No. 765,965. PATENTED JULY 26, 1904.

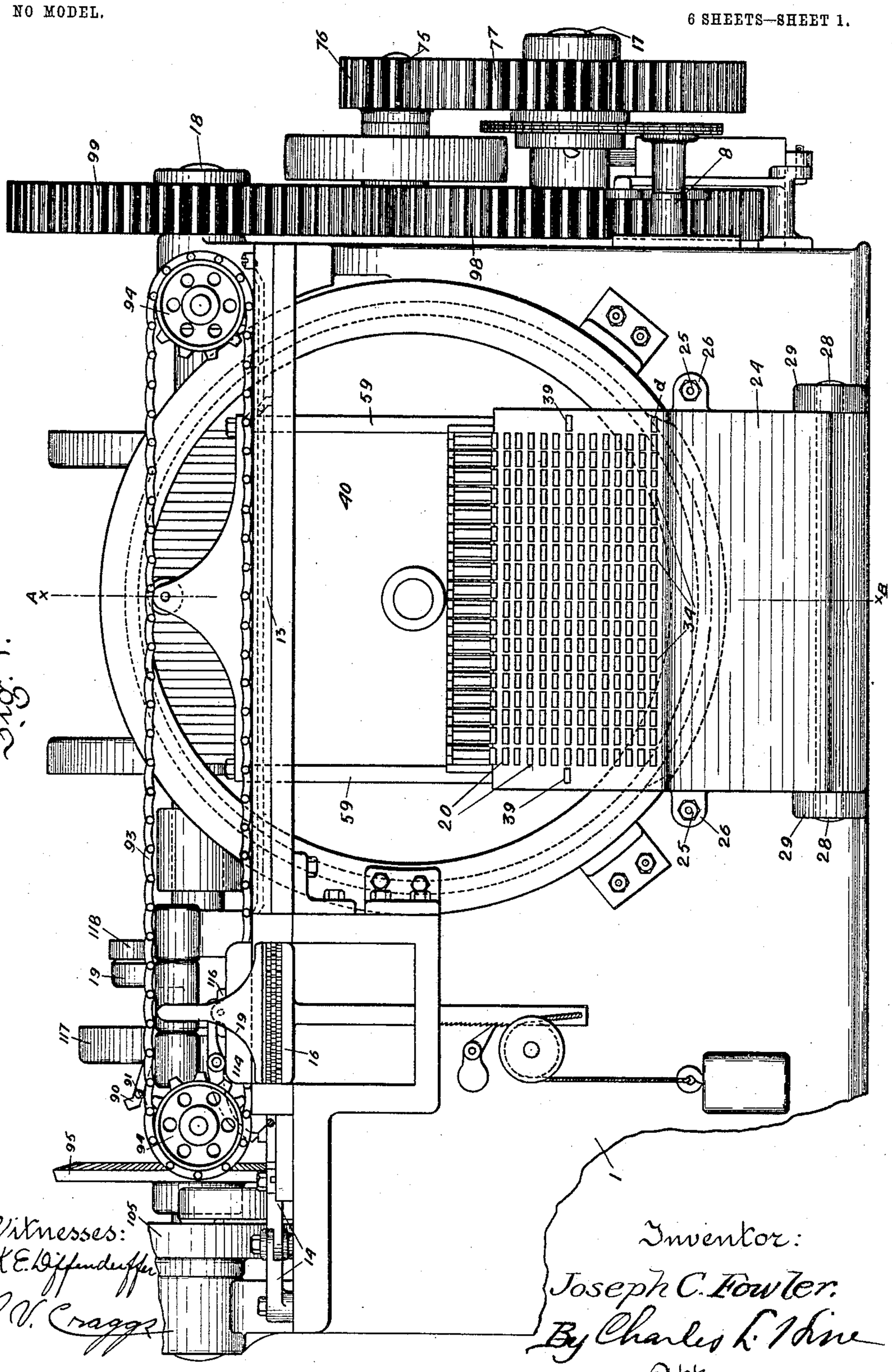
J. C. FOWLER.

TYPE CASTING AND SETTING MACHINE.

APPLICATION FILED FEB. 11, 1904.

NO MODEL. 6 SHEETS—SHEET 1.

Fig. 1.



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R. V. Craggs

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NO MODEL. 6 SHEETS—SHEET 2.

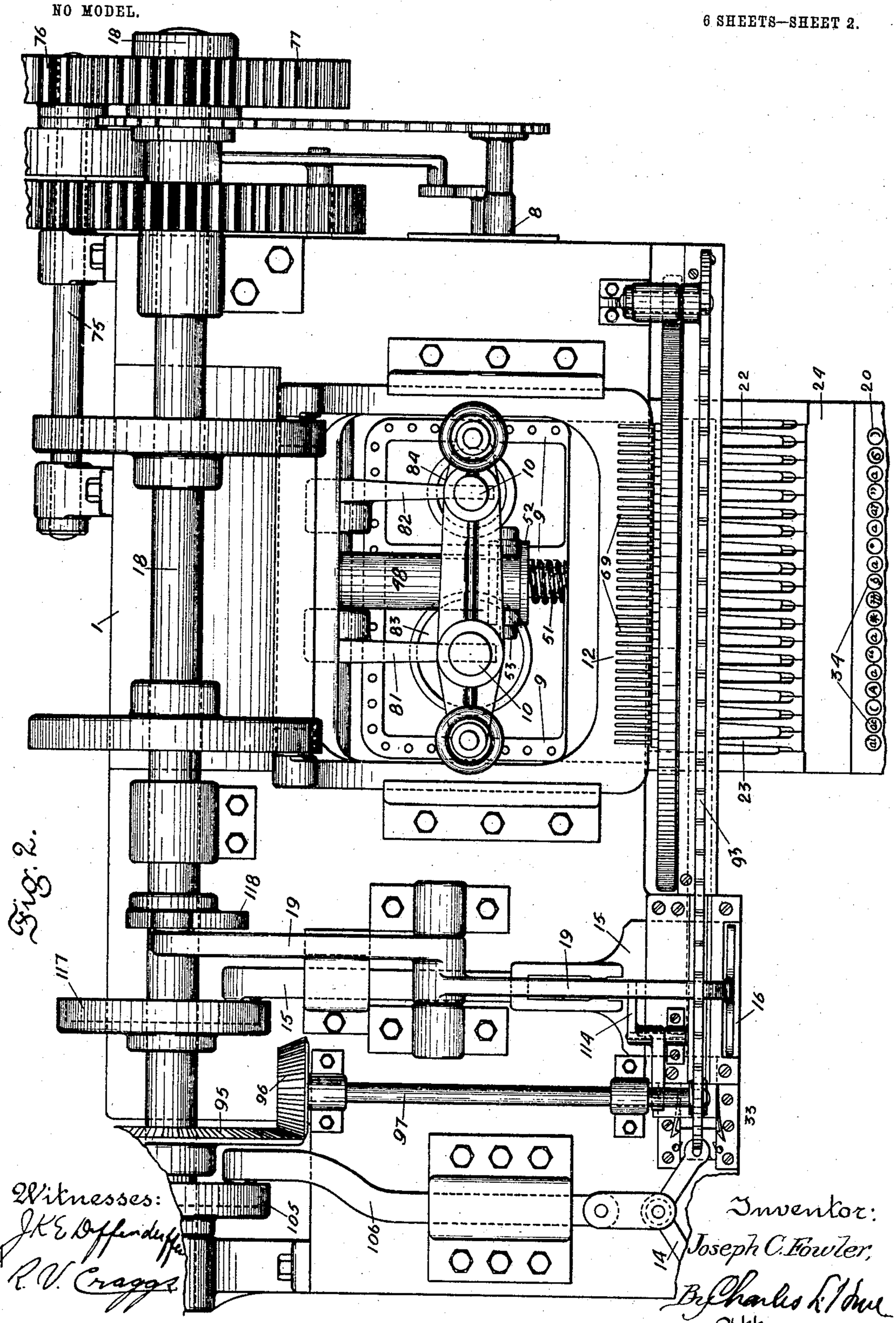

Fig. 2.

