

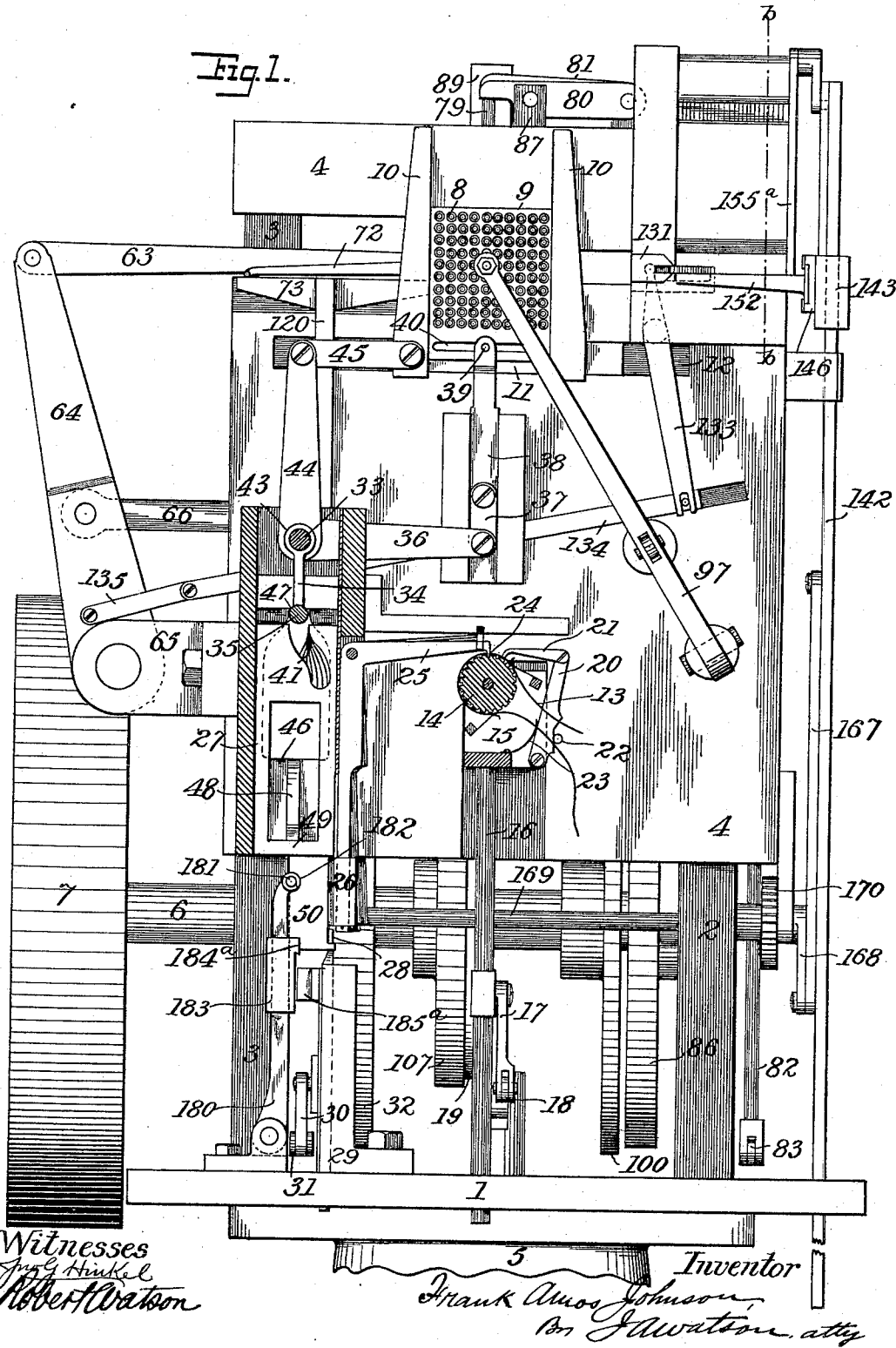
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F. A. JOHNSON.
TYPE CASTING AND COMPOSING MACHINE.

No. 584,365.

