(No Model.)

3 Sheets—Sheet 1.

G. CALDER, Jr.

MATRIX MAKING MACHINE.

No. 444,125. Patented Jan. 6, 1891.

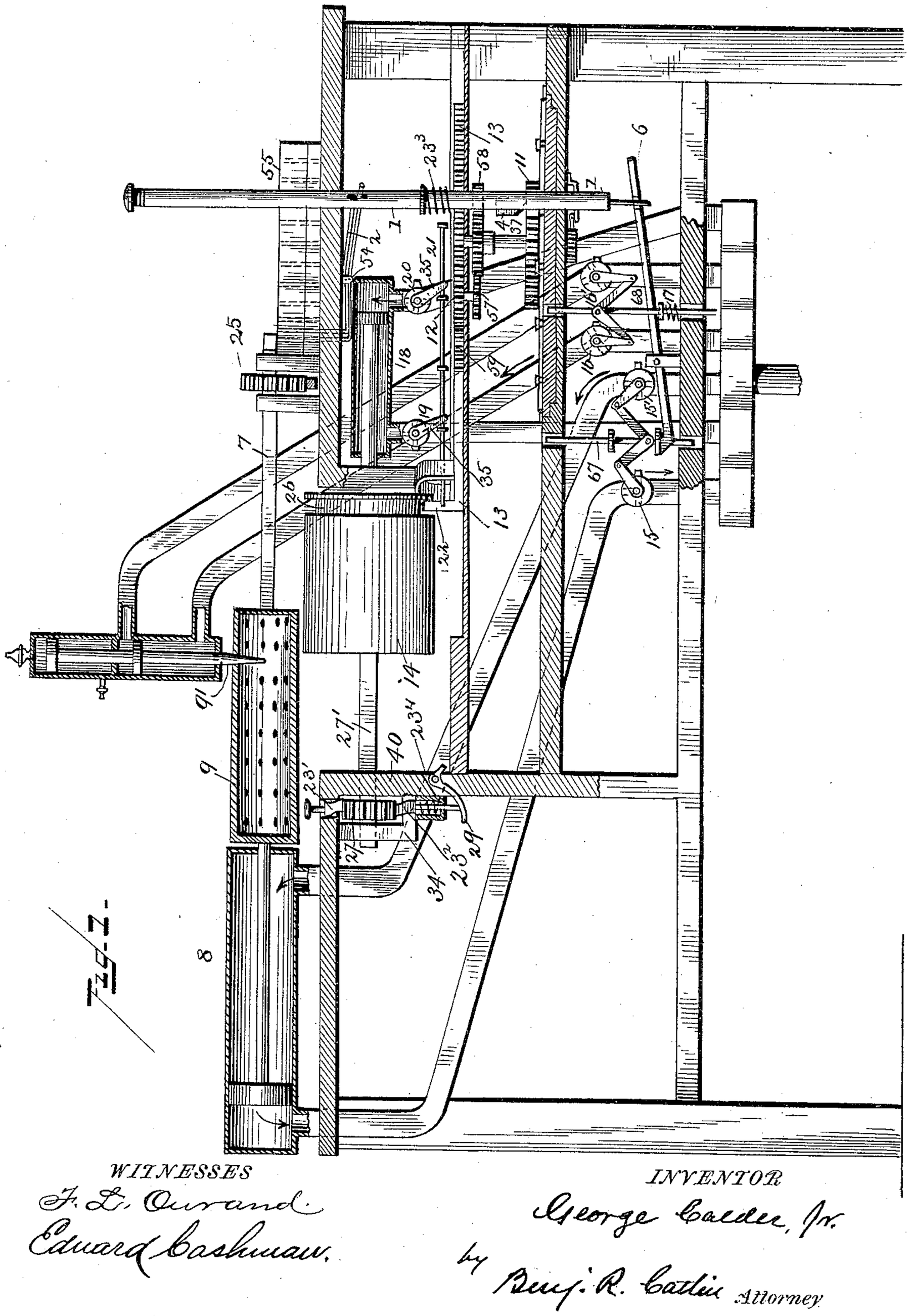

Fig. 2.

