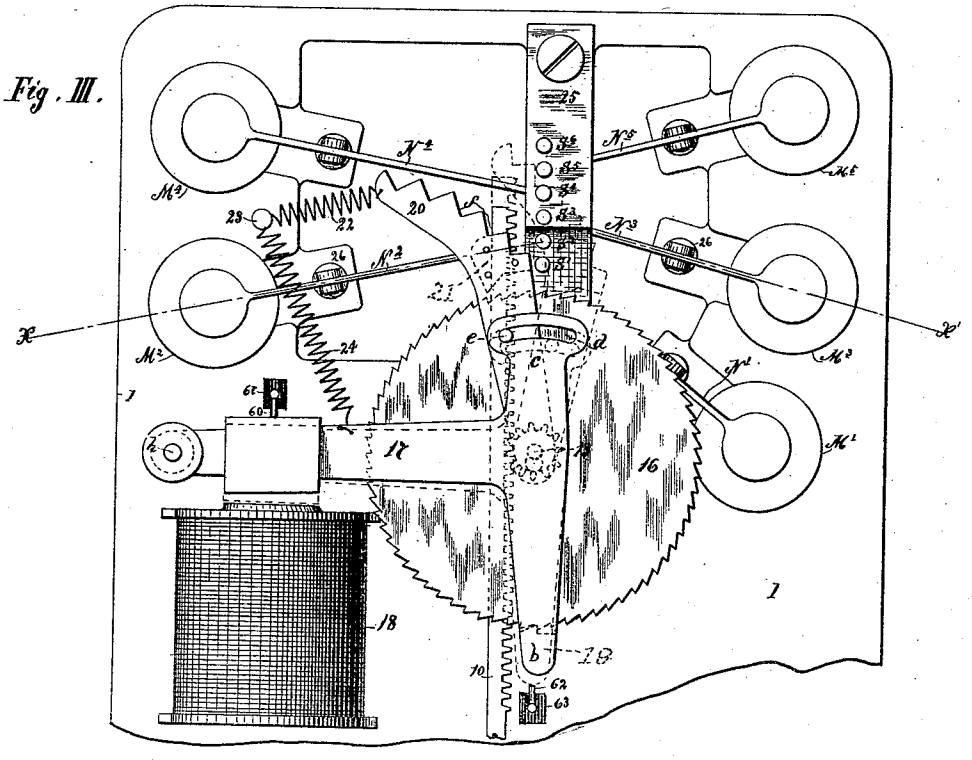


Fig. III.



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

G. A. GOODSON.

MATRIX MAKING MACHINE.

No. 479,773. Patented July 26, 1892.

Fig. VI.

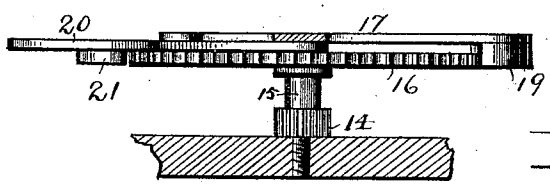


Fig. IX.

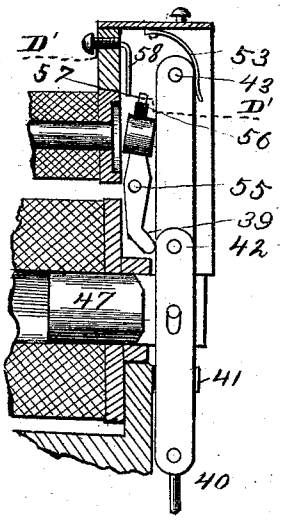
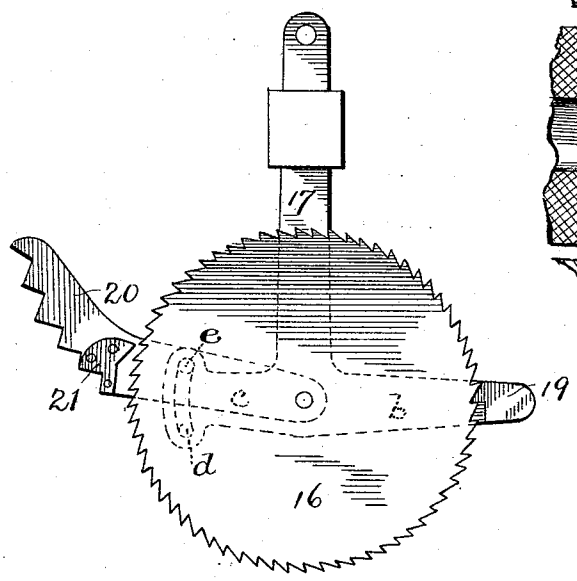


Fig. VIII.