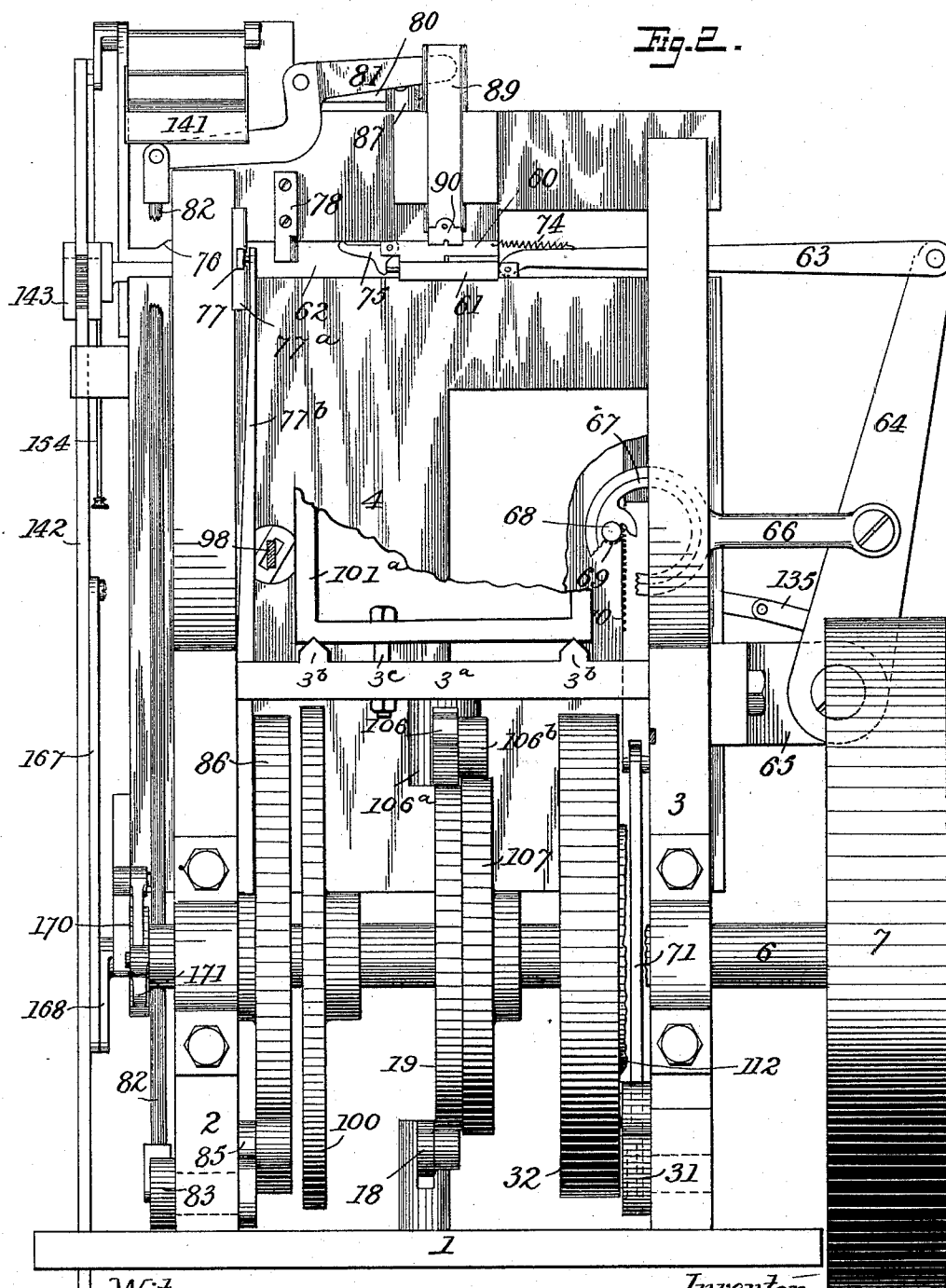
Patented June 15, 1897.



8 Sheets—Sheet 2.

No. 584,365.

Patented June 15, 1897.