WITNESSES

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(No Model.)

3 Sheets—Sheet 2.

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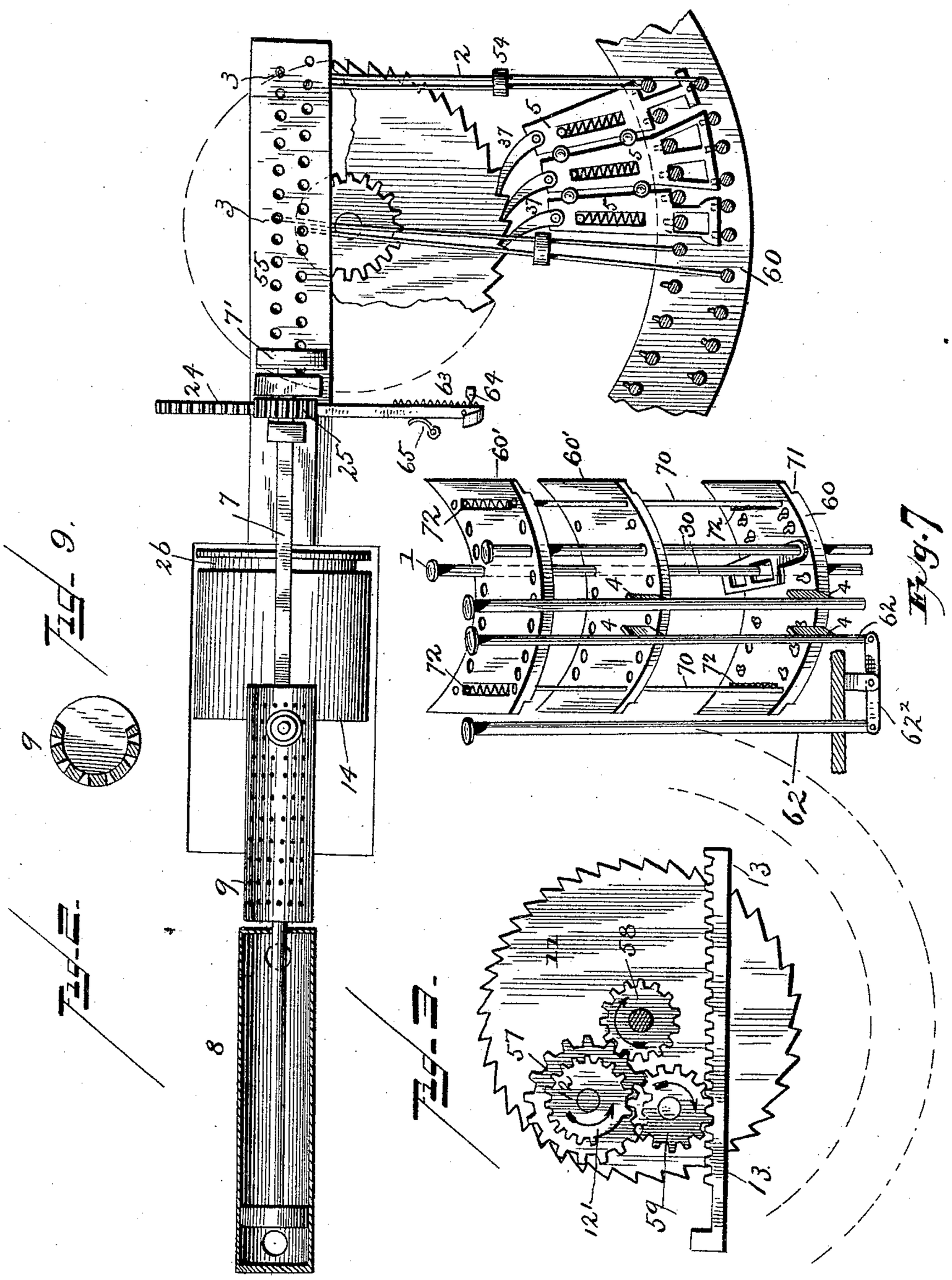

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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(No Model.) 3 Sheets—Sheet 3.

