(No Model.) 6 Sheets—Sheet 1.

M. LANE.

MATRIX MAKING MACHINE.

No. 530,279. Patented Dec. 4, 1894.

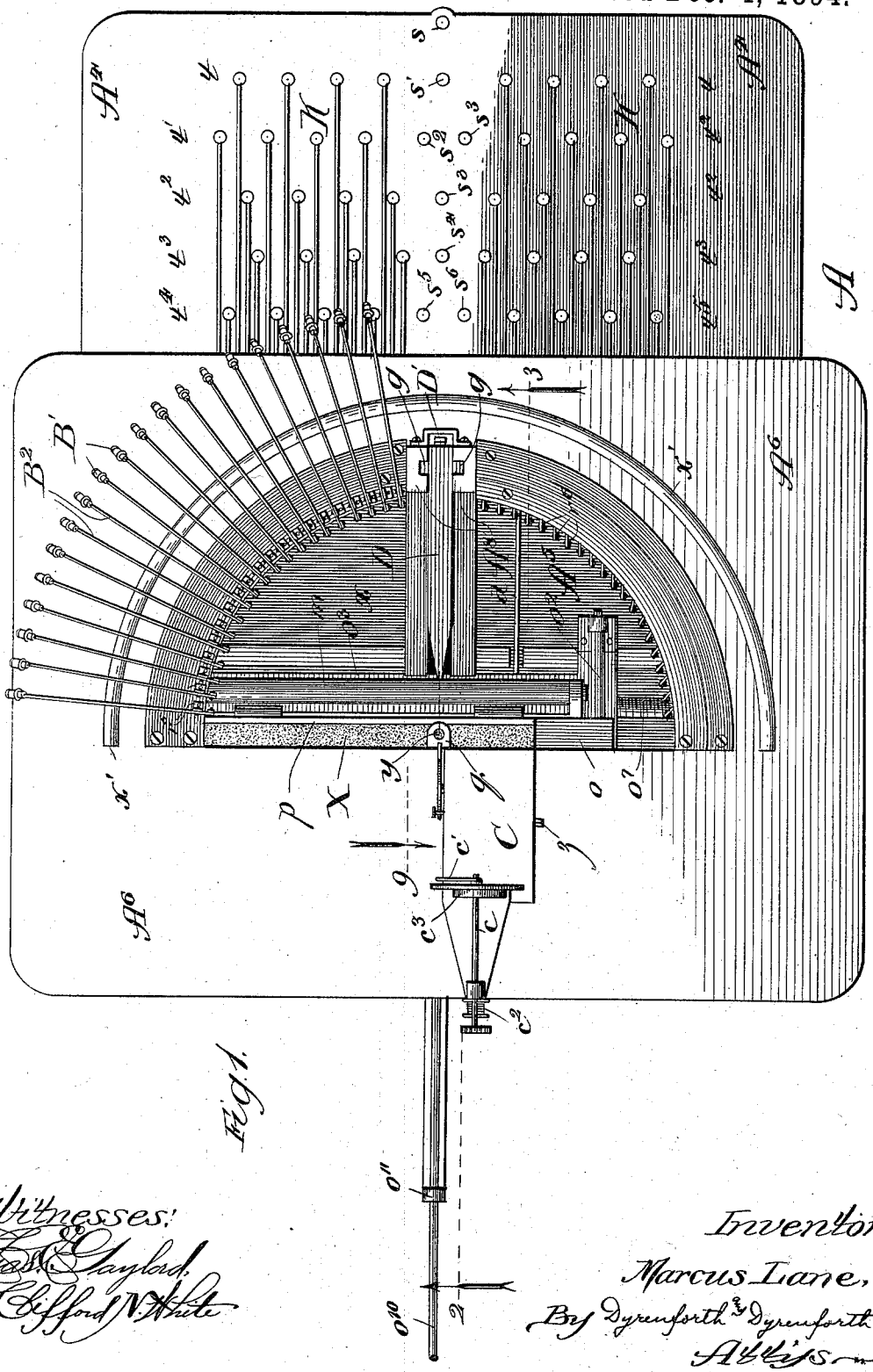

Fig. 1.

Witnesses:
Chas. E. Gayland.
Clifford N. White

Inventor:
Marcus Lane,
By Dyrenforth & Dyrenforth
Attys

(No Model.)

6 Sheets—Sheet 2.

M. LANE.

MATRIX MAKING MACHINE.

No. 530,279. Patented Dec. 4, 1894.

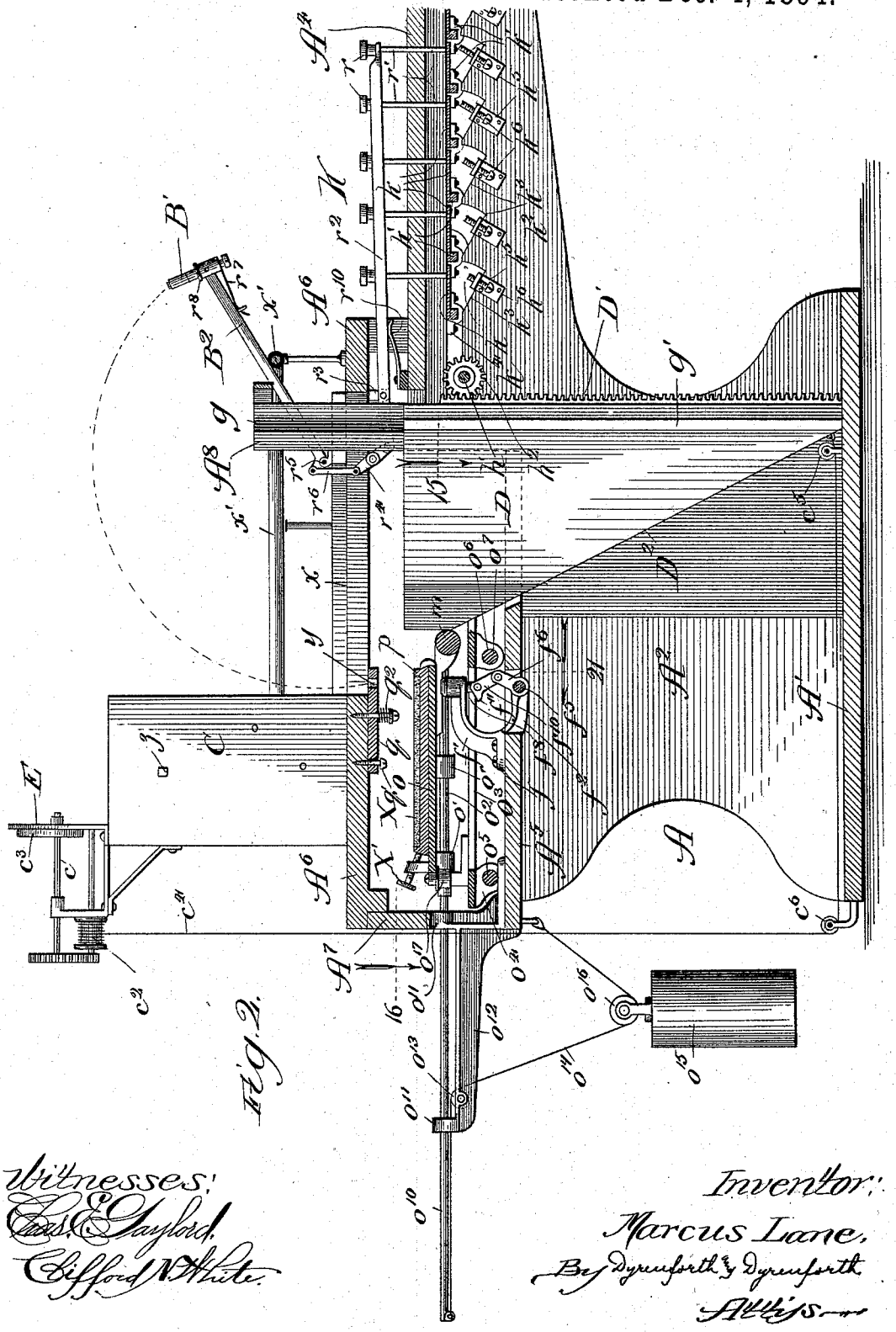

FIG. 2.