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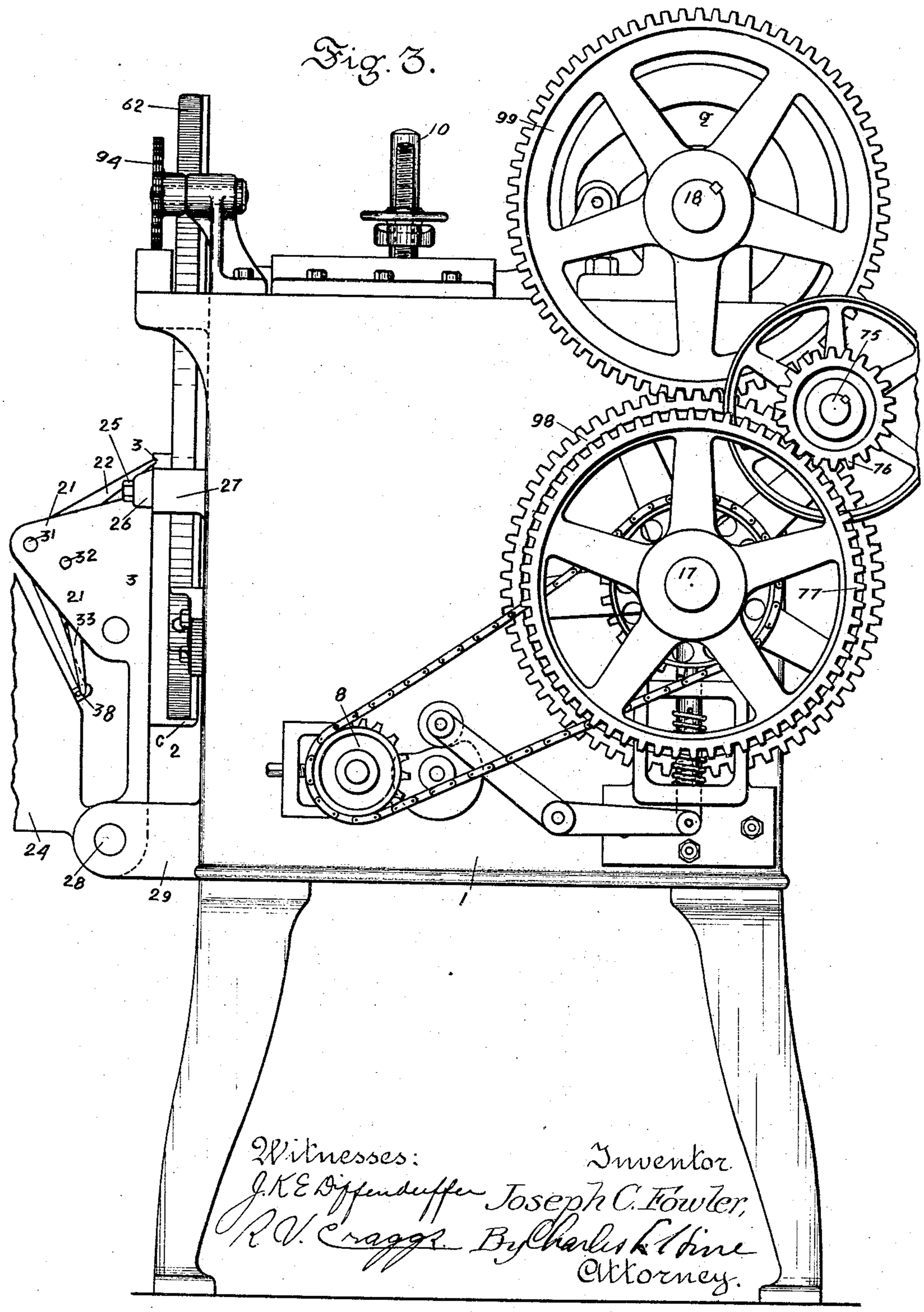
NO MODEL.

6 SHEETS—SHEET 3.

Fig. 3.



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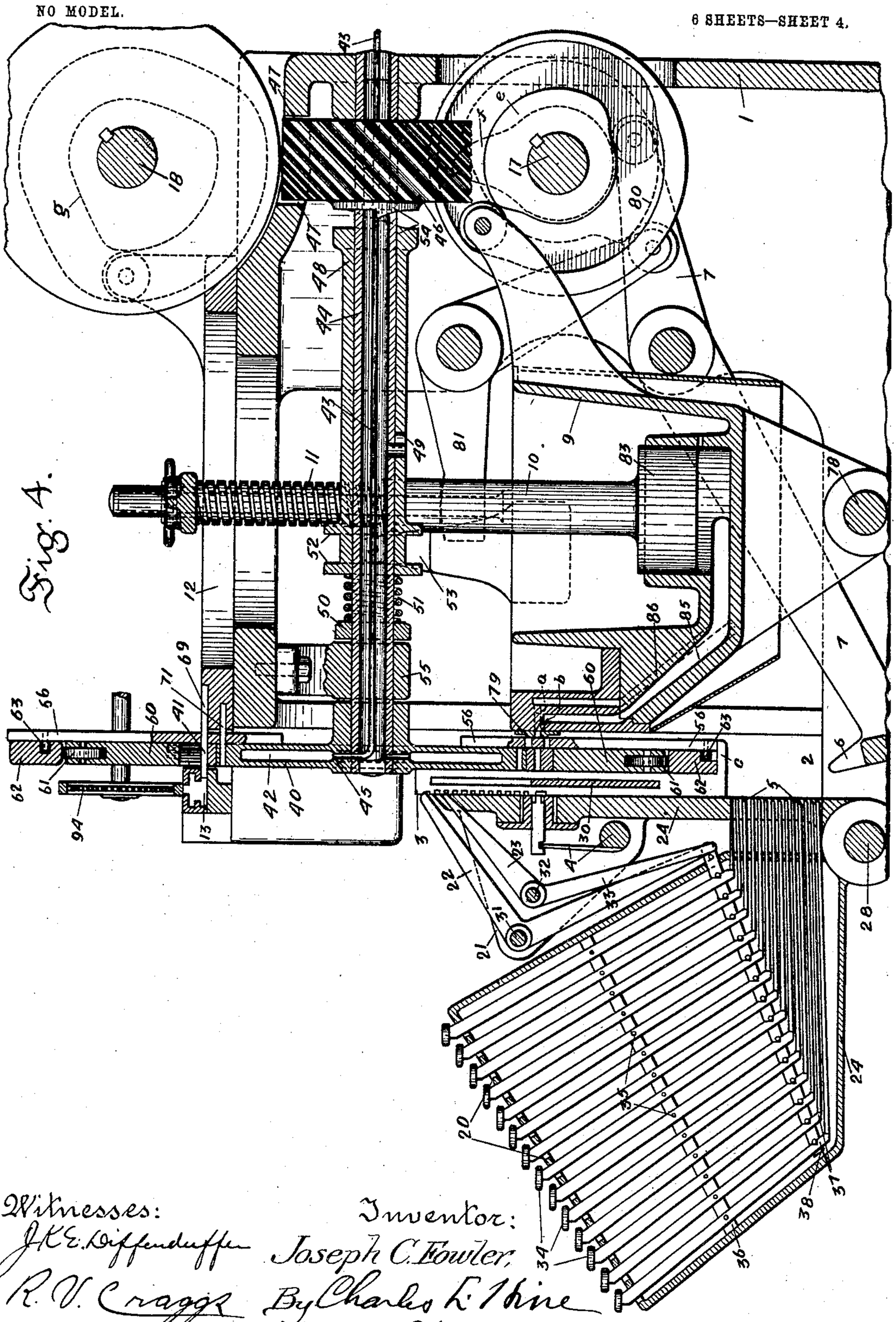
NO MODEL. 6 SHEETS—SHEET 4.