Witnesses—

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Inventor—

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By his attys

Whitaker & Swoope

UNITED STATES PATENT OFFICE.

GEORGE A. GOODSON, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS S. BASSFORD, OF NEW YORK, N. Y, RECEIVER OF THE MINNEAPOLIS ELECTRO-MATRIX COMPANY.

MATRIX-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 479,773, dated July 26, 1892.

Application filed March 20, 1888. Serial No. 267,796. (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 certain new and useful Improvements in Matrix-Making Machines, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to matrix-making machines, and is in the nature of an improvement on the machines set forth in my patents, Nos. 414,399 and 414,400, dated November 5, 1889, and in my former application, filed May 31, 1887, under Serial No. 239,735.

The improvements herein set forth are comprised more particularly in the feed mechanism and the electric connections for the same, and involve an automatically-actuated matrix-material carriage with an electrically-actuated escapement for controlling the action of the motive power that propels the carriage, and electrically-actuated stops for variably limiting the travel of the carriage according to the space-units required by the different characters, these parts having been substituted for the independent electric motors shown in my former machine.

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

In the drawings like notations refer to like parts throughout.

Figure I is a plan of my machine with the die-impressing mechanism and part of the die-carriage seat removed. Fig. II is a view of the machine, partly in longitudinal section and partly in side elevation. Fig. III is a plan, on an enlarged scale, of the escapement and its connected mechanism in working position, part of the machine being broken away. Fig. IV is a section on the lines X X′ of Fig. III. Fig. V is a detail showing an armature-lever. Fig. VI is a detail in section showing the escapement-lever and ratchet-wheel detached. Fig. VII is a detail of a part of the matrix-material carriage in longitudinal section showing the mechanism for effecting the lateral movement of the same for spacing between the lines. Fig. VIII is an under side view of the escapement-lever and ratchet-wheel. Fig. IX is an enlarged detai view of a part of Fig. II.

1 is the bed-plate, 2 the character-board with key-seats having contact-points adjacent to the same, 3 the combined die-alignment bar and hand-key, 4 the die-carriage on one end of said bar, 5 the hand-key with contact-point on the other end of said bar, 6 the type-dies classified according to the units of space required, 7 the contact-points adjacent to the key-seats on the character-board, 8 the die-carriage seat provided with a tapering hole *a* in line with the common center or printing-point, 9 the matrix-material carriage, and 10 the rack-bar attached to said carriage, all substantially the same as in my former applications.

I will now describe my improvements.

11 and 12 are a pair of motor-springs attached at one end to the bed-plate or other fixed support and at the other to the matrix-material carriage. Weights can be used.

13 is vertical shaft rigidly secured to the bed in proximity to the rack 10.

14 is a pinion loosely mounted on this shaft for engagement with said rack and is provided with an extended hub 15, reaching to the level of the top of the shaft.

16 is a ratchet-wheel rigidly secured to the hub or sleeve 15.

17 is an armature-lever pivoted at one end to a suitable support, as the post *h*, secured to the bed-plate, and is provided at its other end with the extensions *b* and *c* at right angles to the armature portion. The arms *b* and *c* lie in a line across the center of the ratchet-wheel 16, the arm *b* extending beyond the periphery of the wheel and the arm *c* stopping near the edge of the same. The part *c* is provided at its outer end with an arc-shaped slot *d*. 18 is an electro-magnet for operating said armature-lever 17. To the under side of the outer end of the lever-arm *b* is attached a pawl 19, which when said lever is in its normal position engages and locks the ratchet-wheel 16, preventing its movement by the motor-springs 11 and 12. To the lever 17, preferably near its outer end, is pivoted a stop-lever 20, which is provided with a projecting-lug *e*, working in the slot *d* in the le-

ver-arm *c*. To the under side of the stop-lever 20 is attached a pawl 21 in proper position to be engaged by the ratchet-wheel 16. The lever 20 extends outward a considerable distance beyond the periphery of the ratchet-wheel and its outer portion is curved or inclined backward, and on its inner face it is provided with a series of step-like shoulders or offsets *f*. The tension-springs 11 and 12, acting through the rack 10 and pinion 14, give the ratchet-wheel 16 a tendency to revolve, and said wheel is normally held from such revolution by the pawl 19 on lever-arm *b*. When the armature-lever 17 is drawn to the magnet 18, the pawl 19 will release the ratchet-wheel 16 and the pawl 21 will be brought into engagement therewith. The tension of the springs will then cause the wheel 16 to revolve, carrying the stop-lever with it until the said lever is stopped by the pin *e* coming into contact with the end of slot *d* or by other means, as will be hereinafter described.