Witnesses:
Chas. E. Gaylord.
Clifford White.

Inventor:
Marcus Lane,
By Dyrenforth & Dyrenforth
Attys

(No Model.) 6 Sheets—Sheet 3.

M. LANE.

MATRIX MAKING MACHINE.

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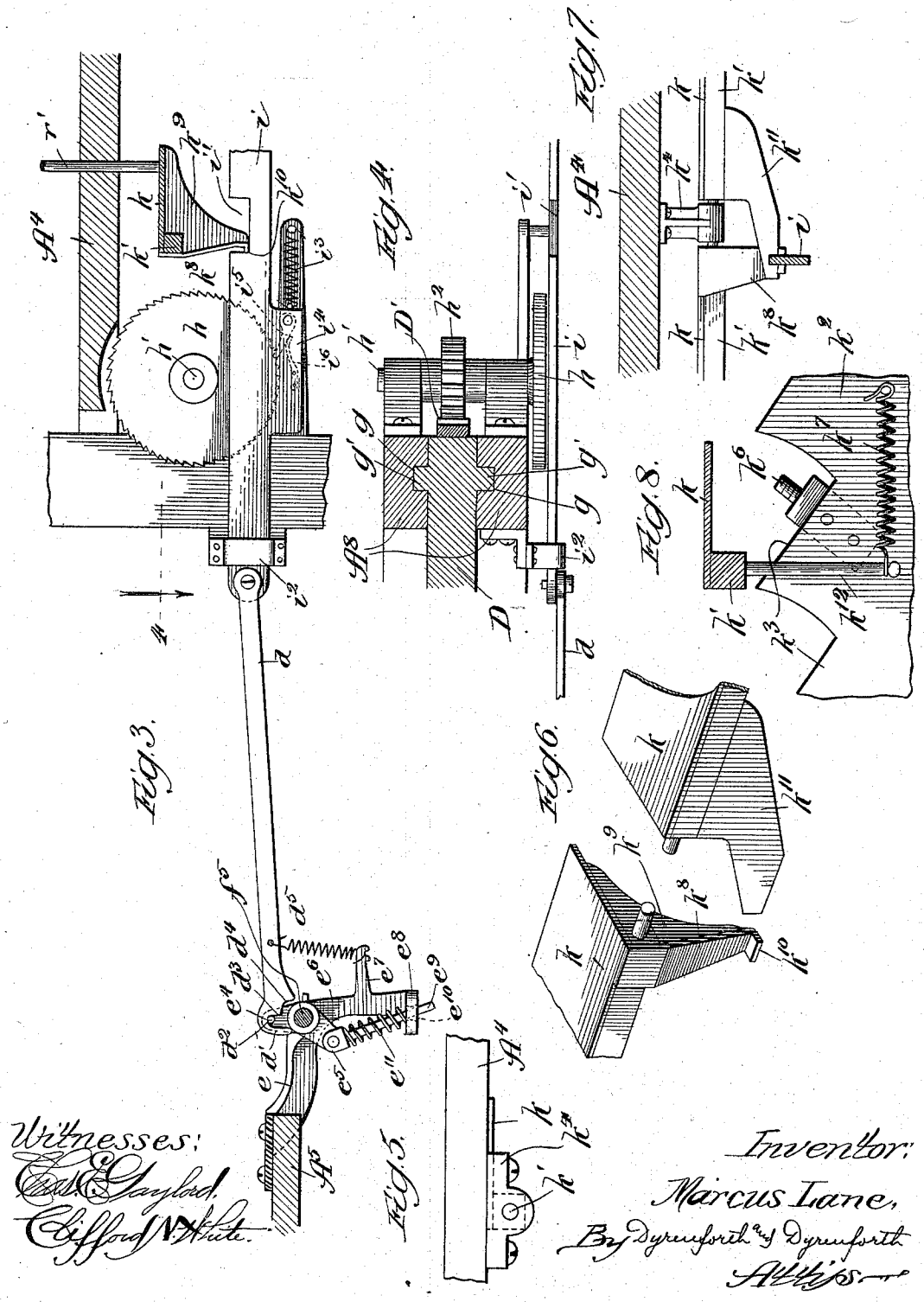


Witnesses:
Chas. E. Gaylord.
Clifford N. White.

Inventor:
Marcus Lane,
By Dyrenforth & Dyrenforth
Attys.

(No. Model.) 6 Sheets—Sheet 4.

M. LANE.

MATRIX MAKING MACHINE.

No. 530,279. Patented Dec. 4, 1894.

Fig. 10.

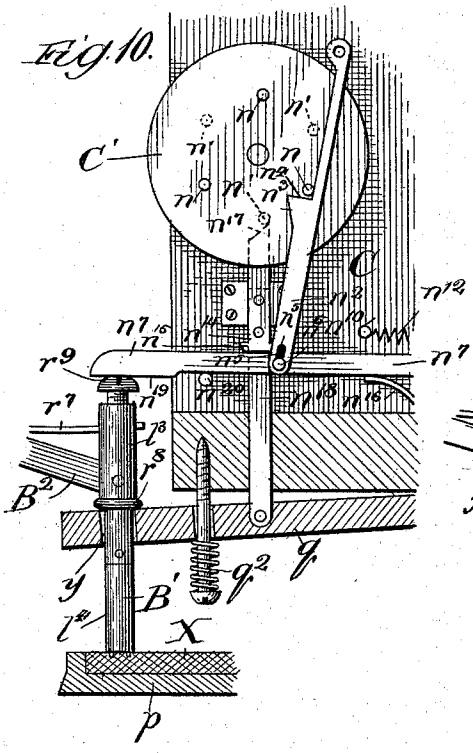


Fig. 9.

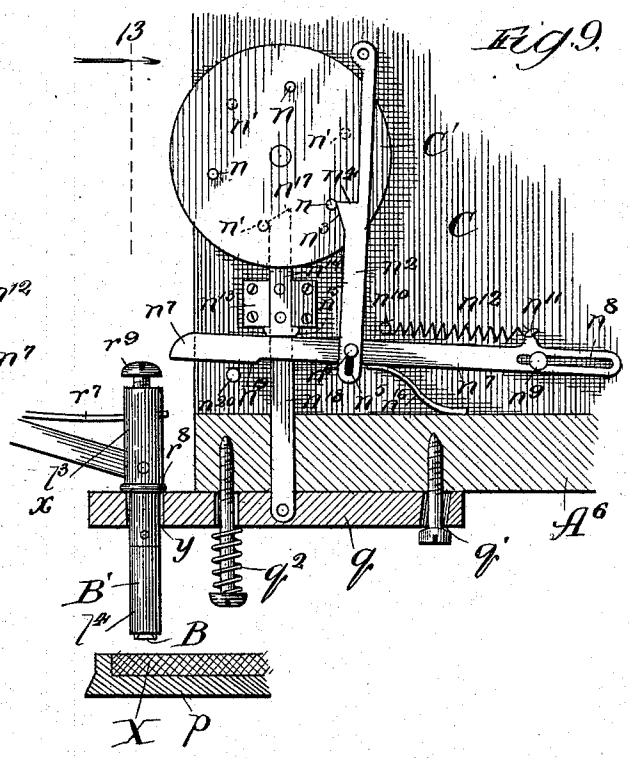


Fig. 11.

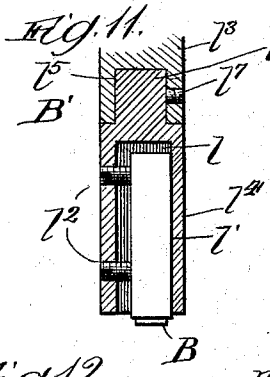


Fig. 12.