Fig. 4.



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NO MODEL. 6 SHEETS—SHEET 5.

Fig. 5.

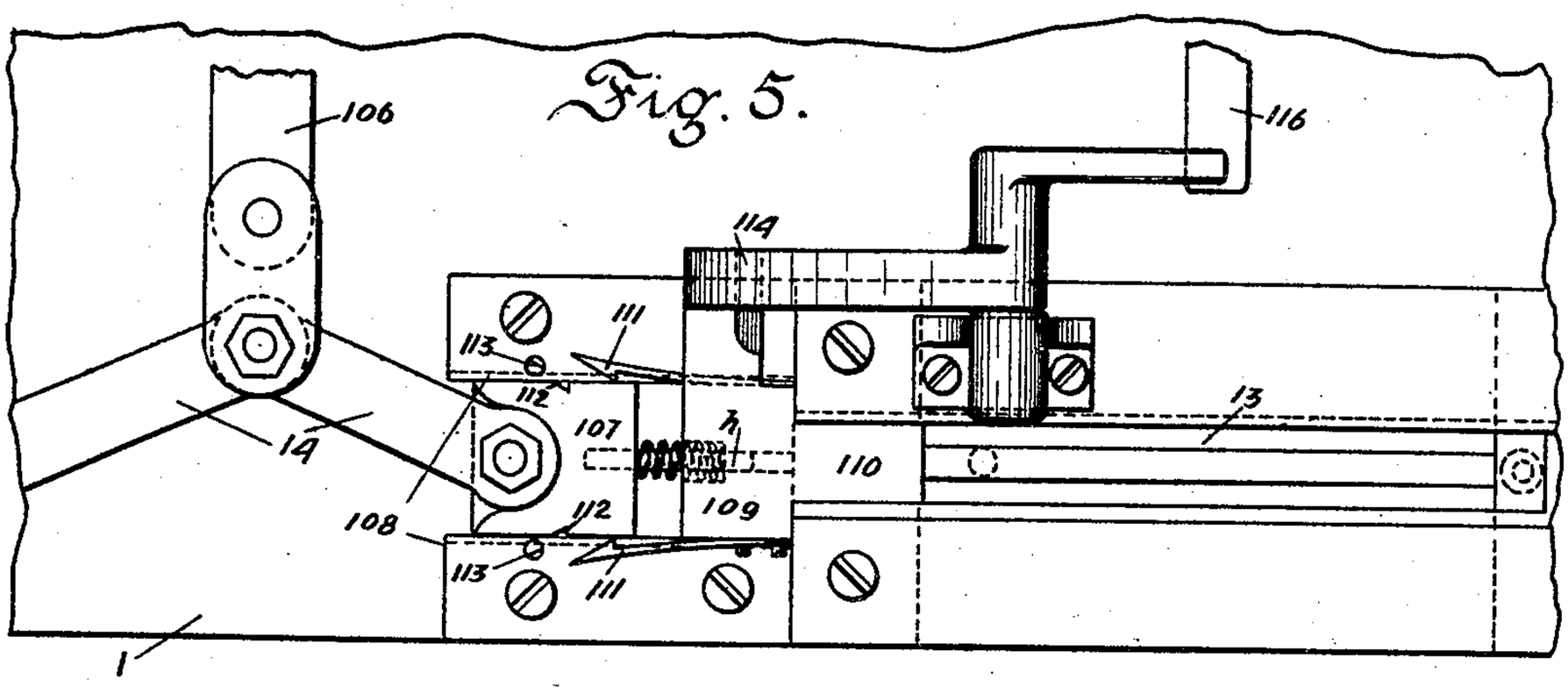


Fig. 6.

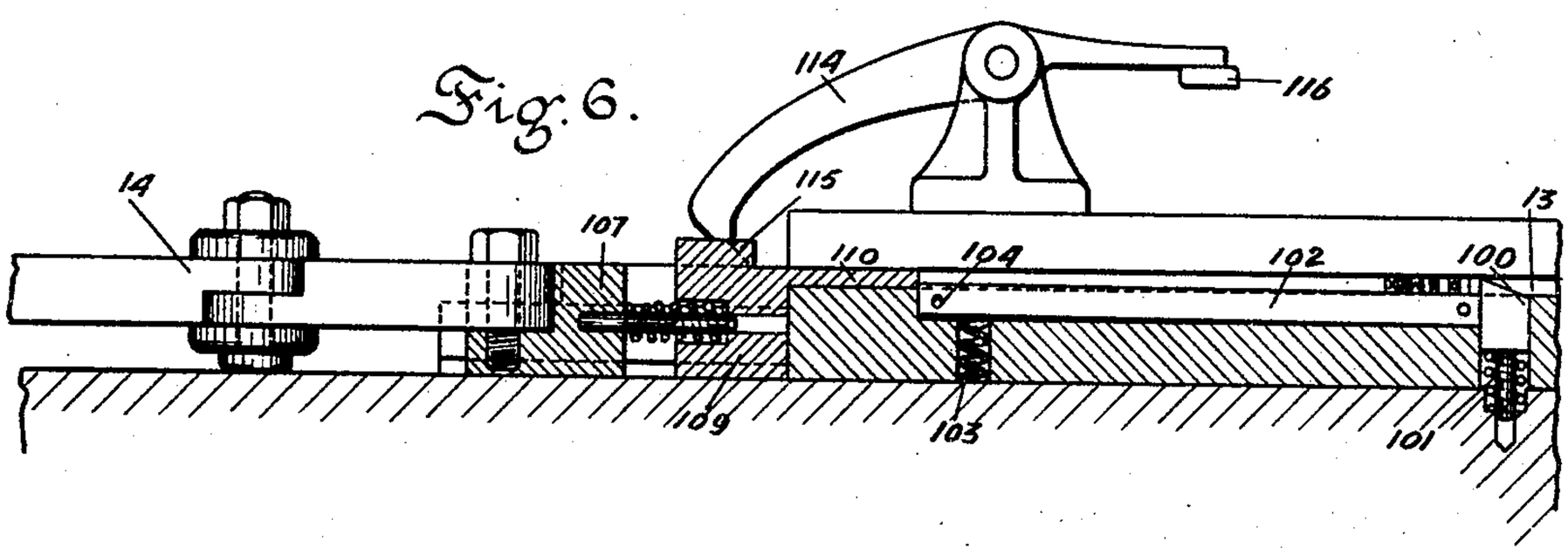


Fig. 7.