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Fig. 5.

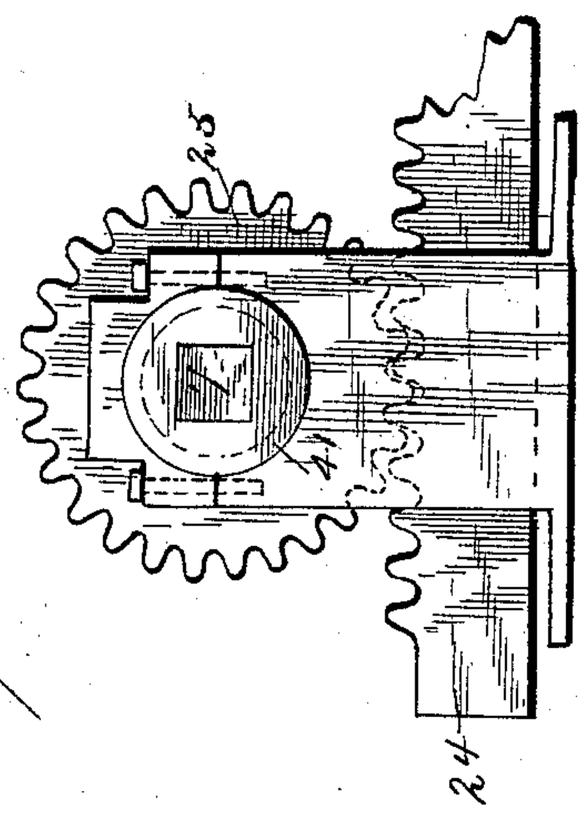


Fig. 6.

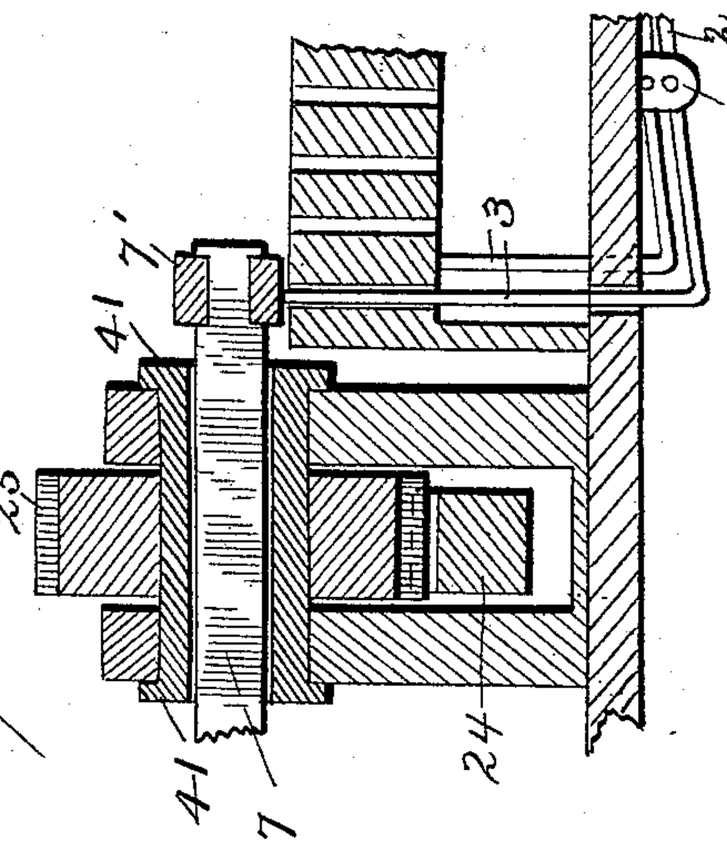


Fig. 4.