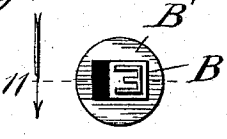


Fig. 13.

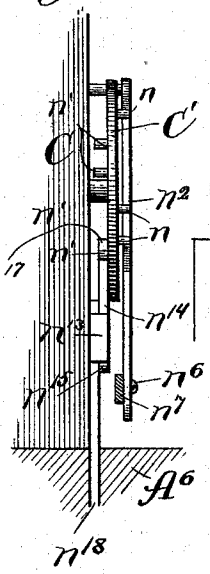
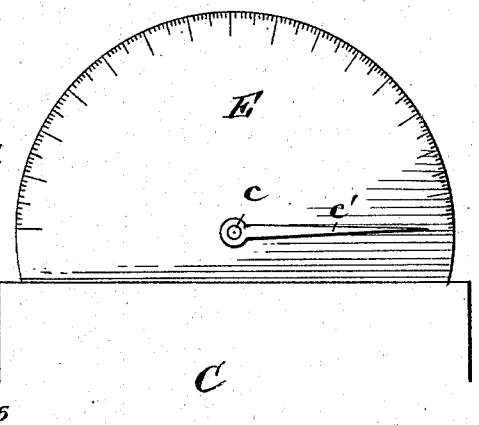


Fig. 14.



Witnesses:
Chas. E. Gaylord.
Clifford N. Wiele.

Inventor:
Marcus Lane.
By Dyrenforth & Dyrenforth
Attys.

(No Model.)

6 Sheets—Sheet 5.

M. LANE.

MATRIX MAKING MACHINE.

No. 530,279. Patented Dec. 4, 1894.

Fig. 15.

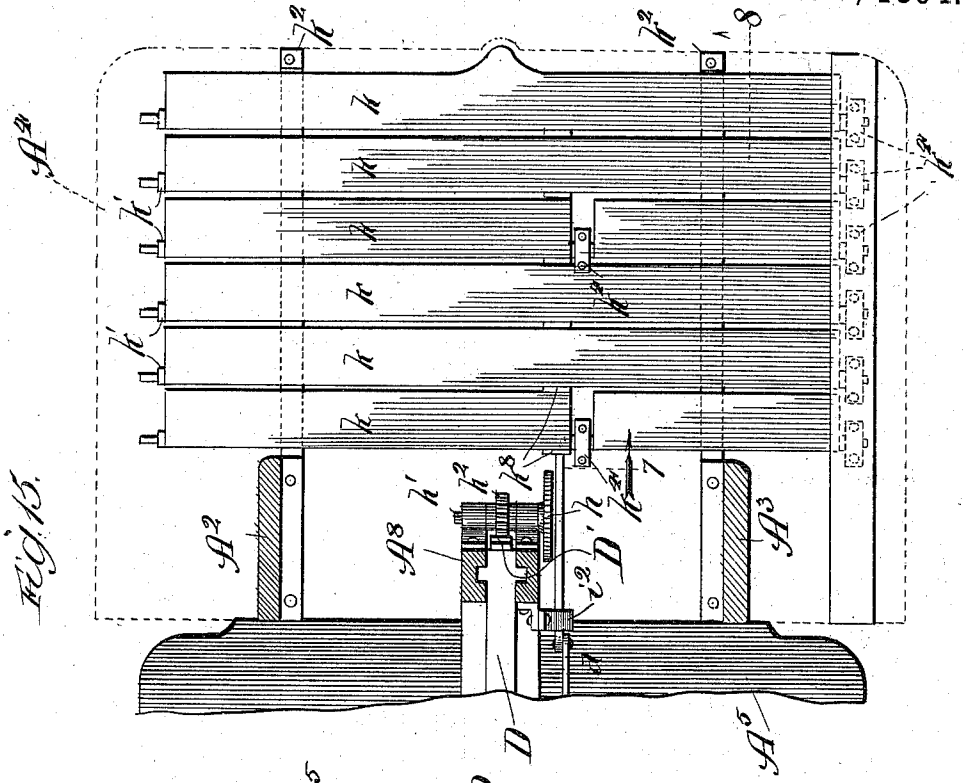
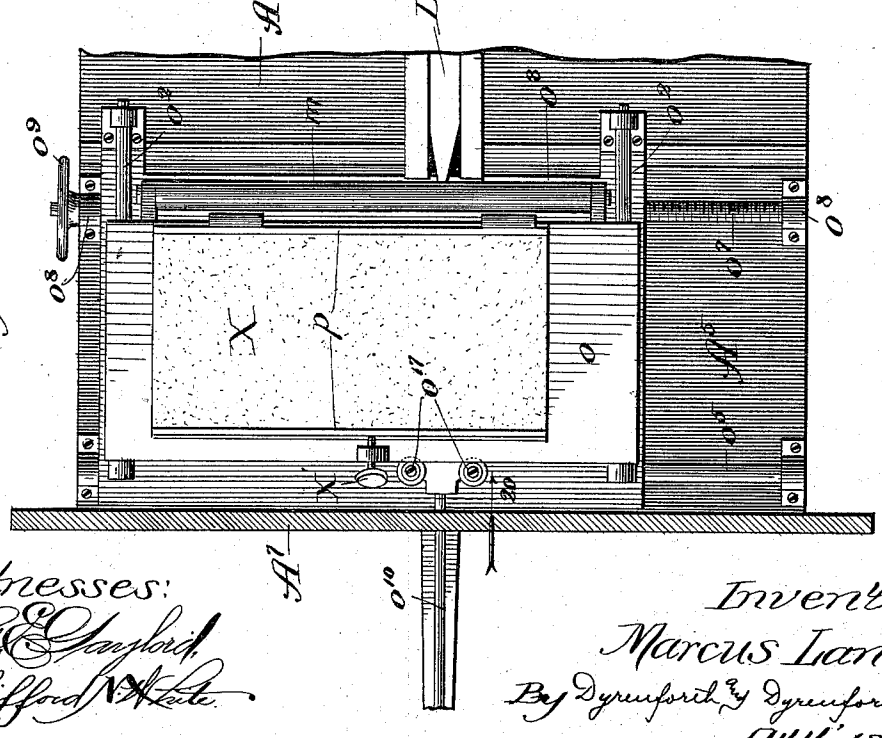


Fig. 16.



Witnesses:
Chas. E. Sanford
Clifford N. Keats

Inventor:
Marcus Lane,
By Dyrenforth & Dyrenforth
Attys

(No Model.) 6 Sheets—Sheet 6.

M. LANE.

MATRIX MAKING MACHINE.

No. 530,279. Patented Dec. 4, 1894.

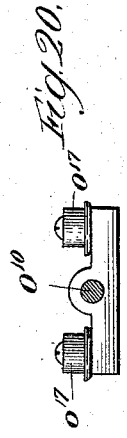


Fig. 20.

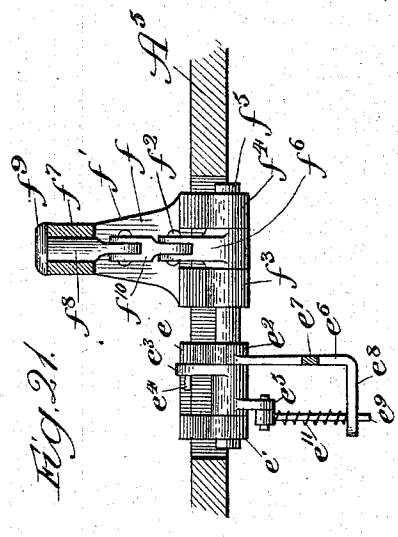


Fig. 21.

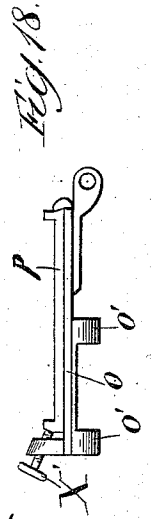


Fig. 18.