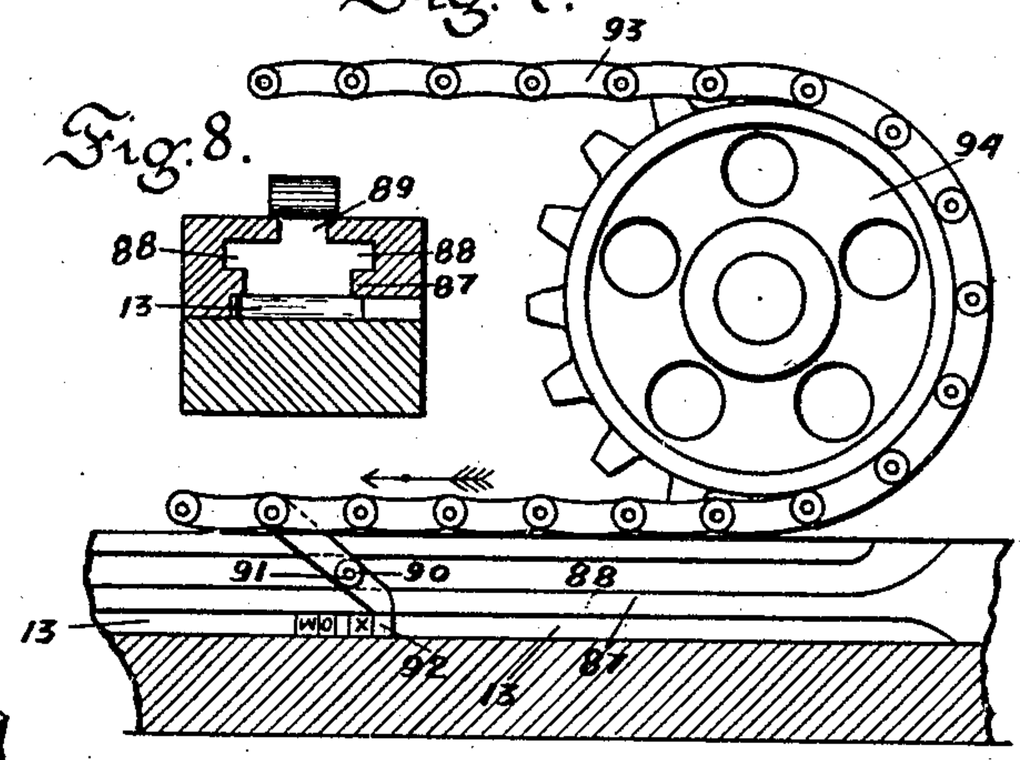
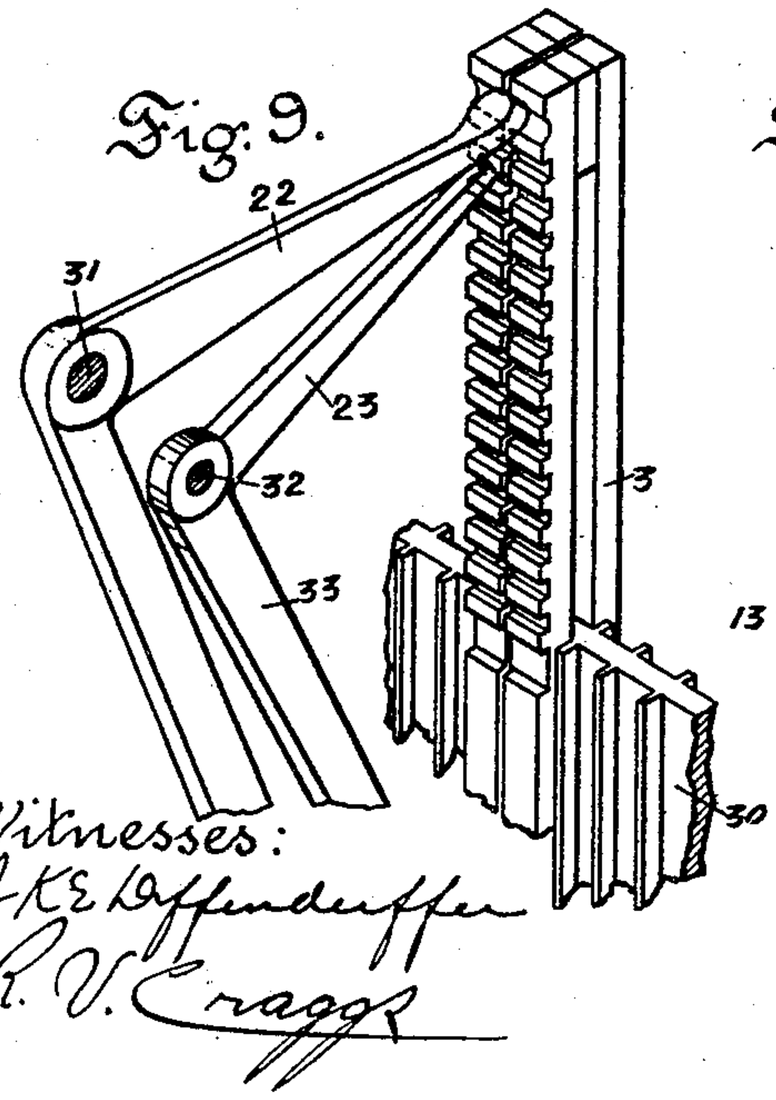


Fig. 8.

Fig. 9.



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No. 765,965. PATENTED JULY 26, 1904.

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TYPE CASTING AND SETTING MACHINE.

APPLICATION FILED FEB. 11, 1904.

NO MODEL. 6 SHEETS—SHEET 6.

Fig. 10.

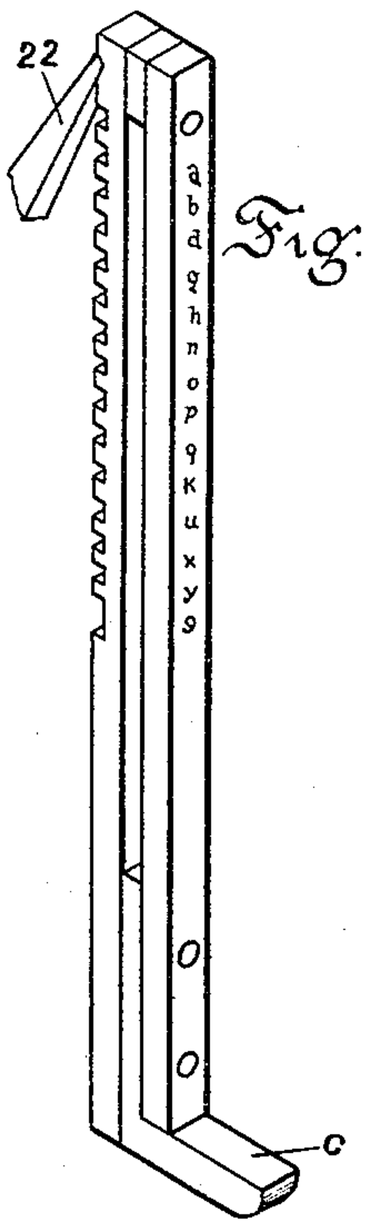
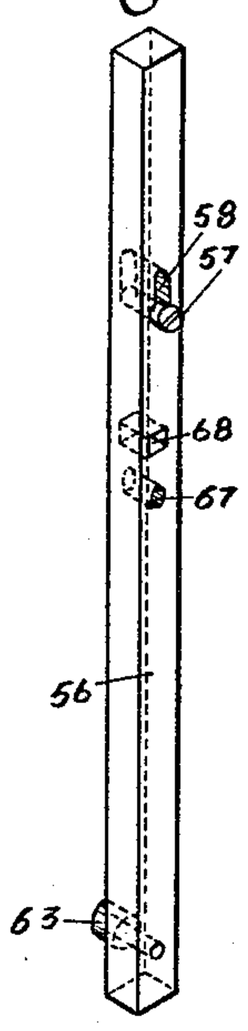


Fig. 11.