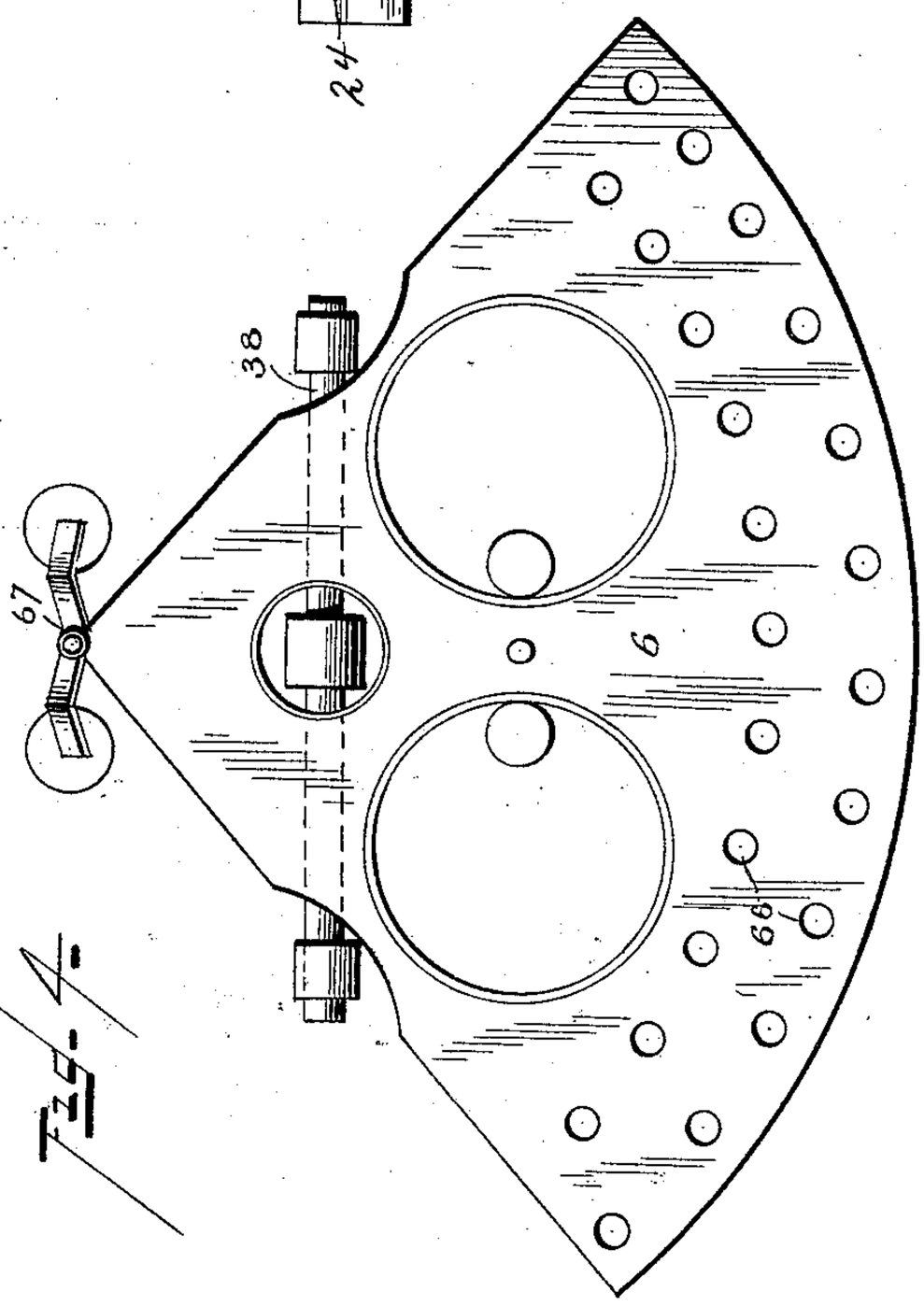
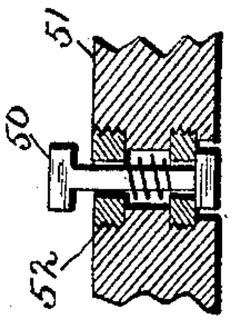


Fig. 8.



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UNITED STATES PATENT OFFICE.

GEORGE CALDER, JR., OF LANCASTER, PENNSYLVANIA, ASSIGNOR TO MARY H. CALDER, OF SAME PLACE.

MATRIX-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 444,125, dated January 6, 1891.