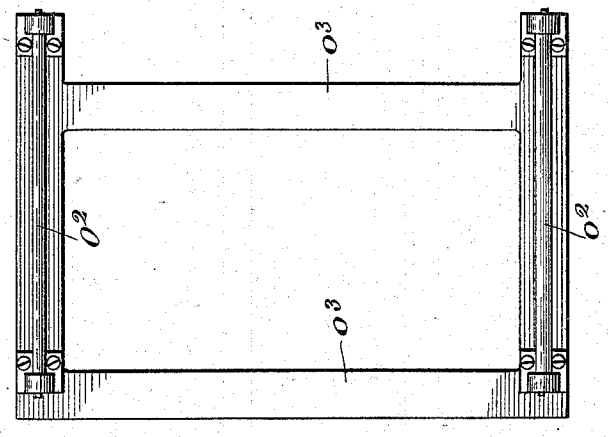


Fig. 17.

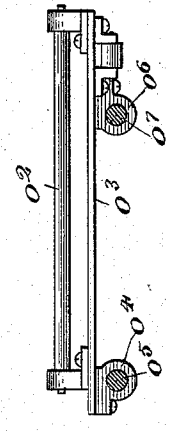


Fig. 19.

Witnesses:
Chas. E. Gaylord.
Clifford N. White

Inventor:
Marcus Lane,
By Dyrenforth & Dyrenforth
Att'ys

UNITED STATES PATENT OFFICE.

MARCUS LANE, OF FREEPORT, ILLINOIS.

MATRIX-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 530,279, dated December 4, 1894.

Application filed December 27, 1892. Renewed May 1, 1894. Serial No. 509,719. (No model.)

To all whom it may concern:

Be it known that I, MARCUS LANE, a citizen of the United States, residing at Freeport, in the county of Stephenson and State of Illinois, have invented a new and useful Improvement in Matrix-Making Machines, of which the following is a specification.

My invention relates to improvements in a type-writing or matrix making machine, in which type characters, in relief, upon pivotal type-bars are actuated from a key-board to imprint uniformly in a certain fixed field across which the material to receive the characters is caused to travel.

My object is to provide a machine of an improved construction of the class named to be used either as a typewriter, or in making matrices upon a bed of plastic material, which material, when allowed to harden, may afford a surface provided with a mold or intaglio-matrix of each character impressed so that a stereotype plate may be cast or molded therefrom.

While, as before stated, my machine is adapted for either typewriting or matrix making, the machine shown in the drawings is intended more particularly for the latter purpose, and for that reason the description is confined to a matrix making machine. With slight substitution of details hereinafter pointed out the machine may be adapted for typewriting.

Referring to the drawings—Figure 1 is a partly broken and partly sectional plan view of my improved machine; Fig. 2, a longitudinal central section of the same taken on line 2 of Fig. 1 and viewed in the direction of the arrow; Fig. 3, an enlarged section taken on line 3 of Fig. 1 in the direction of the arrow; Fig. 4, a sectional plan view taken on line 4 of Fig. 3; Fig. 5, a broken view illustrating a bearing detail of the construction; Fig. 6, a broken perspective view of one of the details of the spacing mechanism, the view showing two adjacent differential spacing plates, separated to illustrate their construction; Figs. 7 and 8, enlarged broken sectional views of portions of the spacing mechanism, the sections being taken on lines 7 and 8, respectively, of Fig. 15; Figs. 9 and 10, sections taken on line 9 of Fig. 1 in the direction of the arrow, and showing mechanism, which governs the depth of impression of the type, in two positions respectively; Fig. 11, a sectional view of one of the type holders, the section being taken on line 11 of Fig. 12; Fig. 12, a face view of one of the type in position in a type-holder; Fig. 13, a broken detail view, partly in section and partly in elevation, of the impression governing mechanism, the section being taken on line 13 of Fig. 9; Fig. 14, a detail view of a dial with a movable pointer thereon; Figs. 15 and 16, broken sectional plan views taken upon lines 15 and 16 respectively of Fig. 2; Fig. 17, a detail plan view of a laterally sliding carrier frame upon which is mounted the movable carrier bed for the matrix holder; Fig. 18, a detail side elevation of the matrix bed and matrix bed carrier; Fig. 19, an end elevation of the frame shown in Fig. 17; Fig. 20, an enlarged sectional view of the end portion of a reciprocating rod forming part of the spacing mechanism, the section being taken on line 20 of Fig. 16 and viewed in the direction of the arrow; and Fig. 21, an enlarged broken section taken on line 21 of Fig. 2, and viewed in the direction of the arrow.

A is the stationary part or frame of the machine comprising a base A′, sides A^2 A^3, key-board platform A^4, shelf A^5, top-board A^6 and back-board A^7.

K represents the keys, or properly the key-board of the machine.

For the purpose of illustration and to prevent confusion the key-board is shown in the drawings to be provided with forty type operating keys, divided into two sets of twenty each located respectively at opposite sides of a set of central keys, provided for spacing purposes. One type key is provided for each type, and the type may be more or less in number than is shown. In practice I prefer to provide eighty-four type bars and characters and eight space keys, the latter being the number shown upon the key-board in Fig. 1.

Presuming that the type to be employed in this machine is what is known in the art as ten point long primer of eight units to the pica em, I prefer to provide the key-board as follows: Keys of type of the same equivalence in units are located together, and at the sides of the space keys of the same number of units. In the key board shown the first line

marked $t\ t$ contains keys of type of two units. The half of the next line marked t' contains keys of type of three units. The other half of the same line, and all of the next line, both designated by the small letter t^2, are the keys of type of four units. The next line marked t^3 contains keys of type of five units. The half of the next line marked t^4 contains the keys of type of six units, and the other half of the line, marked t^5, contains the keys of type of seven units.

s is a space key of one unit; s', a space key of two units, the equivalent of the type keys in the line t; s^2, a space key of three units; $s^3\ s^3$, space keys of four units; s^4, a space key of five units; s^5, a space key of six units, and s^6 the space key of seven units,—all the space keys corresponding in units with the lines of type-keys with which they are placed adjacent.

Each key comprises a head r upon a stem r', and each stem passes through a separate key lever r^2, which is pivoted to a bearing r^3 suspended from the top board A^6. At its rear end each lever r^2 is pivotally connected to a lever r^4 which between its ends is pivoted to the main frame.

Each type or die B is preferably of steel and secured in the end of a type-holder B′ pivotally mounted between its ends upon a type-bar B^2, which near its opposite end is pivoted to the main frame at r^5. At the end of its short arm each type bar is pivotally connected by means of a link r^6 to the end of one of the levers r^4. In the top-board A^6 of the main frame is a semi-circular opening x, and the type bars are pivoted in the bearings r^5, arranged around the semi-circular edge of the opening x. Near the opening x is a cushioned rail x' against which the type bars rest when in normal position, as indicated in Fig. 2. The type bars extend radially from an opening y, at the center of the arc described by the semi-circular edge of the opening x, and when swung upon their pivots r^5 the type holders strike into the opening y. The opening y is in a yielding stop, or type receiving lever q, which is pivoted at q' to the under side of the board A^6 and projects beyond the edge of the opening x. The lever q is held between its ends normally against the under surface of the top-board A^6 by a confined spring q^2.

When a key is struck the head r is depressed with its lever r^2, causing the latter to swing upon its pivot r^3, swing the lever r^4, and draw down the link r^6 to swing the type bar and type holder in the direction of the dotted circle in Fig. 2, causing the type-holder to strike into the opening y of the type receiving lever q.

The material which receives the impression of the type and affords the matrix is preferably a plastic substance capable in a comparatively short time of becoming very hard from exposure; or it may be a comparatively hard substance capable of readily receiving an indentation, and of hardening still further under the action of heat or other agency.