Witnesses

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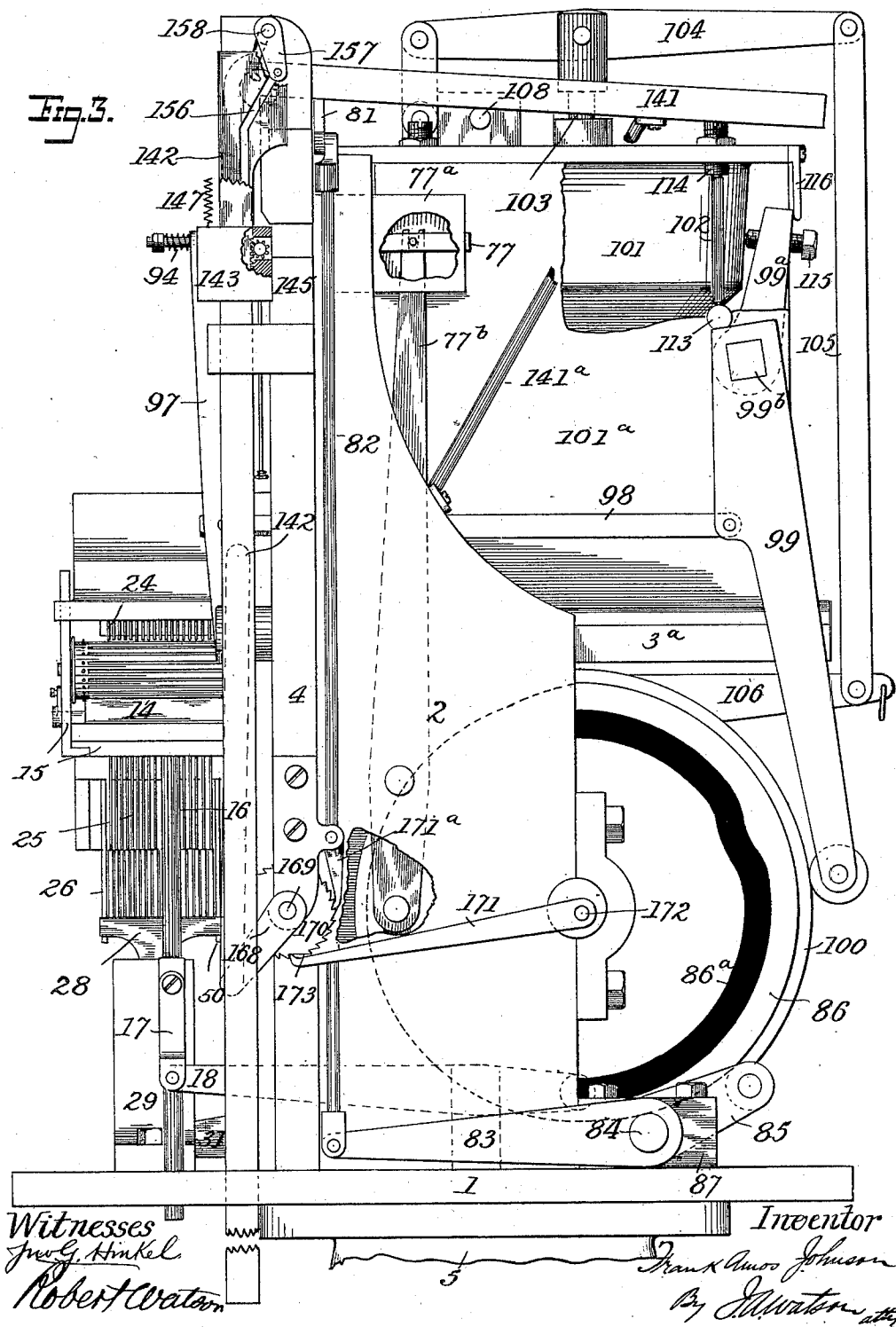
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