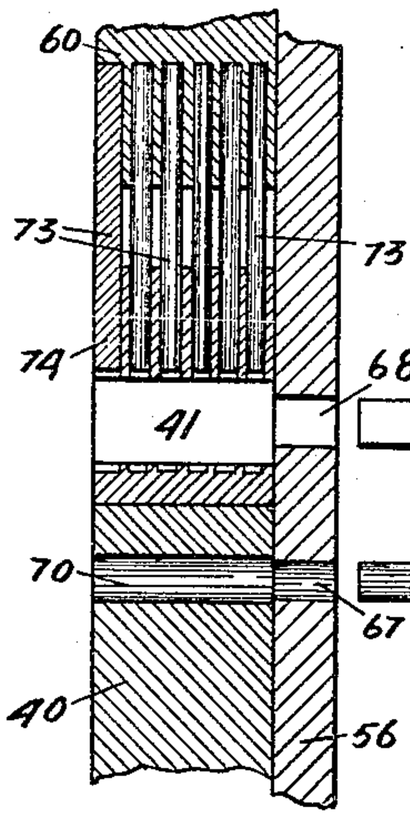


Fig. 12.

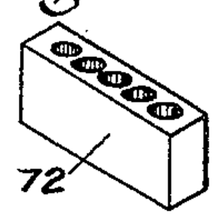


Fig. 13.

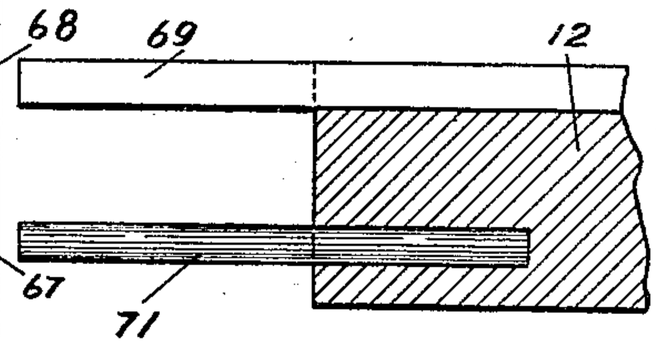


Fig. 14.

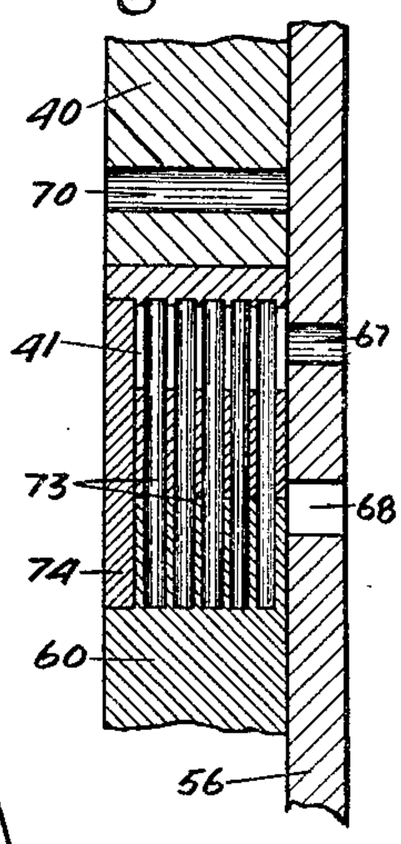
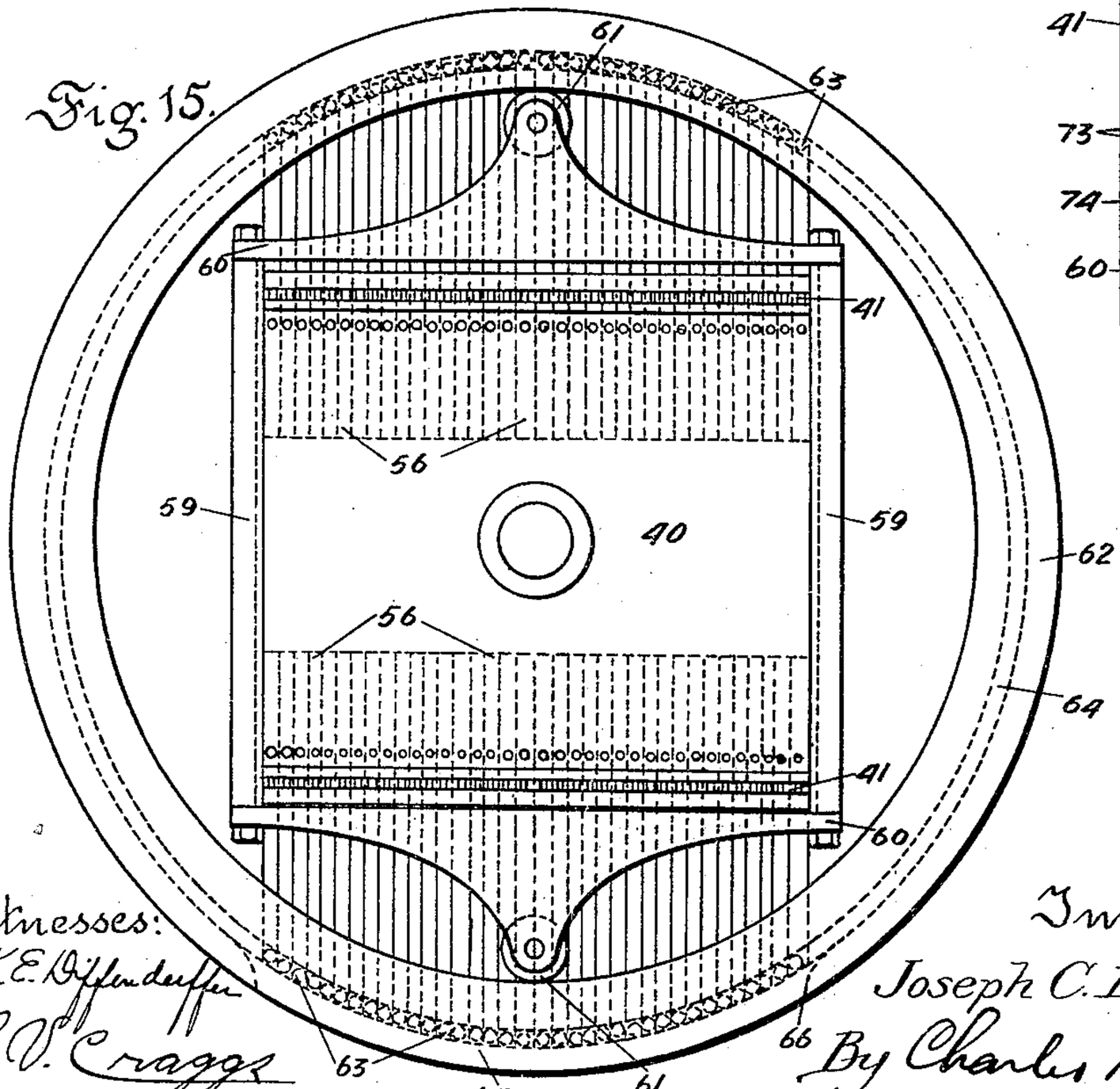


Fig. 15.



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No. 765,965. Patented July 26, 1904.

UNITED STATES PATENT OFFICE.

JOSEPH C. FOWLER, OF BALTIMORE, MARYLAND, ASSIGNOR TO CASTOTYPE MACHINE COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

TYPE CASTING AND SETTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 765,965, dated July 26, 1904.

Application filed February 11, 1904. Serial No. 193,149. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH C. FOWLER, a citizen of the United States, residing at Baltimore city, State of Maryland, have invented certain new and useful Improvements in Type Casting and Setting Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to mechanism for casting individual type and spacers, composing and justifying, and transferring to a galley.

The objects sought are greater simplicity and accuracy, easier running of the mechanism, avoiding shocks, and more rapid action.

In carrying out said invention a rotary mold plate or disk is employed having two sets of molds for casting individual type and spacers, the molds of each set corresponding to the number of matrix-bars and spacer-bars and said sets being located at the opposite ends of a diameter through the disk, the type or spacers, or both, being cast in the set which is for the moment the lowermost and the molded type and spacers being concurrently ejected from the uppermost set into a composing-race. Provision is also made for casting a spacer concurrently with, but independent of, the terminal letter of any word, and means are also embodied in the machine whereby the spacers are cellulated while being cast in such manner that they may be readily compressed in justifying.