The material X which is to receive the indentations is spread or otherwise inserted in a matrix holder p, and must afford a smooth plain surface. The matrix holder p may be a metal plate, of the form in cross section shown in Figs. 2 and 18, removably secured upon a movable carrier bed o provided on its under side with guide projections o' adapted to surround and slide upon horizontal guide rods o^2 extending longitudinally of the machine. The guide rods o^2 are upon a sliding frame o^3 provided, at opposite ends of its rear edge, with guide openings o^4 of smooth bore to slide upon a guide rod o^5 mounted upon the platform A^5 of the machine. Near its forward edge the frame o^3 is provided with internally threaded guides o^6 adapted to receive a worm shaft o^7 held against longitudinal movement in bearings o^8 at opposite ends of the platform A^5, as shown most clearly in Fig. 16. At one end of the worm shaft o^7, beyond its bearing o^8, is a hand-wheel o^9, by means of which the worm shaft may be turned to cause the sliding frame o^3 to move in either direction transversely of the machine.

On the top-board A^6 is a casing C in which is housed a spring actuated train of gear wheels or clock gear; the spring being upon an arbor z, to be wound up by a suitable key, and the final wheel of the gear being a disk C′ on the outer side of the case. The train of spring actuated gears is not illustrated in detail for the reason that it is of common construction. Its function is simply to give to the disk C′ a progressive movement on its axis whenever it is released, as hereinafter described. On opposite sides of the disk C′, and in the relative positions shown in Figs. 9 and 10, are pins $n\ n'$, the pins n being on the outer side of the disk, and the pins n' on the inner side thereof.

Pivoted to the side of the case C above and to one side of the disk C′ is a swinging arm n^2 formed on its forward edge with a cam surface n^3 terminating at an abrupt shoulder n^4. At its lower end the swinging arm n^2 is provided with a longitudinal slot n^5 through which it is pivotally connected, by means of a pin n^6, to an oscillating and longitudinally reciprocating depressing lever n^7. The depressing lever n^7 is provided at its rear end portion with a longitudinally extending slot n^8 through which passes a pin n^9, fastening the lever pivotally to the side of the case without interfering with its longitudinal reciprocation. Fastened at one end to a pin n^{10} on the side of the case and at its opposite end to a lug n^{11} on the lever n^7 is a spring n^{12}, which tends normally to draw the lever n^7 forward. Confined and reciprocated in a guide n^{13}, on the side of the case C, is a plunger n^{14} provided at its lower end with a head n^{15}. The lever n^7 is maintained normally raised to the top of the slot n^5, in the arm n^2, by a finger

spring n^{16}, and the plunger rests at its head n^{15} normally upon the upper side of the lever n^7. The upper end of the plunger n^{14} is formed with a cam surface n^{17}. Fastened at its upper end upon the rear side of the plunger n^{14} and pivotally connected at its lower end to the receiving lever q is a rod n^{18}. When the mechanism described is in its normal position the lowest pin n, on the disk C′, bears upon the cam n^3 adjacent to the abrupt shoulder n^4; and the lowest pin n' bears against the side of the plunger n^{14} adjacent to the cam surface n^{17}. At its forward end portion the depressing lever n^7 is provided with an impact face n^{19}. In practice the face n^{19} extends in a plane about one hundredth part of an inch below the lower edge of the lever n^7; but in the drawings (Figs. 9 and 10) it is somewhat exaggerated for the purpose of illustration. Below the impact face n^{19}, when the lever is in its normal position, is a stop n^{20} in the form of a pin projecting from the side of the case C.

The object of the mechanism described is to regulate with absolute certainty the depth of the impressions made by the type upon the surface of the matrix material.

Each type-holder B′, as before stated, is pivoted between its ends upon the end of its type bar B^2, and it is held normally by a spring r^7 in the position to cause its free end, containing the type, to strike into the opening y of the receiving lever. On each type-holder adjacent to its pivot is an annular shoulder r^8 below which the type-holder is of reduced diameter, as shown. The reduced portion of the type-holder moves readily through the opening y, but its movement is stopped by the engagement of the shoulder r^8 with the surface of the receiving lever q about the opening y. In its movement from the rail x' to the opening y the end of the type-holder describes a circle, as before stated, of which its bearing r^5 is the center, but in moving downward in the openings y the type-holder must extend in a plane perpendicular to the surface of the matrix material. After entering the opening y the type-holder is guided by the opening to move in a vertical plane, at a tangent to the circle described in its previous movement, and in doing this the type-holder turns upon its pivot against the resistance of the spring r^7. On the upper end of the type-holder is an adjustable set screw r^9, for a purpose hereinafter described.

In operation when a type-key is struck the respective type lever B^2 carries its type-holder to the opening y, causing the lower part of the holder to pass through the said opening until the shoulder r^8 strikes the receiving lever. The impact of the shoulder against the receiving lever depresses the latter, against the resistance of the spring q^2, and draws down the rod n^{18}, and, with the latter, the plunger n^{14} and lever n^7, against the resistance of the spring n^{16}. The downward movement of the plunger n^{14} releases the pin n', engaging the plunger, and permits the disk C′, to be revolved by the spring-actuated gear housed in the case C. The pin n at the cam n^3 is moved to release the arm n^2, causing the depressing lever n^7 to plunge forward under the action of its spring n^{12} over the top of the set screw r^9; and the passage of the pin n' across the cam surface n^{17} depresses the plunger n^{14}, a certain predetermined distance, to press the impact face n^{19} of the lever n^7 upon the set screw r^9, and thus force down the type-holder to press the type into the matrix material the exact distance desired. As the disk C′ rotates, the pin n' last engaging the plunger moves past the cam surface n^{17}, the springs q^2 and n^{16} raise the lever q, rod n^{18}, plunger n^{14} and lever n^7 to their initial positions; and when the next pin n engages the cam surface n^3 of the arm n^2 the latter is swung backward and moves the depressing lever backward against the resistance of the spring n^{12}, until the disk C′ is stopped by the engagement of the next pin n' with the side of the plunger n^{14}. Below each operating lever r^2 forward of its pivot r^3 is a spring r^{10} (Fig. 2) which bears against the lever r^2 and operates, when the key is released, to raise the lever to its normal position. The action of the mechanism which regulates the depth of the impression made upon the matrix material is very quick, so that when the operator releases the key last struck the type-holder will have been released and thrown upward by the depressing lever, and the type-bar and type lever swung back to their initial positions by the action, primarily, of the spring q^2 and secondarily by that of the spring r^{10}.

It is desirable in matrix making that there shall be as little displacement as possible of matrix material, around the intaglio, under the impact of the type in making impressions, and it is found in practice that less displacement of material occurs when the impression is made by repeated and comparatively gentle impacts than under a single strong impact of the type. The link and lever connections between the operating levers r^2 and type-bars B^2 are such that when a key is depressed the type-holder is swung with a greater force than is considered desirable in ordinary typewriting machines, owing to their construction, and without any greater exertion of force by the operator. This is particularly desirable for manifolding.

When the shoulder r^8 strikes the receiving lever q it springs the latter downward until the impact face n^{19} of the lever n^7 strikes the stop n^{20}. This permits the type in practice to enter the matrix material a distance approximating say one-hundredth part of an inch. Farther than this, therefore, the type will not enter the matrix material under the direct force exerted from the key. To engage the top of the type-holder the impact face n^{19} passes beyond the stop n^{20}, and the second impact exerted under the action of the spring mechanism housed in the casing C,

forces the type say one-fiftieth of an inch into the matrix material making a total depth of impressions of about one-thirty-third of an inch, which is regarded as sufficient. The depth of impressions under the impacts stated may be varied if desired by raising or lowering the frame carrying the matrix material, adjusting the set screws r^9, or increasing or diminishing the extent of projection of the impact face n^{19}. When the device is used as a typewriter it may be regulated in either way described to meet the requirements of manifolding when the typewriter is used for that purpose.