Application filed January 31, 1890. Serial No. 338,744. (No model.)

To all whom it may concern:

Be it known that I, GEORGE CALDER, Jr., a citizen of the United States, residing at 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 appertains to make and use the same.

The object of the invention is to provide a machine for impressing matrices that shall be simple in structure and easy and efficient in operation; and it consists in the matter hereinafter described and pointed out.

In the accompanying drawings, Figure 1 represents a vertical section of the machine; Fig. 2, a plan partly in section. Fig. 3 is a plan of a ratchet-wheel and rack-bar and intermediate gear-wheels. Fig. 4 is a plan of a lever for moving cocks. Figs. 5 and 6 are respectively an end elevation and longitudinal section of a gear-wheel with its journal and longitudinally-movable shaft. Fig. 7 is a perspective of a modified device for moving a type-holder. Fig. 8 is an enlarged view of a type and of a section of a type-holder, and Fig. 9 is a transverse section of the holder.

In this machine the type-carrier and the hammer for impressing the type upon the matrix are moved preferably by compressed air, and the cocks for effecting the operations are suitably opened and closed by a series of operating-rods 1, provided with suitable knobs extending above the top of the machine or above its key-board or operating-table, a cylinder, piston, and piston-rod having thereon a type-carrier and devices for moving the piston and carrier by compressed fluid, and also the combination therewith of a piston-hammer operated by similar means and not claimed herein, being the subject of claims in my application, Serial No. 335,100, filed December 27, 1889.

The type-carrier 9 is by preference a longitudinal section of a cylinder made fast to a piston-rod, which is provided with a piston within cylinder 8. Compressed air is alternately admitted to each side of the piston and discharged or wasted from the other by means of cocks 15 and 15′, and the type-carrier 9 is thereby moved to and fro under the hammer 9′. The type-carrier is provided with any convenient number of series of type supported in transverse openings therein in manner indicated in Fig. 8.

50 denotes the end of the type that receives the impact of the hammer, and 51 a section of the carrier, and 52 a spring which normally supports the type in the position illustrated, said spring in the present instance being secured to the type-body in a space between bushings inserted in the body of the carrier. Type of a particular size or character are or may be arranged in each series of openings.

Each distinct series of type should be provided with its own series of stops. One series of stops may, however, be used with separate series of type if the latter be of the same dimensions and arranged in the same order, though the style of the type varies. Thus series of Roman and Italic characters might be operated with a single series of stops. If the type-carrier is made semi-cylindrical, or nearly so, the outward rows of type should not be placed so close to the edge of the carrier that when turned to an operative position the opposite edge of the carrier will be placed in the path of the hammer.

The lengthwise movement of carrier 9 from cylinder 8 and under the hammer is determined in each case by a stop 3 appropriate to a particular type and arranged to be raised in the path of a head or cross-bar on the free end of shaft 7, which is affixed to the said type-carrier. The particular stop is selected by operating a corresponding rod 1, which moves a particular one of a series of levers 2, each fulcrumed, as at 54, and lifts its free end or stop 3 through an opening in table 55 and into the path of the head 7′ of the shaft 7. This head has a loose or pivoted connection with the shaft and is not revolved by it. The power-arm of each lever passes through a slot in its corresponding rod 1 and is depressed to raise the stop on the other end by depressing the rod. The lever 2 is made of steel or other elastic material, which permits its end engaging the rod to bend after the upward movement of the opposite end is arrested. This puts the arm 2 under tension,

and it thereby lifts or aids in lifting the rod when subsequently released by the operator.

The hammer 9′ is operated by means of the piston with which it is connected, and which is raised or lowered by compressed air admitted below or above the piston by means of suitable pipes and the air-cocks 16 and 16′, so arranged that when compressed air is admitted to either side of the piston through one of the cocks it is wasted from the other side through the other cock.