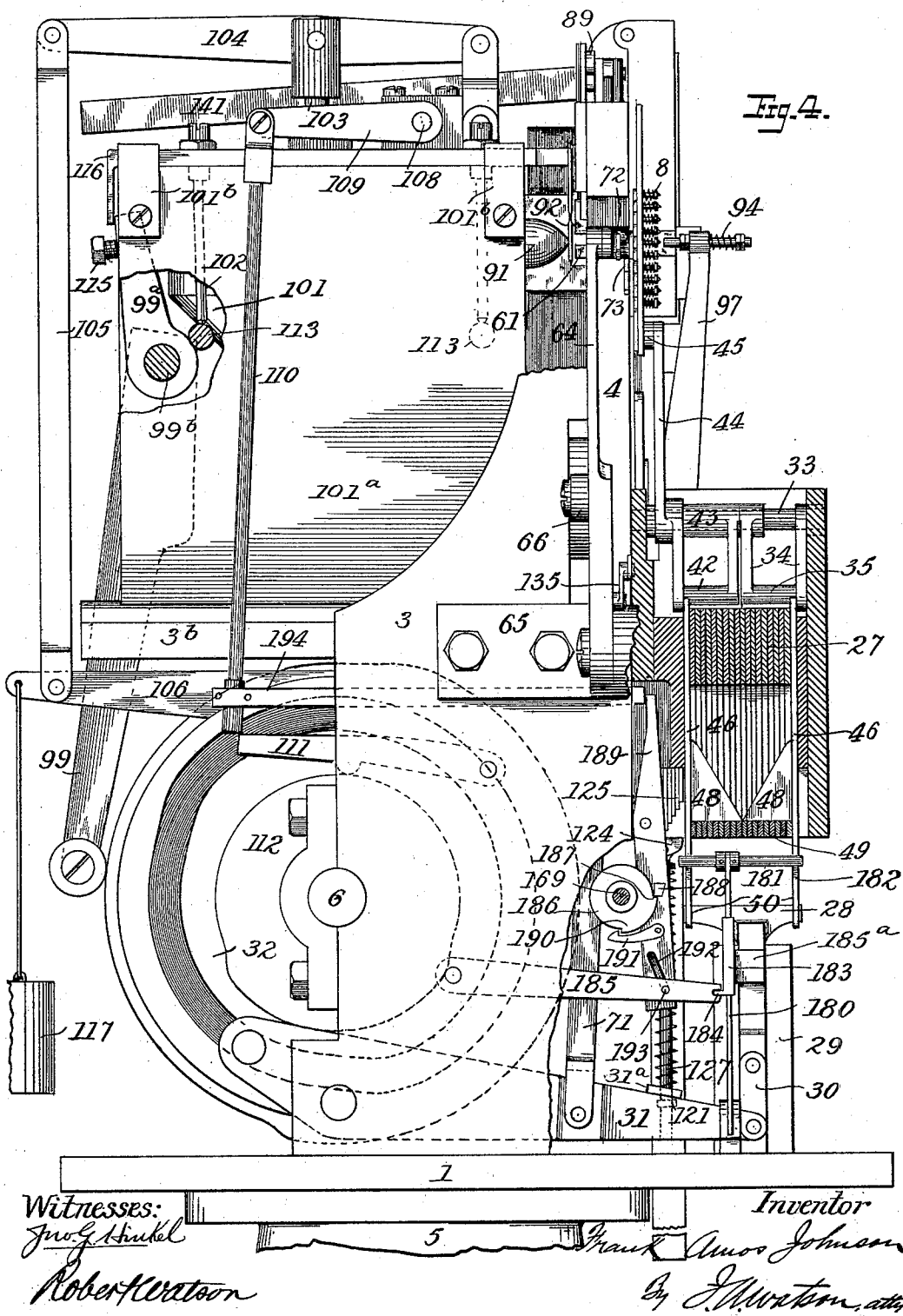
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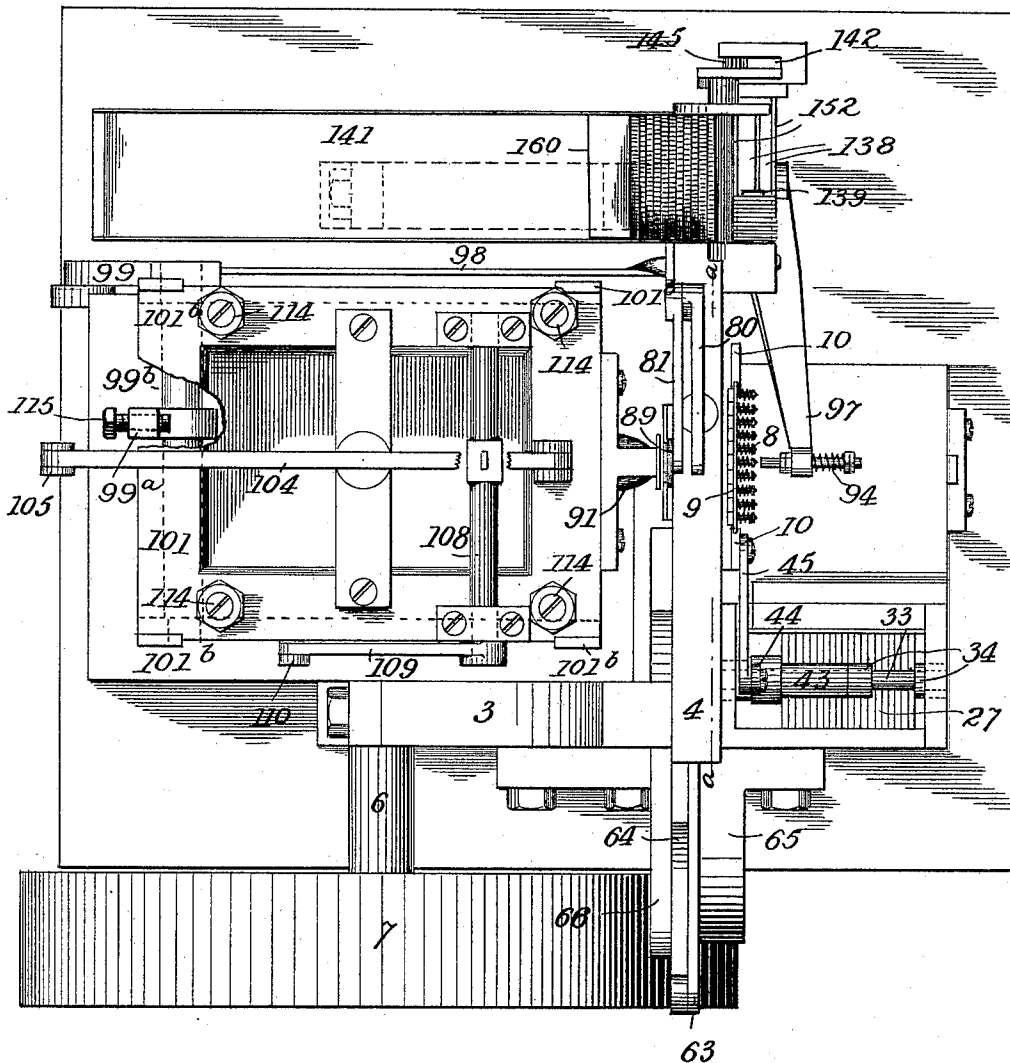