The matrix bed p, as before stated, is mounted upon a bed-plate arranged to travel upon the guide-rods o^2, in a direction longitudinally of the machine, and the bed-frame is mounted to travel in the direction transversely of the machine by turning the worm rod o^7. Each time an impression is made upon its surface the matrix material must travel a sufficient distance below the opening y to present a new surface of the extent desired for the next impression; and the movement of the matrix bed for this purpose is accomplished by the mechanism now to be described. Bearing against the rear edge of the bed-frame o is a rod o^{10} movable longitudinally through guides o^{11} o^{11} (Fig. 2) upon a bracket o^{12} extending from the rear of the machine. Journaled in the bracket o^{12} is a sheave o^{13}. A cord o^{14} secured at one end to the under side of the platform A^5, extends over the sheave o^{13} and is fastened at its opposite end to the free end of the rod o^{10}. Between the platform A^5 and sheave o^{13} the cord carries a weight o^{15} which is suspended upon a pulley o^{16} running on the cord. The action of the weight o^{15} is to draw the rod o^{10} forward and through the latter to move the bed-frame o in the forward direction. If desired a suitable spring may be employed, as the recognized equivalent of a weight, to advance the rod o^{10}. The rod o^{10} presses against the rear side of the bed-frame, and to permit the latter to be moved transversely of the machine without strain upon the rod, the rod o^{10} carries wheels o^{17} which engage the rear side of the bed-frame o and permit the latter to be moved transversely of the machine without material friction. Journaled at opposite ends in the front part of the bed-frame o is a roller m.

The spacing for letters and words in a line of the matrix is accomplished by causing the bed-frame, carrying the matrix material, to move in the direction of the front of the machine; and the spacing between lines by causing the bed-frame to move in the direction transversely of the machine. Each time a character is struck, and an impression made upon the matrix material, the bed-frame must be moved a distance equal to the space occupied by the character, and the space between characters, which in all cases between the letters forming a word will be the same. The characters in a font of type are each made to occupy a certain number of units of space; that is to say the narrowest characters occupy two units, and the widest characters, provided for in the machine shown, occupy seven units of space, the units in the present instance being one-eighth of a pica em or one-forty-eighth of an inch. Therefore, each time a letter or character in the first line t of the key-board is struck the bed-frame must move a distance equal to two units to bring a fresh surface of the matrix material below the opening y in which the next character may be impressed, the distance being increased to three units when keys t' are struck, and so on.

Each type-holder B′ is provided with a socket l capable of receiving the type of the character of largest number of units in the font. One side of the socket is a straight wall or surface l' against which the type must be set irrespective of its width. Entering the said socket from the opposite side of the type-holder are set screws l^2, which operate to tighten the type in place and maintain it in contact with the said surface, or registering wall, of the socket l. The type being placed against the registering walls of the type-holders, the sockets of all of which are the same, the initial point or line of each letter will strike upon the same point, in the matrix material, with relation to the opening y; and the forward or initial point of each intaglio will thus be at the initial point or line of the first unit of space in the field below the said opening. As each character, in order to make an upright intaglio, must extend at a different angle to its radial type bar, I make the type-holders in two sections l^3 l^4, the upper section l^3, which is pivoted to the type-bar, having a socket l^5 in its under-surface to receive the upper reduced end l^6 of the lower section l^4. The lower section contains the type, and it may be turned axially in the socket l^5 to adjust the type to any desired angle with relation to the type-bar, and when adjusted it may be tightened by a set-screw l^7. Thus all the type-holders may be constructed alike.

Extending below each transverse line of keys of the same equivalence on the key-board, is a swinging spacer-plate k mounted at its rear edge upon a shaft k' which is pivoted in bearings on the under side of the key-board platform. Below the spacer plates k and toward opposite ends of the latter are two stationary and longitudinally extending strips or arms k^2 provided in their upper edges with serrations affording inclines k^3. The topmost point of each incline is directly below a shaft k', and each plate k is adapted to swing upon its pivots down in the direction of the coincident inclined edges of the arms k^2. The plates k below the spacer key s, and full lines t' t^2 and t^3 of character keys, are pivoted in bearings k^4 (see Fig. 5) near opposite edges of the under side of the key-board platform. Under the line t' t^2

and line t^4 t^5 the spacing plates are divided at points between the spacer keys s^2 s^3 and s^5 s^6, respectively, where bearings k^4 are provided in proper position to receive the adjacent ends of the shafts. (See Fig. 15.) At the inclined edges k^3 are bracket pieces k^5, having threaded openings containing set screws k^6 against the tops of which the spacing plates are adapted to strike. The set screws may be adjusted to limit the distance to which the free ends of the spacing plates may be swung in the downward direction. Each shaft k' is provided with a downward extending arm k^{12}, (see Fig. 8,) and connected at opposite ends respectively with the arm k^{12} and side of a stationary part of the machine, is a spring k^7 operating normally to maintain the free edges of the plates k against the lower ends of the stems r' of the keys. On each plate k (extending the full length of a line of keys) is a downward extending projection k^8, which may be stiffened by a rib k^9. At the lower end of each projection k^8 is a backward extending toe k^{13}. All the projections k^8 are in one longitudinal line. The plates k which extend below the half lines of character keys t^2 and t^5 (four and seven units, respectively) are provided at their ends adjacent to their pivots near the center of the key-board with plates k^{11} which extend beyond the ends of the plates k. On the adjacent plates k, which extend below the lines t' t^4 of type keys, are projections k^8, like the projections k^8 above described, and provided with similar toes k^{10}. The plates k^{11} extend across the adjacent projections k^8, as shown in Fig. 7. Below the line of projections k^8, and extending longitudinally of the machine, is a spacing bar i provided in its upper edge with notches or recesses i' into which the said projections k^8 extend. The bar i is movable longitudinally through guides i^2 on the frame of the machine, and is held normally at the forward limit of its movement, with the rear edges of its recesses i' against the toes k^{10}, by a spring i^3 attached at one end to a downward extending portion i^4 of the bar, and at its opposite ends to a part of the main frame, (Fig. 3.)

Journaled in the frame adjacent to the bar i is a ratchet wheel h, upon a shaft h' carrying a pinion h^2. The bearings of the shaft h' are upon a bifurcated standard A^8 which between its forks affords a vertical guide for a block or spacing cam-frame D. The guide A^8 is formed with guide recesses g, and upon opposite sides of the cam frame D, near its rear vertical edge, are guide projections g' adapted to move in the guide recesses g. On the forward edge of the frame D is a rack D', which meshes with the pinion h^2 on the shaft h'. The rear edge of the frame D is made tapering to afford a cam D^2.

Whenever a key is pressed down, its stem r' bears upon a plate k and swings the latter down upon its pivots causing the toe k^{10}, on its projection k^8, to engage the spacing bar i and move the latter backward against the resistance of the spring i^3. On the part i^4 of the rod i is a dog i^5 (Fig. 3) held by a spring i^6 normally in engagement with the teeth of the ratchet wheel h. In the backward movement of the bar i under pressure from one of the keys, as described, the dog turns the ratchet wheel. The turning of the ratchet wheel turns the pinion h^2, and by the engagement of the latter with the rack D' moves the cam frame D in the vertical direction. The different parts of the spacer mechanism are so constructed, with relation to each other, that when the space key s is struck down the plate k below the said key will be stopped, by the set screws k^6 below it, when it has swung a predetermined distance. In swinging this distance the toe k^{10} moves the bar i, against the resistance of the spring i^3, just far enough to turn the ratchet wheel h a distance equal to one tooth of the ratchet, which in the present instance is one-twelfth of an inch. The difference in diameters between the wheel h and pinion h^2 causes the latter when the ratchet wheel is moved one-twelfth of an inch to raise the rack D', and consequently the frame D, one-twenty-fourth of an inch. The roller m on the bed plate o, which carries the matrix material, bears against the cam surface D^2 of the frame D, being held thereto by the weight o^{15} before described. The cam surface D^2 is so constructed with relation to the block that in the rise of the latter one-twenty-fourth of an inch the movable bed frame is permitted to move forward one-forty-eighth of an inch, that being one unit measurement. The roller m prevents the frame D from being retarded in its forward movement by the pressure against it of the bed frame, and reduces the tendency which the bed frame would otherwise have toward lifting the cam frame D. The set screws k^6 below the space plates against which the stems of the two unit keys strike, are sufficiently lower than those of the single unit spacer to permit the plate k to turn twice the distance, and move the bar i, ratchet wheel h, pinion h^3 and block D twice the distance, and permit the carriage to move a distance of two units. The set screws k^6 under the three, four, five, six and seven unit spacer plates are set proportionately lower, so that the bed frame will be moved three units under the action of a three unit key, and so on. It will thus be seen that as a key is struck the cam frame will be raised to permit the matrix bed frame to feed forward a distance equal to the number of units represented by the key. It is necessary, however, that the bed frame shall not move when released by the cam surface D^2 until after a character has been struck and an intaglio made in the matrix. To prevent this movement of the bed frame I provide stop mechanism, which engages the under side of the traveling bed frame when a key is moved in the downward direction and holds the same until the key is released.