The matrix is secured upon a cylinder 14, fixed on a shaft 27′, made angular in a part of its length and movable endwise in its bearings, said bearings at one end being made to constitute journals for the ratchet-wheel 27, these journals having bearings in posts 40 and bracket 34, the construction being similar to that shown in Figs. 5 and 6, hereinafter to be described, and which will permit the matrix-cylinder and its shaft 27′ to be moved lengthwise. The shaft passes freely through wheel 27, but is connected with it, as stated, so as to be turned when said wheel is turned by pawl 23^2, actuated by lever 29. This lever is pivoted in an opening 23^4, formed in the wall 40, and has one arm arranged in the path of cylinder 14 and the other loosely connected with the stem of pawl 23^2, which is surrounded by a retracting-spring. The lever 29 may be actuated by hand to turn the ratchet-wheel 27 and the matrix when it is desired to omit one or more lines.

The matrix-cylinder is moved lengthwise by air-pressure alternately applied to opposite sides of the piston in cylinder 18 by means of suitable pipes and the cocks 19 and 20. The movement of the cylinder is limited and controlled in one direction by the rack 13, which has an arm 22 engaging a groove 26 in the periphery of the cylinder. This rack is moved at will through desired distances by mechanism elsewhere set forth, and it retains the matrix-cylinder in suitable lengthwise position, the cylinder being positively moved by fluid-pressure to a distance determined by the arm 22 of the rack.

When air is being admitted to the right of the piston, as indicated in Fig. 1, it tends to move the cylinder to the left; but the extent of the movement and the time of its occurrence is governed by the rack 13, which is itself moved by means of the ratchet-wheel 11 and intermediate gears 57, 12, and 59 and pinion 58, the latter being fixed upon said ratchet-wheel. This wheel 11 is moved by one or more pawls 37, pivoted to a sliding plate 5, supported on a sliding plate or section 60, resting on a floor constituting part of the frame of the machine. The plate 5 is moved by a cam-like projection 4 formed on the several operating-rods. These projections 4 are made of different widths for the purpose of varying the extent of the movement of the plate and pawls and of the ratchet-wheel 11 and the rack 13, and consequently of the matrix, to correspond with the thickness of the various type corresponding to the different rods having such suitable projections. By the means just described the matrix can be moved by repeated use of one or more operating-rods the whole length of a line to be impressed thereon and moved step by step, according to the thickness of the type represented by the particular rods that are manipulated.

As it is contemplated to use type of larger size in some of the lengthwise series in the carrier 9, a device for correspondingly increasing the distance moved by the ratchet-wheel 11 and the rack 13 and the matrix has been illustrated in Fig. 2, in which 60 indicates a movable or sliding plate or table supporting and carrying one or more plates 5, which, however, are free to move independently of said plate 60. This plate may be rigidly connected by rods 70 with similar plates 60′ 60′, as indicated in Fig. 7, each supported upon a floor of the frame and having a sliding connection therewith. The upper plates 60′ are not essential, however, as the various rods may pass through suitable openings in the floors themselves. The plate 60 has a bearing, as at 71, in the floor and is moved by one or more rods 62, passing up through floors and provided with cams similar to those on rods 1 and made of a size to correspond to the increased size of the type to be used. Thus, if plate 5 and its series of operating-rods are adapted normally to a particular font of type and it is desired to substitute type having greater thickness, then plate 60 and all the rods 1 connected therewith are moved by a rod 62 a fractional part of the whole distance, and plate 5 is then independently moved by its type-rod. The movement of plate 60 carries its type-rods a space nearer to plate 5, and also moves ratchet-wheel 11 and the matrix a portion of the desired distance, according to the greater size of the series, and the remainder of the distance is completed by the individual action in the case of each letter of its rod 1 acting independently on the plate 5.

72 are springs compressed by the action of rods 62 and their cams 4 and serve to return the plate when the rods are released by the operator and carried up by their springs. This action is repeated for every letter or character of the supposed larger series. A rod 62′, attached to the opposite end of the pivoted lever 62^2, affords a means of raising rod 62 to its initial position.

It should be understood that rods 62 have no connection with the valve-operating mechanism nor with the stop mechanism, and, further, that similar rods 30, having no connection with either the cocks or the stop mechanism, are provided for moving a plate 5 and the ratchet-wheel 11 and the matrix when blanks or spaces are desired in the line on the matrix.