F. A. JOHNSON.
TYPE CASTING AND COMPOSING MACHINE.

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Fig. 5.



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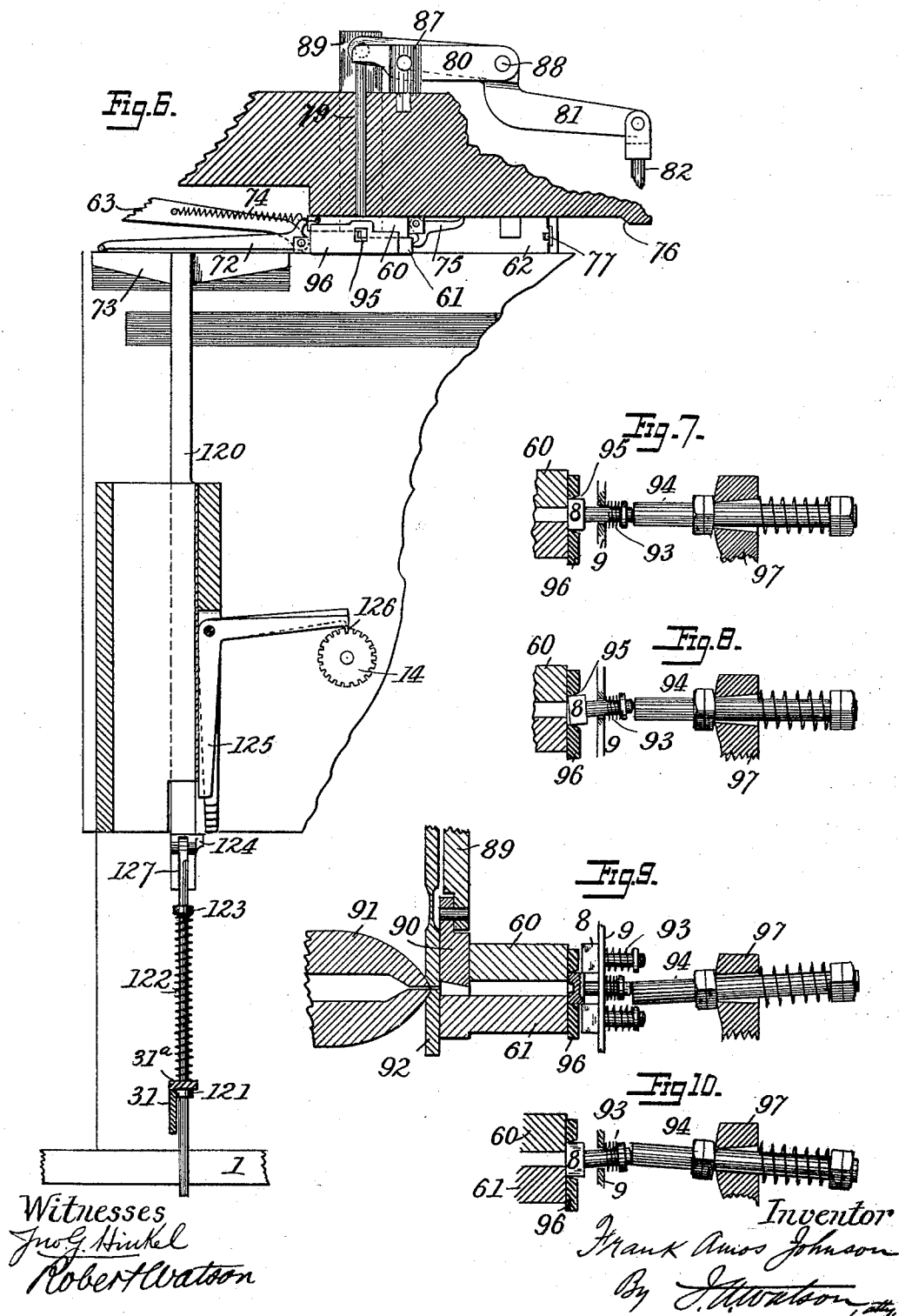
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F. A. JOHNSON.
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(No Model.)