In the drawings, Figure 1 is a front elevation of the body of a machine embracing said invention in the best form now known to me. Fig. 2 is a top plan view thereof with the keyboard broken away to show only the upper row of keys. Fig. 3 is an end elevation showing driving-gear, clutching devices, and a part of the keyboard and of the detent mechanism. Fig. 4 is a sectional view taken upon line A B, Fig. 1, showing keyboard, cam-shafts, and melting-pot. Fig. 5 is an enlarged fractional plan view showing the toggle-joint justifying device and type-race. Fig. 6 is a sectional front elevation of the parts represented in the preceding figure. Fig. 7 is a fragmental longitudinal section through the type-race and composing-pawl guide with the pawl engaged therein, showing also in elevation one of the sprocket-wheels and a length of the chain, which is thrown over said wheel and its congener to carry the composing-pawl. Fig. 8 is a transverse section through the type-race and composing-pawl guide, showing a type just inserted in the race. Fig. 9 is an enlarged detail illustrating a matrix-bar and a spacer-bar side by side, so that the casting from the latter will succeed that from the former when ejected into the type-race, a detention-lever for holding both, a detention-lever for holding one when both are released and releasing that one when needed, and a guide-plate for the bars. Fig. 10 is a detail of a matrix-bar enlarged and detached. Fig. 11 represents a gate-bar, of which there are two sets, also enlarged and detached and carrying a roll for engagement with its operating channel. Fig. 12 represents one of the cellular spacers, of compressible lead, intended to be employed in this machine as well as others for a cognate purpose. Fig. 13 is an enlarged detail embracing a section of the upper half of the revolving mold-disk, taken through the spacer-cell, with core-pins withdrawn and ejector bar and fingers on the point of acting. Fig. 14 is an enlarged detail in section through the lower half of the mold-disk, including the spacer-cell, with core-pins down ready for casting the cellular spacer and the gate-bar alined for casting; and Fig. 15 is an elevation, detached and enlarged, of the eccentric housing-ring within which the mold-disk revolves and by which the gate-bars are controlled, showing also its relation to said disk and gate-bars.

Referring now to said drawings, the numeral 1 indicates a strong frame for the support of the various operative elements of the mechanism. Comprised within this frame or mounted in ways or bearings therein are the matrix-bar and spacer-bar well 2, the gravity matrix-bars and spacer-bars 3, the matrix-bar and spacer-bar pressers 4, matrix-bar and spacer-bar stops 5, restoring-shoe 6 and its operating-lever 7, starting-clutch 8, two-com-

partment melting-pot 9, one for the type-metal and the other for a softer metal for the spacers, forcing plungers or pistons 10, with their springs 11, type-ejector 12, type-race 13, justifying-toggle 14, line-ejector 15, counterbalanced galley 16, cam-shaft 17, carrying cams for operating the melting-pot and its pistons or plungers and the restoring-shoe lever, and a second cam-shaft 18, having cams for operating the type-ejector, justifying-toggle and line-ejector, and line-pusher 19, by which the justified line is laid in the galley and the latter depressed the space of one em.

All of these parts thus far referred to have been shown and described either in Letters Patent No. 705,525, granted July 22, 1902, to Joseph C. and Joseph C. Fowler, Jr., or in an application filed June 8, 1903, Serial No. 160,651, by the same parties, except that the throats of the two metal compartments extend across the full width of the space occupied by the mold when in position for casting and there is a separate duct leading from the throats for each mold-cell, the ducts *a* from the type-metal compartment leading to the type-cells and the ducts *b* from the spacer-metal compartment leading to the spacer-cells. Also two cam-shafts are used instead of one, as in the former patent and application, and hence will call for no detailed description or anything more than incidental reference hereinafter.

Differing from the former device, however, the key-bank 20, the housing 21, the detent-levers 22 and 23, the matrix-pressers 4, and the matrix-bars and spacer-bars are self-contained—that is to say, they are carried—upon a supplemental frame 24, which when secured to the main frame by the bolts 25 passing through ears 26 on the supplemental frame and bosses 27 on the main frame forms, essentially, a rigid part of the latter, but upon the withdrawal of the bolts is capable of being swung back on shaft 28, journaled in lugs 29, from the main frame. This is convenient for cleaning or repair-work.

There are eighteen matrix-bars and eighteen spacer-bars, beginning with a matrix-bar at the extreme right and alternating with spacer-bars all through the series. Thus a spacer can be cast simultaneously with and in the proper relation to any terminal letter of a word. Each bar slides upon a guide-web 30, Fig. 9, which is secured at each end to the uprights of the supplemental frame 24 or housing-frame. Each pair of bars—a matrix-bar and a spacer-bar—is supported in normal position by a detent-lever 22 common to both, (see Fig. 9,) and the spacer-bar is also independently supported by a detent-lever 23, engaging with itself alone, so that the companion matrix-bar may be disengaged and allowed to drop without releasing the space-bar. The detent-levers 22, which on account of their dual function will be termed the "duplex detent," are bell-cranks and each independently pivoted upon a rod or shaft 31, mounted in housing 21, so that only one will be operated by the depression of a single character-key. The spacer-detents, on the other hand, are fixed to their shaft 32, so that they will all be disengaged together; but as this shaft also has one or conveniently two depending power-arms 33 they also possess the character of bell-cranks.

The keys 34 are pivoted at 35 to parallel bars 36—one for each vertical row. Their lower ends 37 engage with the matrix-bar stops 5, so that when depressed they will thrust them forward and also just above the matrix-bar stops engage with reciprocable bars 38, one for each vertical row of keys, and consequently one for each matrix-bar, with one (or two) over for the spacer-bars, and at their inner ends these bars have slot-and-pin connection with the power-arms of the appropriate detents. The keys, upon the tops of which the characters are in print, are selected in the present machine from right to left and depressed, no two in the same vertical column, as each vertical column on the keyboard represents one and the same matrix-bar. The depression of any character-key thrusts out the matrix-bar stop appropriate to that character and at the same time disengages the duplex detent from the matrix-bar bearing that character, permitting it to fall, the companion spacer-bar, however, being still restrained by the spacer-bar detent. When it is desired to drop a spacer-bar after a matrix-bar, one of the spacer-keys 39, Fig. 1, is depressed at the same time the key representing the character to precede this space is depressed. This disengages the duplex detent from both matrix-bar and spacer-bar and also the spacer-bar detent, allowing both to drop. As already pointed out, all spacer-bar detents are fixed to a common shaft, so that all will be simultaneously disengaged upon the depression of either one of the spacer-keys; but the only spacer-bar to fall will be the one whose character-detention lever or duplex detent is disengaged at the same time. All the other spacer-bars are kept from falling by the duplex detents. When the finger is lifted from the spacer-key, all the spacer-detents are returned to their normal positions.