The matrix-cylinder having been moved lengthwise by the above-described means un-

til the end of a line is reached, it is carried a little beyond by depressing a rod 30 until the matrix-cylinder strikes a lever 29, which compresses the spring 23′ and moves the pawl-and-ratchet wheel 27, thereby turning the cylinder the distance of one line, which distance can be determined or varied by changing said ratchet-wheel.

The matrix-cylinder is returned lengthwise to a suitable position to begin the impressing of a new line by the suitable reversal of the cocks 19 and 20 to admit compressed air at the left of the piston in cylinder 18, the rack 13 being at this time released by the revolution of the mutilated gear 12, bringing the part 12 of said gear adjacent to the rack, whereupon the piston in cylinder 18 and the connected matrix-cylinder and rack 13 are returned to near the position shown in Fig. 1, the cocks 19 and 20 being then reversed by projections on rod 21 engaging and moving arms 35, suitably attached to said cocks. The rod is connected to and moves with rack 13. The cocks are reversed at the proper time at the opposite end of the piston stroke by means of suitable projections on rod 21 coming in contact with levers 35, which effects the desired reversal and admits compressed air to force the cylinder and rack back to the position shown in Fig. 1, at which time wheel 12 is brought into gear with 59, and the rack is thereby subjected to the control of ratchet 11.

In Figs. 2, 5, and 6 are illustrated devices for turning the type-carrier to bring any desired series of type in line with the hammer.

25 is a gear-wheel provided with journals 41, suitably supported to revolve in bearings, as indicated. The type-carrier shaft 7 has an angular connection with these journals, as indicated, whereby it can move lengthwise independently of the wheel, but is turned by its revolution.

24 is a rack-bar geared with wheel 25 and operated in the present instance by hand.

65 is a spring to keep a lateral rack 63 in engagement with a finger 64, which indicates the extent of the movement of the rack, and consequently of the type-carrier. The number of teeth in rack 63 adapted to be engaged by the stop should be equal to the number of rows of type and must be arranged a suitable distance apart to hold the type series in alignment with the hammer.

Lever 6 for operating cocks to suitably move the type-carrier and hammer is shown in plan in Fig. 4, in which view the three large circles simply indicate portions cut away to render the lever lighter. It is fulcrumed on the rod 38. The points of contact of a part of two series of depressing-rods 1 are indicated at 66. A weighted rod pivotally connected with bars which have a similar connection with arms rigidly connected with the cock is indicated at 67. A similar rod 68 is connected with like bars and arms for operating cocks 16 and 16′ to move the hammer. These valves are normally in the position shown in Fig. 1, and they are reversed by the descent of rod 1, which depresses the power end of the lever 6, compressing spring 17, depressing the pivoted bars, and moving apart the arms attached to the cocks. The same movement of a rod 1 brings projection 4 in contact with a sliding plate 5 to move ratchet 11 and the matrix-cylinder.

The various mechanisms actuated by rods 1 are so arranged that the movement of the parts are properly timed, the stop 3 is raised, the type-carrier 9 moved, the matrix moved, and the hammer operated in the order recited, but nearly simultaneously. The reverse movement of the parts, excepting the matrix-cylinder, occurs as soon as the operator releases a rod, which is then immediately raised by springs 23^3 and spring-lever 2, the stop 3 being lowered by the ascent of the rod, the cocks 16 and 16′ being reversed by spring 17 and cocks 15 and 15′ by weighted bar 67.

It is obvious that the matrix-cylinder could be positively moved by the rack 13. It will be also understood that one or more levers 6 may be employed, though one is sufficient in ordinary cases. Further, it will be understood that the number of type or type series in the carrier and the number of stops and of operating-rods may be varied and other mechanical changes made without changing the principles of the operation, and, further, a revoluble semi-cylindrical type-carrier connected to a piston operated by devices utilizing fluid-pressure is the subject of claim in my application, Serial No. 336,736, filed January 13, 1890, and in said application I have also claimed a cylinder and piston-hammer and means for operating it by a compressed fluid, including conduits having two-way cocks operated by the type-operating rods or keys and intermediate devices, said cocks being moved to permit the compressed fluid to enter the cylinder on one side of the piston and exhaust from the other alternately, said intermediate mechanism including a sliding pawl-plate, the several parts being so connected that the type rod or key operates the type-carrier, hammer, and matrix-cylinder, and such devices are not claimed herein.

