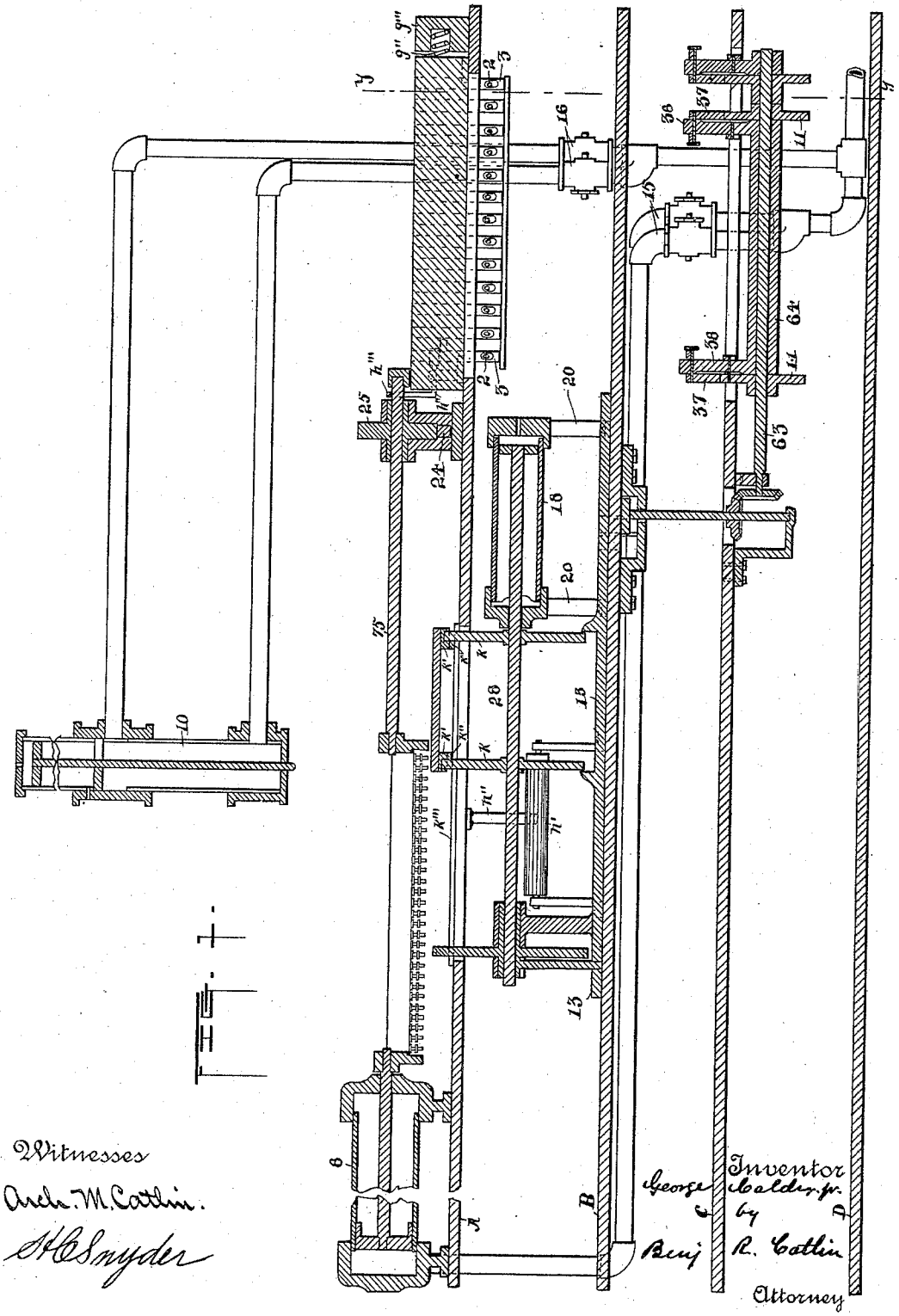
(No Model.)

4 Sheets—Sheet 1.

G. CALDER, Jr.

MATRIX MAKING MACHINE.