A rotary mold or rectangular mold-disk 40 is employed in this machine instead of a fixed or reciprocating mold, as in the former patent and application. Two sets of mold-cells 41, thirty-six cells in each set, are arranged upon opposite and parallel sides of this disk equidistant from the axis thereof, so that while the type or spacers, or both, are being cast in the cells of one set beneath the axis of the disk molded type or spacers, or both, are being ejected from cells of the other set upon the raceway overhead. The mold-disk has a chamber 42 surrounding its hub and extending into

close proximity with the two lines or rows of mold-cells and is kept cool by water introduced into this chamber by tube 43, passing through the hollow disk-shaft 44, the water then flowing by outlet 45 into said shaft and thence to a suitable drain. Upon the rear end of the disk-shaft is loosely mounted a skew-gear 46, engaging with a properly-timed skew-wheel (not shown) upon the lower cam-shaft or pot cam-shaft 17 and kept from lateral movement along the disk-shaft by engagement with a recess 47 in an overhead web of the main frame or by other suitable means. Embracing the disk-shaft is a clutch-sleeve 48, keyed thereto and allowed a limited play therealong by slot and pin 49. Between the inner end of this sleeve and a collar 50, pinned to the disk-shaft, is a coiled spring 51, thrusting against said sleeve, and between circumferential flanges 52 on said inner end takes a roller-yoke 53 from the melting-pot, so as to throw the sleeve forward against the spring when the pot is swung toward the mold-disk and to carry it back to engage the wing-clutch 54 on the hub of the skew-gear when the pot is swung away from the disk. A space of about one-sixteenth of an inch normally exists between the collar on the disk-shaft and the adjacent hanger-bearing 55, permitting said shaft to move longitudinally and jam the disk tightly but yieldingly against the matrix-bars and spacer-bars in such forward induced movement of the clutch-sleeve.

Secured to the rear face of the mold-disk are two sets of gate-bars 56, one set for each set of mold-cells and one gate-bar for each cell. The attachment is made by headed screws 57 taking into longitudinal slots 58, which allow the bars a limited endwise play. These bars are guided not only by the screws and slots, but by the bearing each has against the adjoining bar and by the bearing of the two outside bars of each set against the side bars 59, considered from the position indicated in Fig. 15, of a rectangular reciproco-rotary frame 60, which engages by roller 61 the eccentric inner track of a fixed housing 62, and being carried around by the engagement of its side bars with the lateral edges of the mold-disk is caused by the eccentricity of its track to play, as to its end bars, toward and from the dual sets of mold-cells.

The gate-bars are each provided with an antifriction-roller 63, which follows a cam-race 64 in the above-mentioned housing to impart reciprocating movement to the bar; but at the bottom this race is cut away, as at 65, the whole width of a set, so that when the rotary mold is in the relative position shown in Fig. 15 the lower set of gate-bars will rest upon the toes *c* of the matrices, which toes should be so disposed upon the shanks of said matrix and spacer bars and so described from the axis of the mold-disk as to form in the normal position of the matrix and spacer bars an arc in continuation of the exterior periphery of the housing 62 and guide the gate-bars when the disk is rotated in such manner that their rollers will ride up the incline 66 and reënter the cam-race. Each gate-bar has a gate 67, through which metal may be admitted to a mold-cell and by which the foot of the cast type is shaved. Proximate to this gate is an opening 68 for the play of the ejector, this latter opening registering with the mold-cell and being traversed by ejector-finger 69 when the gate-bar is in the overhead position, as in Fig. 13, while the gate registers with a clearing-opening 70 through the mold-disk and is traversed by a clearing-finger 71 from the type-ejector slide. When the gate-bar is down in the lowermost position of the set and is released by the drop of its supporting matrix or spacer bar, the gate registers with the mold-cell, but the ejector-opening, as shown in Fig. 14, is cut off by the blank wall of the mold-disk.

It is desirable to make the spacers 72, Fig. 12, cellular in order that they may be readily and evenly compressed in justifying, and they must also be shorter in length than the character type. For this purpose the end bars of the reciproco-rotary frame 60 are provided with core-gangs 73, one gang for each spacer-cell, which are closed up into said cells when the mold-set approaches and reaches its lowermost position, as shown in Fig. 14, but are withdrawn therefrom, as in Fig. 13, when approaching and reaching the overhead position. It also has in front of each gang of cores a cut-off finger 74, which closes the outer end of the spacer-cell simultaneously with the projection of the cores, to shorten the cell, and is withdrawn as the cores are withdrawn to leave the cell open for ejecting the spacer just cast.

When by manipulating a single horizontal line of keys the operator has set such required matrix-bars with necessary spacer-bars as the line will permit, he depresses the clutch-key *d* and engages the main clutch, as in the pending application aforesaid. The main shaft 75 then through pinion 76 and spur-gear 77 sets the lower cam-shaft in operation, and the pot-cam *e* on the latter rocks forward the melting-pot on its pivot 78 until its throat-plate 79 is tight against the operated gate-bars and directly opposite the open gates thereof. In this movement the roller-yoke 53 carries forward the clutch-sleeve on the disk-shaft and thrusts the mold-disk firmly but yieldingly against the matrix and spacer bars, as before explained, making a perfect joint further induced by the action of the matrix and spacer bar pressers 4. At this point the two piston-cams 80 have released the bell-cranks 81 82, allowing the pistons 83 and 84, respectively, for type-metal and for lead to descend by spring-pressure and force the metals through the throat-channels 85 and

86 and the ducts *a* and *b* into such molds as have been opened.

When the cast is complete, the piston-cams again engage the bell-cranks and lift the pistons, the pot-cam swings the melting-pot back upon its pivot, relieving the mold-disk from the matrix and spacer bars. The shoe is lifted by the shoe-cam *f* to restore the matrix and spacer bars and carry the gate-bars into position for their rollers to ride up the incline 66 and enter the cam-race. The mold-disk clutch will be engaged and the mold-disk given one-half revolution, bringing the loaded cells overhead and in line with the type-race and the gate-bars in position for the action of the type-ejector, which under the influence of ejector-cams *g* takes place the instant the mold-clutch is disengaged, this being effected by an initial forward rocking of the melting-pot.

The type-race in which the type are deposited by the ejector-fingers, with their characters inverted and reading from left to right, as in a composing-stick, is partly open overhead, the type being confined by ledges 87, Figs. 7 and 8, above which are guide-grooves 88 and above these a central, longitudinal, and comparatively narrow slot 89 to admit the shank of a composing-pawl 90, which has lateral roller-pins 91 to engage the guide-grooves and an elongated nose 92 to take into the race and carry the type forward. This pawl is carried by chain 93, thrown over sprocket-wheels 94 and driven by bevel-gear 95 on the upper cam-shaft and bevel-pinion 96 on a transverse shaft 97 at such speed as to make one complete circuit for each cycle of operations of the machine, carrying the pawl into the race and guide-grooves just as the type-ejector completes its action and leading it out when the type have been deposited in the composing-box.

The upper cam-shaft is driven from the lower by gears 98 and 99 and operates the type-ejector at the time the cast is being made in the mold-cells which are for the moment lowermost. The type being ejected are carried along the race by the composing-pawl until they pass the latch 100, Fig. 6, which, as shown, is seated on a coiled spring 101 and beveled on the side from which the type come. Upon passing this latch the type are caught and prevented from turning or twisting by retainer-bar 102, pivoted at the end adjacent to the latch and at the other end seated on a spring 103 and restrained in play by slot and pin 104. This retainer-bar is practically the exact length of a justified line and forms with the latch the justifying-chamber. Beyond this justifying-chamber is the justifying mechanism (shown more particularly in Figs. 5 and 6, with incidental reference to Figs. 1 and 2) for operating parts corresponding to those explained in the former application before mentioned—to wit, the cam 105, connecting-arm 106, and toggle 14. In the present instance the toggle operates a push-block 107, moving in ways 108. Another block 109—the justifying-block proper—moving in the same ways, is connected by a spring and dowel-pin *h* with the one first mentioned and has a tongue 110 entering the justifying-chamber, so that as it is pushed forward by the toggles it forces the line against the abutment formed by the latch and justifies it by compression of the cellular spacers. In this action the justifying-block is forced back toward the push-block, and one or more pawls 111, carried by the former, engage recesses 112 in the latter, so that in the back stroke of the toggles the justifying-block is withdrawn until disengaged by tripping-pins 113, acting against the beveled noses of said pawls. The pawls of course do not engage until the justifying-block meets the resistance of a completed line of type, and then justification immediately takes place. The justifying-block is engaged and withdrawn, allowing the line-ejector trip 114 to pass off the lip 115 and release the line-ejector latch 116, as in said former machine, thus causing the line-ejector to be actuated by its cam 117 and move the justified line into the galley, whereupon the pusher is depressed by cam 118 the space of one em. Upon the release of the justifying-block it flies back, urged by the spring, and raises line-ejector trip into its first position, disengaging the ejector-pawl and throwing the line-ejector out of action until another line is completed.