The frame, or cam-faced stop, D, is pro-

gressively movable in the sense that after it has been raised, when a key is struck, it does not retract, but remains stationary until again advanced by the striking of a key. Thus it moves progressively one step at a time, the length of the step in each operation being governed by the number of units of space represented by the key struck, to stop the bed frame when the latter has been advanced by its feed a corresponding number of space units.

Secured to the platform A^5 is a bracket f having an upward and forward extending arm f' and a downward and forward extending arm f^2; and adjacent to the bracket f is a forward and slightly downward extending bracket e. The arm f^2, of the bracket f, and the bracket e are bifurcated at their free ends (Fig. 21) to afford the bearings e' e^2 f^3 f^4 for a rock shaft f^5. On the shaft f^5 between the bearings f^3 f^4 is an arm f^6, and extending through a guide f^7, at the top of the arm f', is a vertically reciprocating plunger f^8 provided with a friction head f^9. A link f^{10} is pivotally connected at opposite ends, respectively, to the lower end of the plunger f^8 and to the free end of the arm f^6. On the link f^{10} is a toe f^{11}, which, in the turning of the shaft as hereinafter described, limits the distance of the movement of the shaft, arm f^6, link f^{10} and plunger in one direction. On the shaft f^5 between the bearings e' and e^2 are an upward projecting lug e^3, having a laterally projecting pin e^4, and a downward projecting lug e^5. Extending downward from the bearing e^2 and forming a rigid portion of the bracket e is an arm e^6 having a forward projecting finger e^7 and laterally projecting finger e^8. Pivoted to the free end of the lug e^5 is a rod e^9 which works through a guide opening e^{10} in the end of the finger e^8, as indicated by dotted lines in Fig. 3. Around the rod e^9 and confined between the head of the rod, at the lug e^5, and the finger e^8 is a spring e^{11}. Pivoted at one end to the rear end of the rod i is a rod d provided at its free end with a curved hook or finger d', a socket d^2, an abrupt surface d^3 and a cam surface d^4. The rod d normally engages at its socket d^2 the pin e^4 on the lug e^3; and a spring d^5, connected at one end to the finger e^7 and at its opposite end to the rod d, tends to maintain the latter down in its normal position. When the bar i is moved backward, as before described, it moves the rod d, causing the abrupt surface d^3 on the latter to bear against the pin e^4 and turn the lug e^3 and the rock shaft f^5 in the backward direction. This movement of the shaft f^5 swings the lug e^5 downward, reciprocates the rod e^9 through the guide e^{10} and compresses the spring e^{11}. The turning of the shaft f^5 in the backward direction, therefore, is against the resistance of the spring e^{11}. The backward turning of the shaft f^5 also turns the lug f^6 in the backward direction, and causes the link f^{10} to raise the plunger f^8 until the toe f^{11} strikes the adjacent surface of the arm f' of the bracket f. The head of the plunger is directly below the under surface of the matrix bed plate and when raised, as described, engages and holds the latter.

The operation of the machine is as follows: The matrix material X is placed in the matrix bed p, the matrix having a smooth and preferably polished upper surface. The matrix bed p is placed upon the movable bed frame o and secured thereon by means of the thumb screws X', shown, or other suitable means. The cam block D is forced down or raised as may be required to bring the surface of the matrix material, at which the impressions are to start, below the opening y of the receiving lever. The key of the first letter or character to be impressed upon the matrix surface is struck, causing the type-holder of that character to be swung over to the receiving lever and strike the latter with its shoulder r^8 to make an initial impression, as before described. The striking of the shoulder against the receiving lever releases the depressing mechanism operated from the disk C', causing the type-holder to be engaged, depressed and released, all as before described. In the meantime, the respective spacing plate k will be turned by the stem r' of the key to move the bar i, ratchet wheel h and pinion h^2, as before described, to raise the cam block D the proper proportionate distance with relation to the number of units of the character impressed. In the same backward movement of the bar i the stop mechanism, described, is operated. When the single unit space key is struck the rod d swings the shaft and plunger upward without producing disengagement of the abrupt surface d^3 with the pin e^4. The backward movement of the rod, however, is double the distance when a two unit key is struck and treble the distance when a three unit key is struck, and so on. When the key of a letter of more than one unit is struck the rod d is forced backward and the shaft f^5 swung until the toe f^{11} strikes the under surface of the arm f, as before described. The shaft can turn no farther, and the socket portion d^2 of the rod disengages itself from the pin e^4, and the rod slides at its cam surface d^4 along the pin, a distance depending upon the distance to which the rod is moved under the action of the key, the extent of movement varying according to the number of units represented by the key. The engagement of the cam surface d^4 with the pin e^4 in the meantime prevents the shaft from returning to its initial position to release the plunger or stop from the base of the matrix bed until the key is released and the rod i moves in the forward direction. The striking of a space key operates the spacing mechanism, as described, and causes the bed frame to be moved a distance corresponding with the number of units represented by the space key.

In order that the operator may be aware

at all times of the number of units he may have left between the last character struck and the end of the line, I provide a dial or space-indicator E in a conspicuous place upon the machine, preferably above the case C. The dial E is marked around its edge with units, and upon a shaft c at the center of the dial is an indicator c' which registers with the unit marks and indicates the relative position of the character struck upon the lines. The shaft c is connected by speed reducing gearing with a drum c^2. On the shaft c is a clock spring c^3 which tends to maintain the indicator at the initial position upon the dial. A cord c^4 is attached at one end to the lower end of the cam frame D and extends thence under pulleys c^5 c^6 to the drum c^2 upon which it is wound by the action of the spring c^3. Movement of the cam frame D in the upward direction causes the cord c^4 to be drawn in the direction of unwinding from the drum to turn the latter and, through the intermediate gear and shaft c, to turn the indicator. The parts of the mechanism are so adjusted with relation to each other that the rise of the cam frame under the action of the single unit spacer will cause the indicator to move one unit upon the dial, the rise of the cam frame under the action of a two unit key, to move the indicator the distance of two units upon the dial, and so on. The operator being aware of the number of units in the line that he is printing, will be able to note, for the purpose of justification, by the position of the indicator upon the dial, the number of units which he may still count upon. When the first line is filled with characters and it is desired to start a new line, the dog i^5 is disengaged from the ratchet wheel h and the operator by placing his hand upon the top of the cam frame D presses the latter down, thus causing the matrix bed to be moved until it reaches its initial position, which will be shown by the indicator on the dial. Assuming, for example, that the line to be printed is upon a 12mo page having a width of twenty-six pica ems or two hundred and eight units, the initial starting point for every line will be at unit No. 208 on the dial. Before commencing a new line it is necessary that the carriage o^3 upon which the matrix and matrix bed frame are mounted shall be moved transversely of the machine to the left to bring a new surface for the line to be produced. If the lines are to be of the distance apart which in the art is known as "solid matter" (that is to say not leaded) the hand wheel on the worm shaft o^7, in the present machine, must be given two full turns. If it is desired to increase the space between lines the distance of what is known in the art as a "light lead," the hand wheel should be turned the further distance of a one-fourth revolution. A further turning of the handle will produce a correspondingly greater space between lines.