No. 474,809. Patented May 17, 1892.



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(No Model.) 4 Sheets—Sheet 2.

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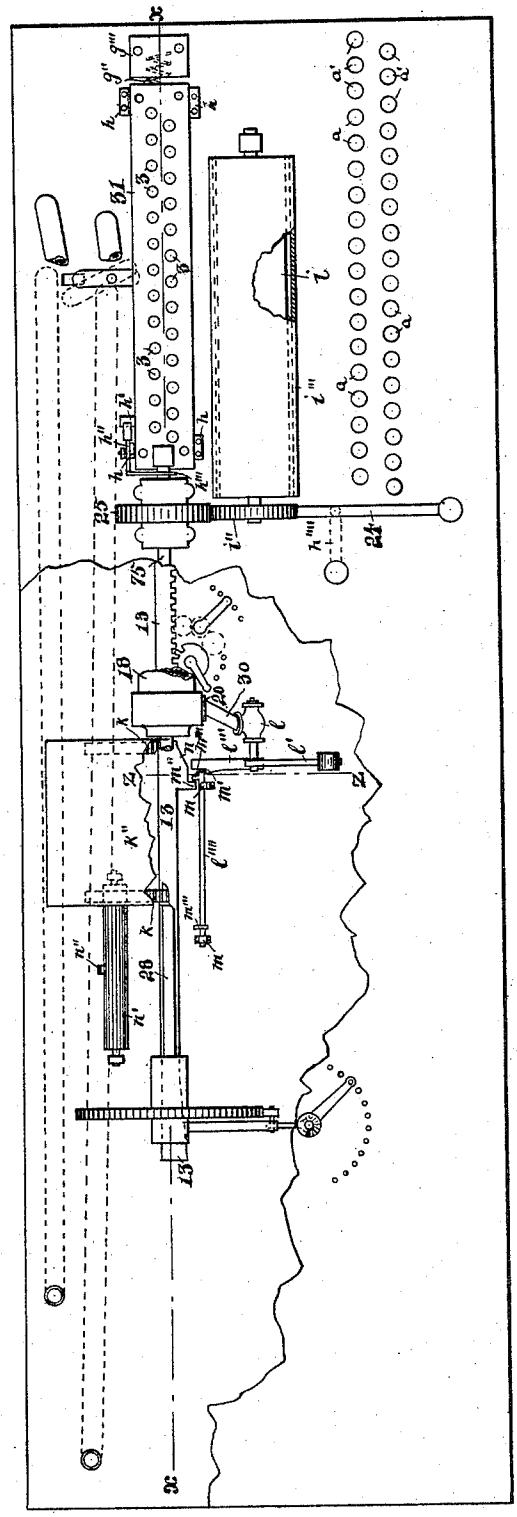

Fig. 2.

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(No Model.) 4 Sheets—Sheet 3.

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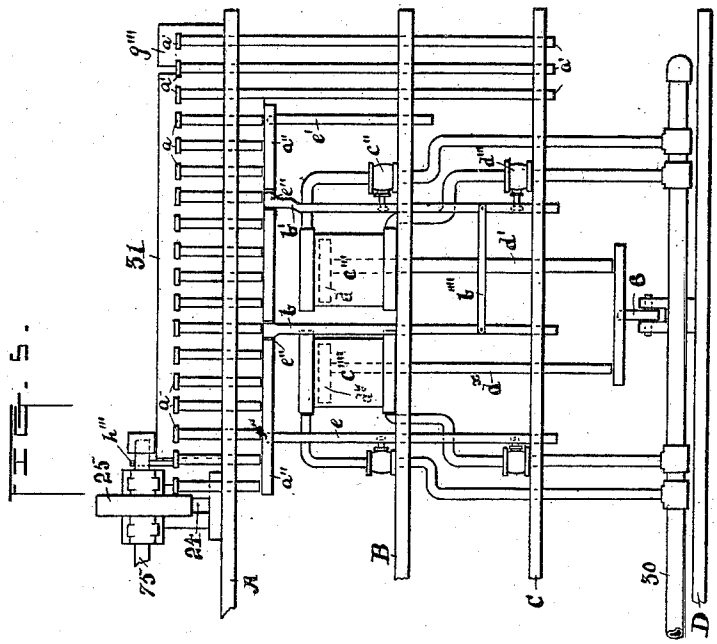

FIG. 5.