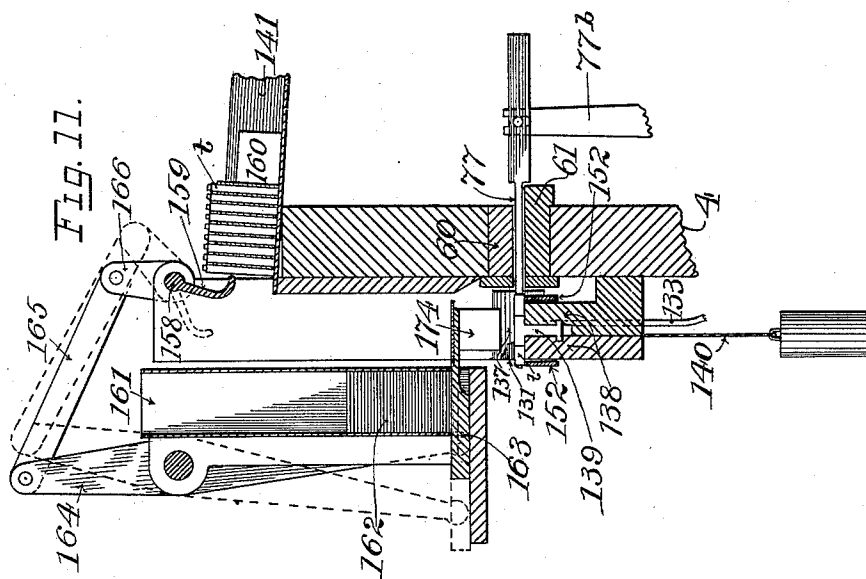
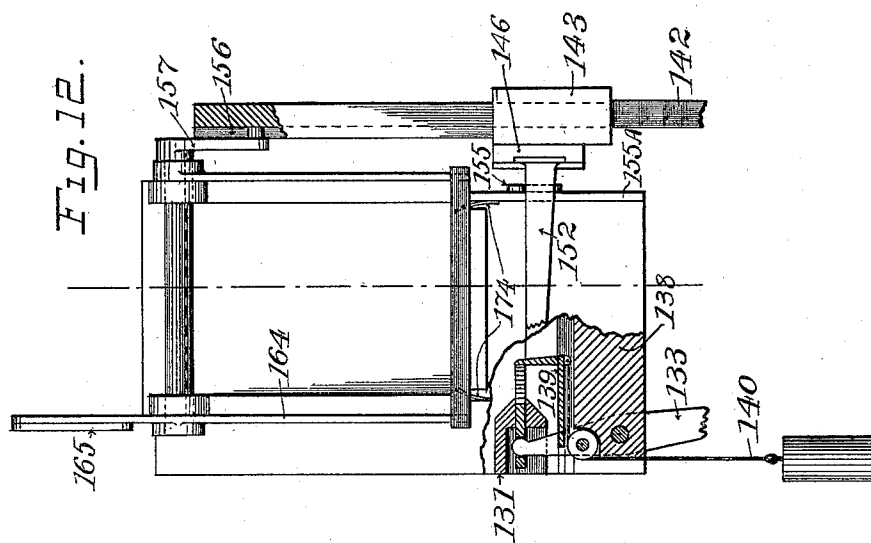
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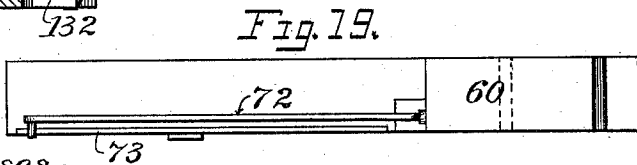
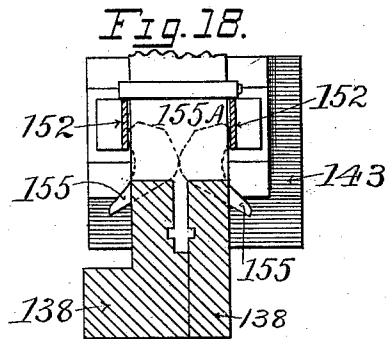
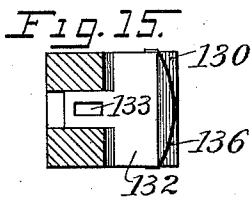
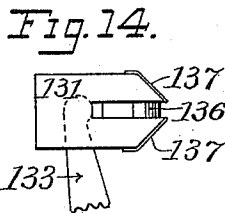
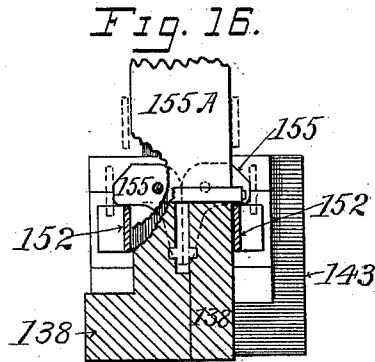
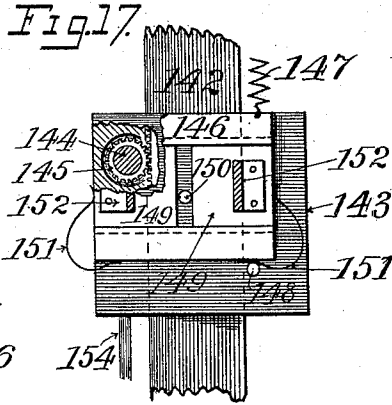
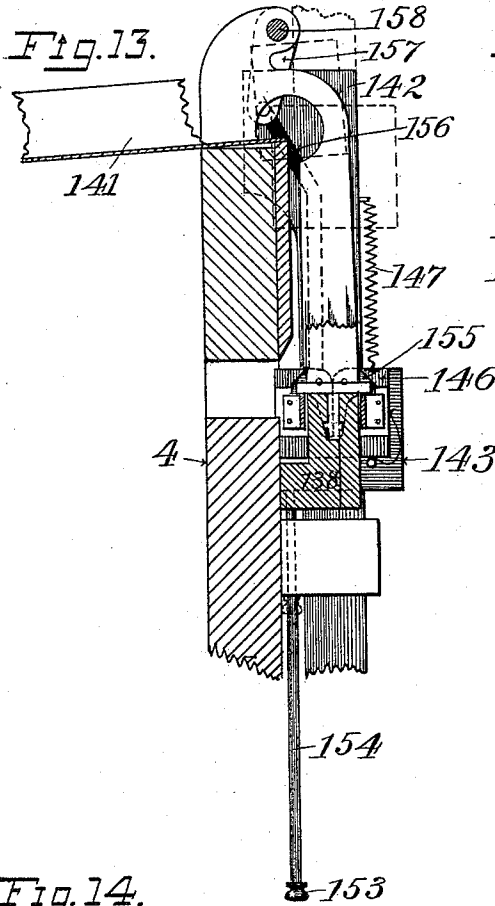
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F. A. JOHNSON.
TYPE CASTING AND COMPOSING MACHINE.