It will be understood that the system wherein each matrix-bar is followed by a spacer-bar can be applied to other machines than those having a rotating mold-disk, that the mold-disk with its two banks of gates may be used with a different system of matrices, that the gates may be operated by different mechanism than that herein described, that the type may be carried along the type-race by other means than the chain and pawl, and that the machine may be altered in many other respects without departing from the principle of my invention.

I claim—

1. In a machine for casting type, the combination with mold-cells and melting-pot, of gravity matrix-bars and spacer-bars arranged in pairs, each pair consisting of one matrix-bar and one spacer-bar, and means whereby both bars of a pair may be dropped to casting position either simultaneously or independently.

2. In a machine for casting type, the combination with mold-cells and melting-pot, of gravity matrix-bars and spacer-bars arranged in pairs, each pair consisting of one matrix-bar and one spacer-bar, detent mechanism for conjointly sustaining both bars of a pair, and detent mechanism for individually sustaining each spacer-bar.

3. In a machine for casting type, the combination with mold-cells and melting-pot, of gravity matrix-bars and spacer-bars arranged in pairs, each pair consisting of one matrix-bar and one spacer-bar, gate-bars sustained by all of said matrix and spacer bars, detent mechanism for conjointly sustaining matrix and spacer bars of a pair, detent mechanism for individually sustaining each spacer-bar, stops to limit the fall of the matrix and spacer bars, and keys for actuating said detent mechanism and stops.

4. In a machine for casting type, the combination with mold-cells and melting-pot, of gravity matrix-bars and spacer-bars arranged in pairs, each pair consisting of one matrix-bar and one spacer-bar, duplex detents engaging both bars of a pair, character keys whereby said detents are independently disengaged, spacer-detents engaging the spacer-bars alone, and a spacer-key whereby all of the spacer-detents are simultaneously operated.

5. In a machine of the character described, the combination with a bank of vertically-guided matrix and spacer bars and key-controlled detents and stops therefor, of a rotary mold disk or plate having a series of individual mold-cells corresponding in number with the matrix and spacer bars, a melting-pot, an overhead type-race, means for giving the mold-plate a half-rotation from the molding position to aline the mold-cells with the type-race, means for ejecting the cast type into the race, and means for carrying the type therealong.

6. In a machine of the character described, the combination with a bank of vertically-guided matrix and spacer bars and key-controlled detents and stops therefor, of a rotary mold-plate having a series of individual mold-cells corresponding in number with the matrix and spacer bars, a melting-pot, a series of gate-bars mounted on the mold-plate, an overhead type-race, means for giving the mold-plate a half-rotation from the molding position to aline the cells with the type-race, means whereby the gate-bars are caused to shear past the feet of the type in such half-rotation, and means for ejecting the cast type into said type-race.

7. In a machine of the character described, the combination with a bank of vertically-guided matrix-bars and spacer-bars and key-controlled detents and stops therefor, of a rotary mold-plate having a series of individual mold-cells corresponding in number with the matrix-bars and spacer-bars, a melting-pot, means for elastically pressing the mold-plate against the matrix-bars and spacer-bars during the molding operation, an overhead type-race, means for giving the mold-plate a half-rotation from the molding position to aline the cells with the type-race, and means for ejecting the cast type into the race.

8. In a machine of the character described, the combination with a bank of vertically-guided matrix and spacer bars and key-controlled detents and stops therefor, of a rotary mold-plate having a series of individual mold-cells corresponding in number with the matrix and spacer bars, a series of gate-bars mounted on the mold-plate, a melting-pot, means for pressing the mold-plate against the matrix and spacer bars during the molding operation, means for pressing the nose of the melting-pot against the gate-bars at such time, an overhead type-race, means for giving the mold-plate a half-rotation from the molding position to aline the cells with the type-race, and means for ejecting the cast type into the race.

9. In a machine of the character described, the combination with a bank of vertically-guided matrix and spacer bars and key-controlled detents and stops therefor, of a rotary mold-plate having two series of individual mold-cells each corresponding in number with the matrix and spacer bars, on opposite sides of and equidistant from the axis of the plate and parallel with each other, a melting-pot feeding to the lower series of cells, an overhead type-race, means for giving the mold-plate successive half-rotations carrying the loaded cells from the molding position into alinement with the type-race, and the empty cells into alinement with the molding position, and ejecting mechanism for clearing the loaded cells upon said race.

10. In a machine of the character described, the combination with a bank of vertically-guided matrix and spacer bars and key-controlled detents and stops therefor, of a rotary mold-plate having two series of individual mold-cells each corresponding in number with the matrix and spacer bars, on opposite sides of and equidistant from the axis of the plate and parallel with each other, a series of gate-bars for each series of mold-cells and mounted on the mold-plate, a melting-pot feeding to the lower series of cells, an overhead type-race, means for giving the mold-plate successive half-rotations carrying the loaded cells from the molding position into alinement with the type-race, and the empty cells into alinement with the molding position, and means for controlling the gate-bars of both sets during the rotation and stoppages of said mold-plate.

11. In a machine for casting and setting individual type, the combination with the spacer mold or molds of a series of core-pins playing into said mold transversely thereof, and means whereby they are projected into and through the mold during the casting operation and withdrawn therefrom for the action of the ejectors.

12. In a machine for casting and setting individual type, the combination with the spacer mold or molds of core-pins playing into said molds, a cut-off plate to shorten the mold, and means whereby said core-pins are simultane-

ously projected into or withdrawn from the mold-cell.

13. In a machine of the character described, the combination with the rotary mold of the encircling cam-housing, the frame traveling thereon, and the core-pins carried by the frame.

14. In a machine of the character described, the combination with the rotary mold and the shaft which carries it, of the swingable melting-pot connected with said shaft to project and retract said shaft.

15. In a machine of the character described, the combination with the rotary mold and the shaft which carries it, of the encircling clutch-sleeve, the slot-and-pin connection, the spring, the driving-gear, the swingable melting-pot, the yoke on said pot taking between circumferential flanges on the clutch-sleeve, whereby the clutch is opened when the pot is swung toward the mold and reëngaged when it is withdrawn therefrom.

16. In a machine for casting and setting individual type, the combination with the type-race of the latch or abutment, the hinged retainer-bar and the justifying-block.

17. In a machine for casting and setting individual type, the combination of the justifying-block, its pusher-block, the yielding connection between the two, the pawl or pawls carried by the justifying-block, the engagement-notches therefor in the pusher-block, and the trip pin or pins.

18. In a machine for casting and setting individual type, the combination of the type-race, the composing-pawl entering and engaging said type-race and traversing in one direction only, the composing-chain carrying said pawl, and means for giving said chain one complete traverse, always in the same direction, for each cycle of operations.

19. In a machine for casting and setting individual type, the combination of the type-race, the composing-pawl entering and engaging said type-race in one direction only, the guideways engaging ears rigid with the shank of said pawl, the composing-chain carrying said pawl, and means for giving said chain one complete traverse, always in the same direction, for each cycle of operations.

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

JOSEPH C. FOWLER.

Witnesses:

JOHN W. HEWES,

J. K. E. DIFFENDERFFER.