I am aware that a type-roller has been journaled in arms so supported on a shaft parallel to the roller that they could be rotated on said shaft and also slid lengthwise thereon, whereby by means of intermediate parts, including a rack and pinion fixed on the type-roller axis, said roller could be rotated and also moved longitudinally. In such construction it was necessary to produce a compound motion of the bearings of the type-roller and also of the operating-key. It was necessary both to depress the key vertically to a given point and also to move it sidewise, and also the key-lever, the roller-bearings, and the said rack and pinion, there being no means

whereby the axis of the roller could be moved longitutinally in its bearings or independently of its rotating pinion. According to my improvement the movement of each key or operating-rod is simple and uniformly in one path, and it sets in operation distinct mechanism for rotating the type-carrier and for moving said carrier lengthwise.

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

1. The type-carrier containing several series of type and its rod or shaft, in combination with a rack and gear for moving the carrier circumferentially to bring different series under a type-hammer, said rod being keyed to the gear-wheel and movable endwise through it, substantially as set forth.

2. A type-carrier provided with a series of type and having attached to its end a rod or shaft, a gear-wheel or ratchet, said rod passing freely through the wheel endwise, but keyed or otherwise connected to revolve with it, a device for turning the wheel, and mechanism for moving the type-carrier and rod endwise, substantially as set forth.

3. A type-carrier provided with series of type and having attached to its end a rod or shaft, a gear-wheel, said rod passing freely through the wheel endwise, but keyed or otherwise connected to revolve with it, a device for turning the wheel, and mechanism for moving the type-carrier and rod endwise, including a cylinder, air-inlet, piston, and piston-rod, the latter being connected to the type-carrier, substantially as set forth.

4. The combination of the grooved matrix-cylinder, said cylinder being longitudinally movable on its supporting-shaft, devices to revolve the cylinder for line-spacing, the rack-bar having a part engaging said groove, and mechanism for moving the bar, substantially as set forth.

5. The combination of the grooved matrix-cylinder, said cylinder being longitudinally movable with its supporting-shaft, the rack-bar having a part engaging said groove, and mechanism for moving the bar, an air-cylinder, and a piston on the matrix-cylinder shaft adapted to move said shaft and cylinder, substantially as set forth.

6. The combination of the grooved cylinder, said cylinder being longitudinally movable with its supporting-shaft, the rack-bar having a part engaging said groove, and mechanism for moving the bar, an air-cylinder, and a piston on the matrix-cylinder shaft adapted to move said shaft and cylinder, and a rod carried by the rack-bar to operate the air-cocks of the piston-cylinder, substantially as set forth.

7. The combination of the matrix-cylinder fixed on a shaft with the pivoted lever, spring-pawl, and ratchet-wheel, said shaft being keyed to the wheel, but movable endwise through it, and mechanism for moving the cylinder and shaft endwise, whereby the shaft is moved through the wheel and the cylinder against the lever, which actuates the pawl to turn the ratchet-wheel and cylinder, substantially as set forth.

8. The combination of the matrix-cylinder having its shaft extended into an air-cylinder and provided with a piston, devices for admitting compressed air to either side of said piston, a rack engaging said matrix-cylinder, and a gear-wheel for moving said rack and matrix-cylinder in one direction, said gear-wheel being mutilated to release the rack and permit it and the matrix-cylinder to be freely returned to their initial position, substantially as set forth.

9. The combination of the ratchet-wheel and intermediate gearing for moving the rack which engages the matrix-cylinder, with the sliding plate and pawl for moving said wheel, bar, and cylinder, and with a second or main plate which is made independently movable, whereby the ratchet-wheel and other connected parts can be first moved by the main plate and then moved by the plate first mentioned, substantially as set forth.

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

GEORGE CALDER, JR.

Witnesses:
WM. N. APPEL,
JOHN W. APPEL.