22 is a retraction-spring secured to the lever 20 and to some suitable base of resistance, as the post 23, for retracting the lever to its limit in the slot *d*.

24 is a retraction-spring attached to the armature-lever 17 at one end and to a suitable resistance, as the post 23, at the other.

S′, S^2, S^3, S^4, S^5, and S^6 are a series of stops for engagement with one or another of the respective shoulders *f* on the stop-lever 20, and limiting the movement of the ratchet-wheel 16, and consequently the matrix-material carriage 9. Of these stops S^6 is stationary, and all the others are movable. The movable stops are mounted in suitable seats and guides fixed to or formed integral with the bed-plate, as the rigid bar 25.

M′, M^2, M^3, M^4, and M^5 are a series of magnets having armature-levers N′, N^2, N^3, N^4, and N^5, respectively, for operating said movable stops. Each armature-lever is pivoted intermediate its extremities to a suitable support, as a post 26, fixed to the bed-plate, and has one end attached to one of the movable stops.

R′ R^2, &c., are a series of retraction-springs, attached at one end each to its respective armature-lever and at the other to a suitable base of resistance, as the bed-plate, for retracting the armatures from their magnets and holding the stops normally out of the path of the stop-lever 20.

The type-dies are classified according to the units of space required. The characters on the character-board or index-seat correspond to the type-dies in the die-carriage and the contact-points adjacent to the key-seats are classified into similar groups, according to the units of space required, as in my former machines.

A local electric circuit through the hand-key 5 and the magnet 18, which branches from the different groups of contacts on the character-board through the corresponding magnets M′, M^2, &c., serves to unlock the escapement and operate the movable stops. Of the wires constituting this circuit, A is the common out-going wire from a source of electricity (not shown) and B is the common return-wire to the same. The wire A is connected to the bed-plate 1, and from the bed-plate the current passes to the alignment-bar 3 and the contact-point on the hand-key 5. There are as many branch wires from the character-board as there are classes of characters.

A′ is the branch from the one-unit group to the magnet M′, A^2 the branch from the two-unit group to magnet M^2, A^3 from three-unit group to the magnet M^3, A^4 from four-unit group to magnet M^4, A^5 from five-unit group to the magnet M^5, and A^6 from the six-unit group to the magnet 18. From the respective magnets M′, M^2, M^3, M^4, and M^5, return branch wires B′, B^2, B^3, B^4, and B^5 extend to the magnet 18 and a common return branch B^6 extends from the magnet 18 to the main return-wire B. It will be thus seen that the magnet 18 is on all the branches and that the machine is constructed for a variable feed of from one to six units.

27 is a shaft journaled on the matrix-carriage and provided with a pair of feed-rollers 28, rigidly attached thereto on its opposite ends, which engage and feed the matrix material laterally to give space between the lines. 29 is a ratchet-wheel rigidly secured to this shaft 27. 30 is a pawl-lever loosely mounted on said shaft, and 31 is a pawl secured to said lever in proper position to engage said ratchet-wheel.

32 is a cam-track secured to the bed-plate. One end is pivoted to the frame by pivot-pin 33, while the other is secured by a set-screw $34\frac{1}{2}$, working through a slot *g*. A cam-finger 34 is pivotally attached at one end to the pawl-lever 30 and has its free end resting on the track 32. As the carriage is withdrawn to start a new line the cam-finger will raise the lever 30, and the pawl 31, engaging the ratchet-wheel 29, will turn the shaft 27 and feed the matrix material laterally the proper distance to form the space between the lines. The slot *g* in the end of the cam-track affords a means of varying the inclination of the track, and consequently the distance between the lines, at will.

35 is a rack attached to the end of the matrix-carriage adjacent to the character-board, and 36 and 37 is a graduated indicator operated by said rack for constantly indicating to the eye of the operator the distance from the end of the line.