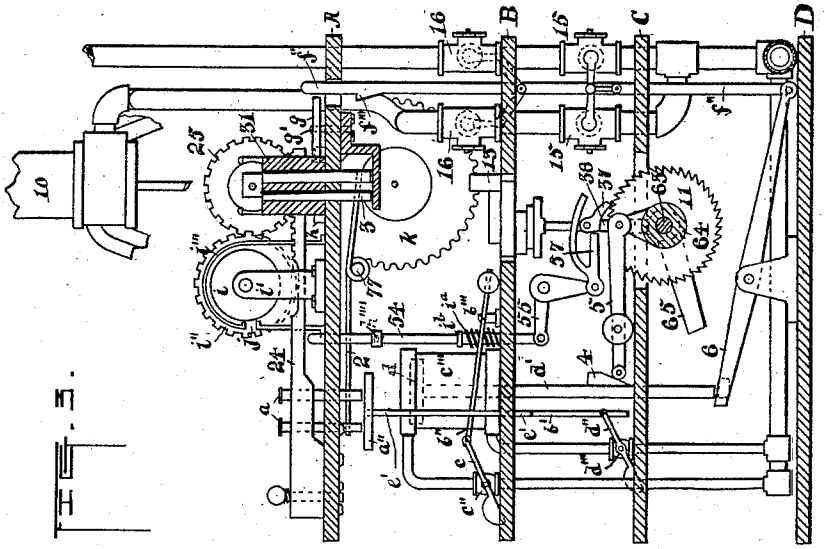

FIG. 3.

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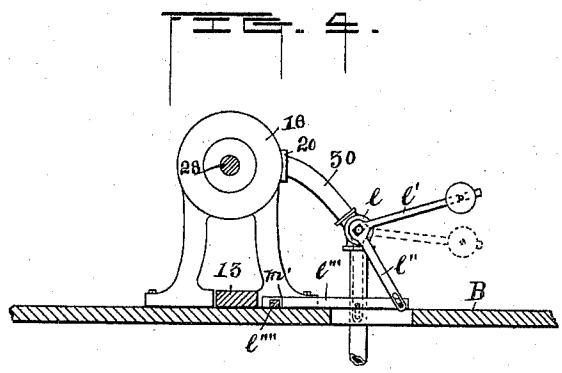

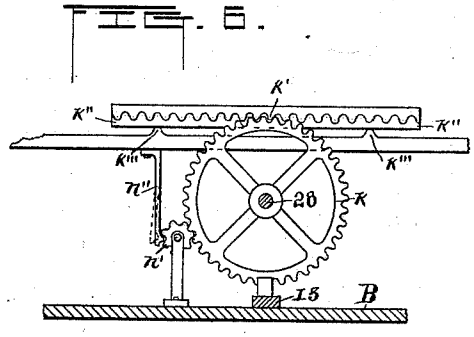

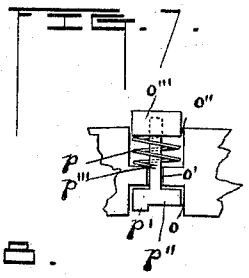

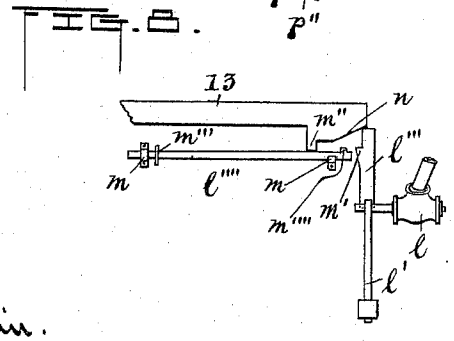

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UNITED STATES PATENT OFFICE.

GEORGE CALDER, JR., OF LANCASTER, PENNSYLVANIA.