No. 584,365.

Patented June 15, 1897.



Witnesses
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UNITED STATES PATENT OFFICE.

FRANK AMOS JOHNSON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO
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TYPE-CASTING AND COMPOSING MACHINE.

SPECIFICATION forming part of Letters Patent No. 584,365, dated June 15, 1897.

Application filed January 29, 1894. Renewed May 17, 1897. Serial No. 637,003. (No model.)

To all whom it may concern:

Be it known that I, FRANK AMOS JOHNSON, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Type-Casting and Composing Machines, of which the following is a specification.

My invention relates to type-casting and composing machines; and it consists in an improved machine of this class involving many novel features, all of which will be fully described in the following specification and pointed out in the claims.

Some of the features of the invention are capable of a wider application, and may be employed, for instance, in matrix-making, type-writing, linotype, and type-casting machines, and for such features I desire protection commensurate with their usefulness.

In the specification I shall describe the invention as embodied in a type-casting and composing machine, and in the drawings I have illustrated a complete machine of this class.

Referring to the drawings, Figure 1 is a front elevation of the machine, partly in section. Fig. 2 is a rear elevation, the melting-pot being removed. Fig. 3 is an elevation of the right side of the machine, several parts being broken away. Fig. 4 is an elevation of the left side of the machine, parts being shown in section. Fig. 5 is a plan view. Fig. 6 is a sectional view on the line *a a* of Fig. 5. Figs. 7, 8, 9, and 10 are detail views illustrating the mold and the devices for accurately setting the dies upon the mold. Fig. 11 is a sectional view on the line *b b* of Fig. 1, showing in addition a leading device. Fig. 12 is a front view of the devices shown in Fig. 11. Figs. 13 to 18, inclusive, are details of the devices for transferring the lines of type to the galley; and Fig. 19 is a plan of the lever and rail for varying the mold-opening.

The various parts of the machine are mounted upon a main frame, which in the present instance consists chiefly of a base-plate 1, upright side plates 2 and 3, and a front plate 4. This frame is shown as mounted upon a pedestal 5, which is partly broken away. Move-

ment is imparted to the various elements of the machine by a series of cams upon a cam-shaft 6, which is provided with a driving-pulley 7. These cams will be referred to hereinafter in connection with the several mechanisms which they actuate. It will not be necessary to describe their particular configuration, which in each case is such as to impart the desired movements at the proper times to the several mechanisms of the machine, so as to cause them to coöperate.

The dies or matrices are supported by a movable die-carrier, as shown. The dies 8 are arranged in a rectangular plate 9 in rows parallel to its edges, there being shown ten rows of ten dies each. The die-plate 9 moves vertically in guides 10 of a carriage 11, which carriage has a horizontal movement in a guide-groove 12, formed in the face of the front plate 4. It will thus be seen that any particular die may be brought opposite the mold or casting-point by imparting proper movements to the carriage 11 and the die-plate 9.

I shall now proceed to describe the devices by which the various movements of the die-plate are controlled.