38 is a cap-plate directly over the die-carriage seat provided with a hole in line with the common center or printing-point. On this cap-plate, as a seat, is located a device for depressing the die when at the common center and devices for controlling and actuating the same.

The die-depressing device and its operating and controlling mechanism here shown are the same as is fully set forth and broadly claimed in Letters Patent of the United

States No. 414,400, dated November 5, 1889. While these parts are here shown and are those I prefer to employ, their particular construction is not herein claimed; nor is it essential to my present invention, as other equivalent devices might be employed. It is herein shown to disclose the particular relation of this special form of electric die-depressing mechanism to the particular form of feed mechanism set forth in this application. Of this mechanism 39 is the supporting-standard secured to the cap-plate; 40, the plunger, working through the hole in the cap-plate 38 and held in a guide 41, attached to standard 39; 42, the toggle-lever, having one end attached to a base of resistance, as the rod 43, fixed in said standard, and having its other end attached to the plunger 40.

44 is the supporting-plate attached to the cap-plate 38 and the standard 39.

45 is the solenoid having a hollow axis mounted on the supports 44 and 39.

46 is its movable core coupled to a source of power and constantly reciprocating. 47 is the independent movable armature having one end attached to the toggle-lever and the other supported within the field of the core 46.

48 is a constantly-running crank-shaft. 50 is a connecting-rod from the crank 49 on said shaft to said core 46.

51 is a driving-pulley, and 52 is a fly-wheel, on the shaft 48.

53 is a retraction-spring attached to standard 39 and the toggle-lever 42.

54 is the electro-magnet for closing contacts of circuit-breaker. 55 is its pivoted armature having a projection extending into the path of the toggle-lever. 56 is a piece of hard rubber on armature end of said lever 55; 57, a contact-strip in the end of the rubber block; 58, a contact-strip normally in contact with 57 at one end and having its other end attached to the binding-post 59. These parts 55, 57, and 58 constitute a circuit-breaker operated by the toggle-lever 42. The contacts 57 and 58 when separated are brought into contact with each other by the magnet 54 and its armature 55.

The operation of the die-depression device is as follows: When a current is passed through solenoid 45, the movable core 46 and armature 47 will be magnetized, and upon the core 46 approaching armature 47 the two parts will adhere and be reciprocated together, thereby operating the toggle-lever 42 and depressing the plunger 40. As the toggle-lever is operated it will strike the projection of armature-lever 55 and separate the contacts 57 and 58, thereby breaking the circuit through the solenoid 45, so that the core 46 and armature 47 will be demagnetized and the armature released.

The electric connections for this die-depressing mechanism are as follows: A contact 60 is mounted on a piece of insulating material, as the hard-rubber block 61, secured to the bed-plate 1, adjacent to a part of the armature-lever 17 in position to be in contact with the armature when retracted to its limit by the spring 24. A similar contact 62 is mounted on a similar piece of insulating material 63, secured to the bed-plate in the proper position to be in contact with said armature (as the part *b*,) when drawn to the magnet 18. The whole bed-plate of the machine is charged from the wire A. A wire C extends from the contact 60 to the magnet 54, and a return-wire C′ leads back to the source through the common return-wire B of the index or stop-magnet circuit. A wire D leads from the contact 62 to the solenoid 45, and a return-wire D′ leads from said magnet to the binding-post 59 through the circuit-breaker contacts 57 and 58, and thence to the source through the return-wire B of the index or stop-magnet circuit.