MATRIX-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 474,809, dated May 17, 1892.

Application filed March 4, 1891. Serial No. 383,699. (No model.)

To all whom it may concern:

Be it known that I, GEORGE CALDER, Jr., a resident of Lancaster, in the county of Lancaster and State of Pennsylvania, have invented certain new and useful Improvements in Matrix-Making Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

The invention relates to matrix-machines; and the improvements are applicable to a machine for which Patent No. 445,040 was granted to me January 20, 1891; and it more particularly relates, among other things, to devices for actuating valve-operating mechanism, for steadying the type-holder during the action of the hammer for indicating its position, for moving the matrix-supporting cylinder, for regulating the extent of its steps in the direction of the length of the line, and for insuring accurate alignment of impressions thereon; and the invention consists in the constructions hereinafter described and pointed out.

In the accompanying drawings, Figure 1 is a vertical section on line $x\,x$ of Fig. 2. Fig. 2 is a partial plan. Fig. 3 is a vertical section on line $y\,y$ of Fig. 1. Fig. 4 is a section on line $z\,z$ of Fig. 1, showing cock-operating device. Fig. 5 is a partial elevation, the valve-operating levers and other parts being omitted. Fig. 6 is an end elevation of the matrix-bed and devices for controlling its movements. Fig. 7 is an end elevation of type-holder. Fig. 8 is an elevation in an alternative position of a detail also shown in Fig. 2.

Referring to the aforesaid patent for a more detailed description of parts not directly involved in the present improvements, I will first describe means for actuating the cocks 15 and 16, that control the admission and exhaustion of the fluid which is used to operate the hammer and the type-holder.

$a\,a'$ indicate keys and key-bars. a includes those keys designed to operate the hammer and move the type-holder, and a' those that simply move the matrix-bed without impressing it.

2 indicates one of a series of springs suitably supported at 77 and having one end engaged with a stop 3 and the other with a key-bar. The depression of the power-arm of the spring-lever 2 by a key-bar puts the spring under tension, which provides for the ascent of the arm and key when the latter is released by the operator slightly in advance of the fall of the pin 3, which in the meantime is held up by the pressure of bar 75, to be described. Below these keys is a movable table a'', to the under side of which are fixed two rods e and e'. Rods b and b' are adapted to pass freely through said table and are operated directly by appropriate keys. They also pass freely through tables B and C, and are rigidly connected by a bar b'''', and are supported by the connection of rod b' with a lever b'', which is weighted, as shown, and has a fulcrum at b''', suitably supported by a post or floor B.

c denotes a weighted lever pivotally connected to lever b'' and rigidly fixed to the plug of a cock c'' in a pipe, which is adapted when the cock is open to supply air or other fluid under pressure to a cylinder c'''.

d indicates a piston, and d' its rod, which is arranged to be forced by said fluid-pressure down upon a lever 6, that by suitable connections operates the cocks 15 and 16, which admit air and exhaust the same from the hammer-cylinder 10 and the type-holder-operating cylinder 8.

d'' indicates a weighted lever fixed to the plug of a cock d''', which admits compressed air under the piston d to lift it from the lever 6.

All the cocks used in the machine are waste-cocks and discharge from the cylinders the air which has been used therein. The depression of rod b' by means of a key opens the inlet-port of cock c'' and the exhaust-port of d'''. When the key and rod are relieved from pressure, the weighted lever c returns them to their initial position and closes the inlet in said cock c'' and opens an exhaust-port in the same, and the lever d'' simultaneously closes the exhaust and opens the inlet in cock d''', whereby the piston d is suitably moved to operate lever 6. The rod e', fixed to the table a'', is simply a guide; but rod e, also fixed to said table, is connected to cocks by means of weighted levers in manner like that already described in connection with the rods b, and said cocks control the operation of a similar cylinder c'''', piston d^{y}, and pis-

ton-rod x, the latter having a cam corresponding in size to letters of less width than those named. These rods also actuate lever 6. The piston-rod d' and the two key-bars b and b' correspond to the wide letters m and w, the rod d' being provided with a wider cam 4 than the rod d, which cams determine the length of movement of the matrix-bed, as described in the aforesaid patent. The object of this mechanism is to relieve the operator from the labor of actuating the lever 6 and lifting its load, this work being done by fluid-pressure. The lever 6 is connected and arranged to lift the bar f'', which by its connections operates the cocks 15 and 16, which control the admission of air to the type-holder and the hammer-actuating cylinders, respectively.