To adapt my machine for typewriting, a suitable plane plate with means for holding the paper to be written upon, may be substituted for the matrix holder, the paper being held down to present a surface corresponding with the surface of the matrix-material; and a typewriter ribbon may be mounted in the usual way to move across the field in which the type strike.

While the machine shown and described is the one I prefer to employ, it is subject to modification, in the matter of details of construction, without departing from the spirit of my invention as defined by the claims.

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

1. In a machine of the character described, the combination, with the type carrying type-bars, of a traveling bed frame for the material to be impressed, feed mechanism tending normally to advance the said bed-frame across the field in which the type strike, a movable stop for the said bed-frame, a key-board containing a key for each type, spacing stop actuating mechanism operated by the said keys to move the said stop in the direction away from the bed-frame a distance according to the number of space units represented by the key struck, and bed-frame engaging mechanism, operated by the said keys to hold the bed-frame against movement under the pressure of its feed while a key is depressed and to disengage the said bed-frame when the key is released, whereby its feed may act substantially as and for the purpose set forth.

2. In a machine of the character described, the combination with the type-actuating key board and traveling bed for the material to be impressed, of a feed for advancing the said bed, a progressively movable cam-faced stop with which the said bed is caused by its feed normally to engage, and differentially operating spacer mechanism between the said stop and key-board serving when a key is depressed to move the said stop to retract its cam-face and cause the bed to be advanced by its feed, substantially as and for the purpose set forth.

3. In a machine of the character described, the combination, with the type carrying type-bars, key board containing a key for each type, movable bed-frame for the material to be impressed, and feed mechanism operating normally to advance the said bed-frame across the field in which the type strike, of a movable stop having a cam surface D^2 which the said bed-frame is caused by its feed normally to engage, and spacer mechanism communicating with the said stop and actuated when a key is depressed to move the said stop, whereby the bed-frame is moved along the said cam-surface, substantially as and for the purpose set forth.

4. In a machine of the character described, the combination, with the type-carrying type-bars, key-board containing a key for each type, movable bed-frame for the material to be im-

pressed, and feed-mechanism operating normally to advance the said bed-frame across the field in which the type strike, of a movable frame D having a cam-surface D^2 which the said bed-frame is caused by its feed normally to engage, a rack on the frame D, gear mechanism engaging the said rack and actuated, when a key is depressed, to raise the frame D to permit the bed-frame to be advanced by its feed-mechanism, substantially as and for the purpose set forth.

5. In a machine of the character described, the combination, with the type-carrying type-bars, bed-frame for the material to be impressed, and bed-frame feed-mechanism, of a movable stop having a cam surface D^2 which the said bed frame is caused by its feed normally to engage, operating-gear mechanism for the said stop, a key-board containing keys for the type, and having the keys of type of the same equivalence in units grouped together, and a movable spacing plate for each group communicating with the said gear-mechanism, and actuated, by the depression of a key of its group, to move the said stop a predetermined distance, whereby, when a key is struck, the said stop is moved to permit the said bed-frame to be advanced upon the said cam-surface a distance according to the number of units represented by the key, substantially as and for the purpose set forth.

6. In a machine of the character described, the combination, with the type carrying type-bars, key-board, movable bed-frame for the material to be impressed, and bed-frame feed-mechanism, of a movable cam, affording a stop for the said bed-frame, spacing mechanism, between the key board and cam, operating when a key is struck to advance the said cam to permit the said bed-frame to be advanced by its feed mechanism, and means for disengaging the cam from the spacer mechanism, whereby it may be returned to its initial position, substantially as and for the purpose set forth.

7. In a machine of the character described, the combination, with the movable spacing cam-frame, and key board, in which keys of type of the same equivalence in units are grouped together, of operating mechanism for the cam-frame, comprising a rocking spacing-plate, below each group of keys, to be rocked by movement of any of the keys of its group, differential stop mechanisms for the said plates, a longitudinally reciprocating bar, advanced and returned with the rocking movement of said plates, and gear-mechanism, between the said bar and cam-frame, operated by said bar to move said frame, substantially as and for the purpose set forth.

8. In a machine of the character described, the combination, with the type-actuating key-board and traveling bed for the material to be impressed, of a feed for advancing said bed, a progressively movable cam-faced stop, a roller upon the bed normally engaging said cam-faced stop, and differentially operating spacer mechanism between the said stop and key-board serving when a key is depressed to move the said stop to retract its cam-face from the roller and cause the bed to be advanced by its feed, substantially as and for the purpose set forth.

9. In a machine of the character described, the combination, with the bed-frame for the material to be impressed, of means for feeding the said frame in one direction, and means for advancing the said frame in a direction at right-angles to the first said direction, comprising a rod mounted in guides on the machine, means for advancing the rod, and a wheel upon the rod normally engaging the said bed-frame, substantially as and for the purpose set forth.

10. The combination with the type and type-bars, of holders, for the type, made in sections, one of which is axially adjustable with reference to the other, and means on the holder for securing the sections together, in adjusted position, substantially as described.

11. In a machine of the character described, the combination, with the swinging type-bars, type holders thereon, means for operating the type-bars to strike with the type in a certain fixed field, movable bed-frame for the material to be impressed, and means for feeding the said bed-frame intermittingly across the said field, of means for governing the depth of impressions made by the type in said material, comprising a depressing lever normally out of the path of the type holders operating mechanism for the depressing lever, a yielding stop, in the path of the type holders, operating when struck thereby to actuate the depressing lever operating mechanism to move the depressing lever and cause the latter to advance, engage, depress and then release the type-holders, substantially as described.

12. In a matrix making machine, the combination with the movable type-bars, type-holders thereon, operating keys for the type-bars, and matrix material, of means for causing the type, when a key is actuated, to strike repeatedly and to successively increasing depths into the matrix material, whereby each intaglio is formed by repeated impacts of the type, substantially as and for the purpose set forth.

13. In a matrix making machine, the combination, with the swinging type-bars, type-holders thereon, means for operating the type-bars to strike with the type in a certain fixed field, movable bed-frame for the matrix material, and means for feeding the said bed-frame intermittingly across the said field, of stop-mechanism against which the type-holders strike operating to check the advance of the type-holders, when the type has entered the matrix a distance less than that necessary to form the completed intaglio, and type-holder depressing mechanism, actuated under the impact of the type-holders against said

stop-mechanism, to engage, depress and then release the type-holder, to complete the intaglio, substantially as and for the purpose set forth.

14. In a machine of the character described, the combination of the disk C′ and rotating means therefor, stops n n' thereon, swinging arm n^2, having the stop engaging cam n^3 and abrupt shoulder n^4, spring actuated depressing lever n^7, plunger n^{14} having the stop engaging cam n^{17} resilient receiving lever q, and rod n^{18} connecting the plunger and lever q, constructed and arranged to operate substantially as and for the purpose set forth.

15. In a machine of the character described, the combination, with the movable bed-frame carrying the material to be impressed, spacing bar i, and means for actuating the same, of bed-frame engaging mechanism, comprising, in combination, the rod d connected with the bar i and having the shoulder d^3 and cam d^4, shaft f^5, eccentric stop e^4 on the shaft engaged by the rod d, bed-engaging plunger f^8 operated by movement of the shaft, and springs tending to maintain the rod d and shaft f^5 in their normal positions, all constructed and arranged to operate substantially as and for the purpose set forth.

16. In a machine of the character described, the combination with the key board, bed frame for the material to be impressed and its feed mechanism, and movable spacing cam, of mechanism for moving the said cam, comprising a ratch, mechanism between the key-board and ratch, operating to move the said ratch a distance according to the number of units represented by the key struck, and gear mechanism engaging the said cam and actuated by movement of said ratch to move the cam a distance governed by the distance of movement of the ratch, substantially as and for the purpose set forth.

MARCUS LANE.

In presence of—
M. J. FROST,
W. N. WILLIAMS.