The operation is as follows: The index or stop-magnet circuits are all open, as hereinbefore stated, at the index-plate. The armature-lever 17 and the contact 60 are normally together, and therefore the circuit C C′ through the magnet 54 is a normally-closed circuit, holding up the pivoted lever 55 and keeping together the contacts 57 and 58. The armature 17 (part *b*, as shown) and the contact 62 are normally apart. Hence the circuit D D′, through the solenoid 45 and the circuit-breaker contacts 57 and 58, is normally open at the escapement. Now when the hand-key 5 is depressed into the key-seat to select any desired character an index-circuit is closed through one or another of the stop-magnets, according to the space-group to which the character belongs, and through the magnet 18. The first effect of this is to unlock the escapement and throw up the proper corresponding stop and allowing the matrix-carriage to move the requisite distance, and the second effect is to bring together the armature-lever 17 and the contact 62, closing the circuit D D′, through the magnet 45 and the circuit-breaker contacts 57 and 58, thus actuating the die-depressing device. The circuit D D′ remains closed only until the toggle-lever strikes the pivoted armature-lever 55. As soon as this occurs the contacts 57 and 58 are separated, breaking the circuit D D′ at that point. As soon as the hand-key is withdrawn from the key-seat on the index-plate, opening the circuit through the escapement-magnet 18, the circuit C C′ will be again closed, through the magnet 54, and all the connections will be in their normal condition, as hereinbefore stated. Inasmuch as the movable stops are all out of the way, no magnet is required for the six-unit stop. On selecting such a character the stop-lever simply moves to its limit against the stationary stop. Weights may be used instead of the motor-springs for moving the matrix-material carriage. It is only essential to keep the carriage under a constant pull or push of such a yielding character to allow the carriage to be stopped without injury to the mechanism.

The phrase "under tension" is used in the claims in a generic sense to cover all such forms of power.

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

1. The combination, with a matrix-material carriage under tension, of character-selecting devices classified into groups, according to the space required by the characters to which they correspond, movable stops for limiting the movement of said carriage, allowing it to move a greater or a less distance in the same direction, electric controlling devices for said stops, a branched circuit including said electric controlling devices for said stops, and circuit-controllers for the branches of said circuit, each adapted to be operated by a single group of the character-selecting devices, substantially as described.

2. The combination, with a matrix-material carriage under tension, of electrically-controlled stops for variably limiting the travel of said carriage, a bar provided with a series of type-dies at one end and a hand-key at the other 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 through the stop-controllers, hand-key, and contacts adjacent to the key-seats, normally open at the index-plate, but capable of being closed by said hand-key, substantially as described.

3. The combination, with a matrix-material carriage under tension, of an escapement for locking and releasing said carriage, an electro-magnet for operating said escapement, two or more movable stops for variably limiting the travel of said carriage, electro-magnets for actuating said stops, and a common electric circuit through said escapement-magnet and said stop-magnets, said circuit being provided with a circuit-controller for closing said circuit through said escapement-magnet and one of said stop-magnets, substantially as described.

4. The combination, with a matrix-material carriage under tension, of a rack secured to said carriage, a pinion engaged by said rack, a ratchet-wheel connected to said pinion, a pivoted armature having arms on its free end projecting into the vicinity of said ratchet-wheel and provided one with a pawl for engaging with and locking said wheel and the other with a slot, an electro-magnet for operating said armature, a stop-lever pivoted to said armature and having a lug working in said slot, retraction-springs attached, respectively, to said stop-lever and said armature at one end and to a fixed resistance at the other, and one or more movable stops for limiting the movement of said stop-lever, electro-magnets for operating said stops, an electric circuit through said escapement-magnet with branches through said stop-magnets normally open, and a circuit-controller adapted to close said circuit through the escapement-magnet and one of said branches, substantially as described.

5. The combination, with a matrix-material carriage under tension, of electrically-controlled stops for variably limiting the travel of said carriage, a die-carriage, an electrically-controlled die-depressing device, an electric circuit with branches normally open through the controllers of the electrically-controlled stops and die-depressing device, a circuit-controller for making and breaking a circuit through one of said electric stop-controllers, and an electric circuit-closer on the common return-wire of the branch circuits through said controllers for closing the branch through the die-depressing device, substantially as described.

6. The combination, with a matrix-material carriage under tension, of an electrically-controlled escapement for locking and releasing said carriage, a series of electrically-controlled stops for variably limiting the travel of said carriage, a die-carriage, an electrically-controlled die-depressing device, an electric circuit with branches normally open through said stop and escapement-controllers, an electric circuit normally open through the controller of the die-depressing device, a circuit-controller for making and breaking a circuit through said escapement-controller and one or another of the controllers of said stops at will, and a circuit-closer actuated by said escapement for closing a circuit through said die-depressing device.

7. The combination, with a matrix-material carriage under tension, of an escapement for locking and releasing the same, a magnet for actuating said escapement, a series of electrically-controlled stops for variably limiting the travel of said matrix-carriage, a die-carriage, a die-depressing device, a magnet for controlling said die-depressing device, an electric circuit through the controlling-magnet of the said die-depressing device and said escapement normally open at the escapement contacts and provided with a circuit-breaker, an electro-magnet for closing the contacts of said circuit-breaker, and an electric circuit through said escapement, and said circuit-closing magnet normally closed at the escapement-contacts, and a circuit-controller for making and breaking a circuit through said escapement-magnet and one or another of the controllers for said stops at will, substantially as described.