31 denotes a box or holder for stops 3, said box being movable lengthwise between the posts h.

In order to move the type-holder first and give time to lock this stop-box, against which it is in operation held by air-pressure, the cocks 15 are so connected to the bar f'' that they will be first opened and the type-holder moved, and before the said cocks 16 are opened said bar f'' is also provided with a lug f''', which when the cocks 15 are opened engages a latch g, which is pivoted to table A at g' and has one end loosely engaged in a slot in the side of the stop-box 31. This latch is moved out of the way of the stop or lug f''' to permit the bar f'' to ascend higher under the influence of the above-described piston-rods acting upon lever 6 to open the cocks 16.

g'' denotes a spring arranged in a fixed bumper g''', placed in the path of the box 31, which carries the stops 3. This box is made movable, so that a single spring can be applied thereto with the effect of modifying the blow of the type-holder bar 75 against each stop supported in the said box, which latter is guided by the posts h, secured to the table A. Whenever a stop is struck by bar 75, the box is moved against spring g'', and the evil effects of a jarring concussion are avoided.

h' is a stud fixed on the side of the box, and h'' a latch pivoted to a post h. It has an arm h''' supported in the path of the head of bar 75 in such manner that the retreat of the bar when the type-holder is returned to its normal position engages said arm and disengages the latch from the stud, as indicated in dotted lines in Fig. 1. The spring g'' softens the concussion of the type-holder and stop-box, being compressed by the impact of the bar 75 against a stop. The movement of the box against the spring permits the weighted latch h'' to drop behind the stud h', and the latch prevents the recoil of the box and consequently avoids the effect of the recoil upon the holder. The spring g'', compressed by the operation just described, reacts to move the stop-box when latch h'' is released. The latch g, one end of which enters a slot in the stop-box, is turned on its pivot (see Fig. 2) by said movement of the box, and thereby is moved out of the way of lug f''', and this permits bar f'' to ascend high enough to open cock 16 to operate the hammer. When a key-bar is released and lever 6 is thereby relieved from the pressure of rod d' or d, the bar f'' drops to its normal position. The latch g is again moved into the path of the lug f''' whenever the stop-box is moved by bar 75. The object of thus temporarily arresting the ascent of the bar f'' is to delay the operation of the hammer until the danger of recoil is obviated by locking the stop-box, as described.

The piston and piston-rods above described are provided with cams 4 of sizes corresponding to the thickness of different type. Each of these cams whenever the piston descends engages a slide 5, suitably provided with friction-rollers, which slide operates the ratchet-wheel 11 through intermediate devices, which ratchet by the medium of gears and other connections moves the rack 13 and matrix-bed a suitable distance for each letter, which distance is regulated by the cam 4, as described in my patent aforesaid. The initial distance of said cams from the operating-slides 5 is regulated by a bar 54, which controls the bell-crank lever 55, by which the location of stop 57 is determined. Said stop is in the path of an arm 38, which is constantly forced against said stop by a weighted arm 65. These arms are rigidly connected and loosely mounted on the shaft 63 by means of a hub 64. The arm 38 determines the position of the pawl 37, which is pivoted to it, and also the position of the slide 5, which is pivotally connected to arm 38, fixed on said hub 64. The bar 24 is arranged on the upper table in the path of bar 54 and has recesses under its bottom. By adjusting said bar 24 the height of bar 54 can be varied with the effect to vary the initial distance of the slide 5 from the cam 4, whereby the extent of the movement of the slide and of the connected mechanism and of the matrix-bed is determined.

h'''' is a key fixed to bar 54.

i^a is a spring bearing on floor B and against a cross-bar i^b. By depressing the key h''' the spring will be compressed and bar 54 lowered and the slide 5 moved away from the cam 4, whereby when the latter is forced down its effect upon the said slide and consequently upon the movements of the matrix-bed will be lessened, said cam having under the case described a greater distance from the slide than ordinarily, and therefore being adapted to engage said slide during only a part of its vertical movement.

i denotes a cylinder located above floor A at the side of the stop-box 31 and supported to revolve between posts i' and adapted to indicate the position of the type-holder with reference to the hammer.