8. In a matrix-machine having a variable-feed mechanism and an impressive device, means for operating them by a single electric circuit.

9. In a matrix-machine, an impressive device, a magnet therefor, a feed-escapement and magnets therefor, a die-carrying lever provided with a circuit-maker, and a single circuit for all of said magnets.

10. The combination, with the feed-wheels, their shaft, the friction-wheel, and its pawl

and lever, of a pivoted pendent arm on the lever, and an adjustable incline on which said arm rides during the return matrix-carriage movement, substantially as and for the purpose set forth.

11. The combination, in a matrix-carriage, with the lever for feeding the matrix-body to space for lines, of the pendent arm pivoted thereto, and a grooved incline therefor adjustable to different angles and arranged to cause said arm to pass free of the incline during the forward carriage movement and to ride up the incline during the return movement, substantially as and for the purposes set forth.

12. In a matrix-making machine, the combination, with the matrix-carriage having a spring-tension for moving it to space for impressions, of a rack, pinion, and escapement for controlling said movement, an electrically-actuated lever carrying one of the pawls and a pivoted stepped lever carrying the other pawl, and electrically-controlled stops for the latter arranged in a course substantially radial to the wheel, for the purpose set forth.

13. The combination, with an escapement for controlling the feed in a matrix-making machine, of a pivoted stepped lever carrying one of the pawls of the escapement, radially-arranged stops therefor, and means for moving the stops to engagement, as required, substantially as set forth.

14. A matrix-making machine having an escapement for controlling the degree of matrix feed, a spring-lever, an armature and electro-magnet for operating the holding-pawl, a second lever pivoted to the former and carrying the free pawl, retreating steps thereon, radially-arranged stops therefor, and levers and electro-magnets for lifting the stops singly to engagement for permitting different measures of movement of the escape-wheel, substantially as set forth.

15. In combination, an escape-wheel for controlling the feed of the matrix-carriage, a T-shaped lever having its stem pivoted, a pawl on one of its shorter arms and a slot in the other, a second lever fulcrumed to the first having a pin in said slot, a pawl for engaging the wheel, and retreating steps on its outer end portion, movable stops for engaging said steps, and means for operating said levers and stops, substantially as set forth.

16. In a matrix-machine, the combination, with a matrix-strip, supporting devices, and intermitting feed mechanism provided with a ratchet-wheel, of a reciprocating bar carrying a detent engaging the ratchet-wheel when the bar is at one extreme of its movement, an arm movable transversely thereto, said arm being provided with a detent or pawl engaging the ratchet when the bar is moved to the opposite extreme of its movement, a series of stops located at different distances from said arm in the direction of its movement, and devices for projecting any one of said stops into the path traversed by the arm to arrest the movement of the latter and the ratchet with which it is engaged, substantially as set forth.

17. In a matrix-machine, a reciprocating matrix-carriage carrying a matrix-strip supporting and guiding frame, toothed feed-wheel on a shaft mounted in said frame for engaging the under surface of the matrix-strip to advance it transversely to the carriage movement, a pawl-carrying lever for rotating said shaft, a pivoted arm of the lever, and an adjustable incline arranged to engage it to operate the lever while the matrix-carriage is making a return movement, substantially as set forth.

18. The combination, with the matrix-carriage and a rack for moving the same, of a rotating graduated disk and a rack-and-pinion connection between the same and the matrix-carriage, as set forth.

19. In a matrix-machine, a magnet controlling the operation of an impressive device, a series of magnets separately controlling a variable-feed mechanism, a circuit including the impressive-device-controlling magnet and having branches to each of the feed-controlling magnets, and a circuit-closer for completing the circuit through the former magnet and any one of the latter, substantially as set forth.

20. In a matrix-machine, a die-impressing device, a controlling mechanism therefor including an electro-magnet, a matrix-feed escapement, mechanism for producing the varying feed movements thereof and including a separate electro-magnet for each measure of movement, and suitable circuit connections between the escapement controlling the magnet and the impressing-device magnet, substantially as set forth.

GEORGE A. GOODSON.

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