25 is a gear splined to the type shaft or bar 75, the rotary movement of said shaft and holder to bring any particular line of type into use being produced by the rack 24.

i'' is a gear that meshes with gear 25. It

is fast on the axis of cylinder i, whereby said cylinder is moved circumferentially at the same time as the type-holder.

i''' is a guard or cover provided with a slot j, which is so arranged with reference to lines of characters on the cylinder i that the line visible through the slot indicates that a corresponding line is under the hammer.

k k indicate two gear-wheels on the shaft 28, suitably supported from the floor B. Said gear-wheels project up through an opening in floor A and engage racks k' k' on the under side of a matrix-bed. This bed has flanges k'' k'' projecting a little below said racks and bearing on the faces of the wheels. The bed rests upon ribs or tracks k''' k''', fixed on floor A parallel to the top of the wheels. The shaft 28, gears k, and matrix-bed k'' are moved forward by a rack 13, operated by the keys a a' through the medium of ratchet-wheel 11 and intermediate devices. The gears are fast on shaft 28, which has a spline connection with its bearings and slides in them as pushed forward by rack 13.

18 indicates a cylinder, and 20 a supply and exhaust port.

30 is a branch of a system of pipes containing air or other fluid under pressure.

l is a cock having a waste fast open to the outside air during the forward movement of the piston in cylinder 18 and its rod 28, which moves the gear and bed. Said cock l is moved to admit air-pressure to the cylinder for the purpose of returning its piston and the matrix-bed after the completion of a line of impressions by the following mechanism: The cock l has weighted lever l', which is held normally raised by the arm l'', the latter being normally held by a bar l''', sliding on table B. This bar l''' has a lug m' in the path of a bar l'''', supported to slide in bracket-guides m. Said bar l'''' engages the said lug m' until tripped by a lug m'' on rack 13, taking against a stop m''' on said bar l''', with the effect to move the bar l'''' out of the path of lug m', whereupon the cock is turned by the weighted lever to admit to the cylinder air under pressure, by which its piston and shaft 28 and the matrix-bed are returned to their initial position and the lever l' restored to its normal position. The cock l is closed and its waste-port opened by the action of the cam n of the rack 13 near the close of its return movement, which movement is effected by the opening of said cock l, as above described. The bar l'''' is moved into engagement with the lug m' by lug m'' striking stop m'''' on said bar. The open position of the waste-cock l corresponds to the position of parts shown in full lines in Fig. 4, which corresponds to the position of connected parts shown in Fig. 2. Fig. 8 and the dotted lines in Fig. 4 correspond to the position of cock l when its inlet-port is open to admit air to the cylinder to return the piston and matrix and preparatory to forming a new line of impressions.

n' is a cylindrical gear journaled in posts supported on floor B, meshing with the gear k and normally held by a spring-stop n''. The gear n' is thus prevented from moving circumferentially except when the force of the spring is overcome by the intentional turning of the gears k, preparatory to beginning the impression of a new line on the matrix. The matrix is suitably wound for this purpose by gears k through the medium of racks k', fast on the bottom of the matrix-bed. The object of the cylindrical gear is to maintain the alignment of the impressions.

The type holder or carriage is composed of three concentric portions, (shown in the present instance as integral,) the inner one having a round opening o, the central one a smaller similar opening o', and the outer one an angular opening o''. The type has three corresponding parts similarly shaped in cross-section. The portion o''' is an angular nut screw-threaded to fit on the stem p''' of the type, and p is a spring. The type-face p' of the smaller sizes is placed at one side of the angular part of the type or type-head p'', whereby the capacity of the head is increased, since the whole head can be utilized for providing thereon larger type-faces without alteration of the vertical page-line on the matrix at which the letters begin their work.

Having thus described my invention, what I desire to secure by Letters Patent is—

1. The combination of a key-bar, a pipe for compressed air, having a waste-cock, a rod adapted to be moved by a key-bar and connected to the cock and adapted to turn it, the weighted lever connected to the said cock and adapted to turn and close the same, a cylinder adapted to be put in communication with the pipe by turning said cock, a piston in said cylinder, a piston-rod, and a lever for operating other cocks to move the type-holder and a hammer, substantially as set forth.

2. In combination, a cylinder, the key-rods, the movable table located in their path, the bars secured to the table and adapted to operate the cock that controls admission of compressed air to the cylinder, the pistons and piston-rods provided each with a cam, and mechanism actuated by said cams to move the matrix-bed, and an independent cylinder-key rod, cock-operating bar, and piston-rod provided with a cam of larger size to actuate said mechanism, substantially as set forth.

3. The combination of a key-bar, a spring-lever, a type-holder, mechanism between said bar and holder to move the latter, and a stop arranged in the path of the holder, whereby the spring-lever is enabled to return the key and permit the reversal of said mechanism for an instant while the holder is against the stop, substantially as set forth.

4. The combination of cocks 15 and 16 in pipes adapted to supply air to move the hammer and piston, a rod connected with said cocks to open and close them, a lug on said rod, and the stop-box provided with a latch normally in the path of said lug and adapted to

be moved out of the path of said lug by the movement of the box, whereby the type-holder may be moved to the end of its path before the rod moves the cock to operate the hammer, said cock being connected to be opened after the other cock, substantially as set forth.

5. The combination of the type-holder, the stop-box, and hammer, and mechanism for suitably moving these parts, the bumper and spring to arrest the box, a lug on the box, and a latch provided with a part located in the path of the type-holder shaft, said latch being adapted to engage the lug and lock the box at the end of its movement and when in contact with said bumper and to be disengaged by the return movement of the type-holder shaft, substantially as set forth.

6. In combination with the matrix-bed, the ratchet 11, and intermediate devices whereby the movement of the ratchet moves the bed, the regulating-bar 54, provided with a returning-spring, and the key h'''', whereby the extent of the movement of the ratchet 11 and the bed may be changed at will, substantially as set forth.

7. The combination of the slotted floor provided with ribs, gears extending through the slot in the floor, and the matrix-bed provided with racks engaging said gears and with flanges embracing the sides of the gears, and mechanism for moving the gears, substantially as set forth.

8. The combination of the rack 13 for moving the matrix-bed-supporting gears with a cylinder having a piston adapted to return said gears, a cock adapted to supply air to move the cylinder-piston, a weighted lever held under a stop and in position to keep the cock closed to the air-supply, and a trip operated by the rack to withdraw the stop and open the valve, substantially as set forth.

9. The combination of the rack 13 for moving the matrix-bed-supporting gears with a cylinder having a piston adapted to return said gears, a cock adapted to supply air to move the cylinder-piston, a weighted lever held under a stop and in position to keep the cock closed to the air-supply, a trip operated by the rack to withdraw the stop and open the valve, and a cam-face on the rack adapted to move the lever below the stop upon the reverse movement of the rack, substantially as set forth.

10. In combination with the matrix-bed and its supporting gear-wheels, the gear-cylinder meshing with said wheels, the spring-pawl to hinder circumferential movement of the cylinder, and mechanism for moving the gear-wheels endwise of the cylinder, substantially as set forth.

11. The combination of the type-holder, the indicated cylinder i for turning said holder on its axis, and intermediate gearing to turn said cylinder with the holder, substantially as set forth.

12. The type-holder having an angular opening o'', in combination with the type and the nut having an angular form fitted to said opening and screwed upon the stem of said type, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

GEORGE CALDER, JR.

Witnesses:
JOHN W. APPEL,
W. U. APPEL.