The prime controlling agent so far as the present embodiment of the invention is concerned is a strip of paper 13, having perforations or combinations of perforations therein representing the various letters or spaces to be selected. This strip of paper or controller is caused to travel by a step-by-step movement over a perforated cylinder 14 as follows: The cylinder 14 is mounted in a frame 15, supported by a rod 16, to which a vertical movement is imparted periodically by means of a link 17, lever 18, and cam 19, as shown in Figs. 1 and 3. Upon the frame 15 is pivoted an arm 20, carrying a pawl 21, which engages a ratchet-wheel on the cylinder 14. On the back of the arm 20 is a cam-surface which engages a fixed pin 22. At each revolution of the cam-shaft the cylinder 14 is raised and lowered. As it is raised the arm 20 is thrown backward by a spring 23, and when it is again lowered the pin 22 engages the cam-surface of the arm 20 and throws the pawl forward, thus feeding the cylinder and the paper forward one notch. Arranged above the cylinder 14 is a set of

feelers 24 upon the horizontal arms of elbow-levers 25. Each time that the cylinder 14 is raised the feelers are also raised unless there are perforations in the paper corresponding to one or more of them, in which case they pass into the perforations and their respective levers are not moved. There are eighteen of the bell-crank levers 25, nine of which serve to determine the horizontal movements of the die-carriage 11, while the remaining nine serve to determine the vertical movement of the die-plate 9. The depending vertical arms of these levers are provided with shoes 26, which normally rest under corresponding slides 27, which are arranged in a row opposite the bell-crank levers. The shoes 26 are mounted upon the depending arms of the levers 25 with freedom to slide thereon vertically. Beneath the shoes 26 is a T-shaped striker 28, the stem of which slides vertically in a guide 29, connected to the base-plate 1. This striker is connected by a link 30 to a lever 31, and a periodical movement is imparted to it by means of a cam 32. Each time that a letter or space is selected one or two of the feelers 24 drop into perforations in the paper strip, and their corresponding shoes remain interposed between the striker and corresponding slides 27, which slides are thereby raised when the striker is elevated. The remaining feelers are raised by the paper strip and their shoes thrown out of the path of the striker. It will thus be seen that either one or two of the slides 27 are raised at each revolution of the cam-shaft.

Above the slides 27 is a rock-shaft 33, upon which are fixed arms 34, connected by a yoke 35, which extends over the front nine of the slides 27. The rock-shaft 33 also has a horizontal arm 36 rigid thereon, which arm is connected with the die-plate through the medium of link 37, slide 38, and pin 39, which pin engages a slot 40 in the plate 9. The slides 27 are provided with cam slots or surfaces 41, which engage and move the yoke 35 when the slides are raised or lowered. The cam-surfaces 41 are all of different configurations, corresponding to the several horizontal rows of dies in the die-carrier. (See Fig. 1.) It will thus be seen that when any one of the front nine of the slides 27 is raised the yoke 35 will be moved to one side or the other, and the die-plate 9 will be moved upward or downward from its normal position to select one of the horizontal rows of dies, and that when the selected slide is lowered the yoke and die-plate will be returned to their normal positions. To select the vertical row in which the desired die is located, similar cam-slots in the rear nine slides 27 act upon a yoke 42, rigidly connected to a sleeve 43 upon the shaft 33, which sleeve carries an arm 44, connected to the carriage 11 by a link 45.

Besides the eighteen slides necessary to move the die-plate from its middle position to select the various dies there are two special slides 46, one in front and the other at

the rear of the slides 27. The central portion of the upper part of the slides 46 is cut away to permit the yokes 35 and 42 to swing in either direction when the slides are raised. In the upper edges of each slide 46 there is a slot 47, communicating with the central opening, which slots receive the yokes 35 and 42 and lock them in their central or normal positions when the several slides are in their lowest positions.

The special slides 46 have foot-plates 48, each of which extends through openings cut in the lower parts of the adjacent nine slides 27 and overlies the lower edges 49 of the slides. It will thus be seen that when any one of the slides 27 is raised the corresponding special slide 46 will also be raised. The slides 46 are also provided with depending legs 50, with which the T-shaped striker 28 engages while moving downward. The slides 46 are thus moved positively downward to their normal positions, their foot-plates 48 carrying with them the slides 27, and through intermediate connections pointed out the die-plate is restored to its normal position at the end of each revolution of the cam-shaft.

The mold is composed of two sections 60 and 61, each having an offset, which sections are movable with relation to each other to vary the width of the opening between them in order to cast letters and spaces of different widths. (See particularly Figs. 2, 4, 6, and 9.) The mold slides horizontally in a groove 62 in the front plate 4, periodically moving from the casting-point opposite the nipple of the melting-pot to a point where the type are discharged in the neighborhood of the galley. Connected to the lower mold-section 61 is a link 63, the other end of which is connected to an arm 64, which is pivoted to the lug 65 upon the side plate or bracket 3. The arm 64 is moved by an eccentric-rod 66, the strap of which surrounds an eccentric 67 upon a small shaft 68. The shaft 68 is rocked by means of a pinion 69 and rack 70, which rack is connected by a link 71 with the lever 31, which operates the striker 28. Both the mold and the striker therefore are operated by the same cam, and their movements are so timed that one of the dies is always centered when the mold is brought to the casting-point, and both are held in this position while the casting operation takes place. The width of the mold is regulated by an elbow-lever 72, which is pivoted to the lower section 61 and has a shorter arm bearing upon the upper mold-section 60.

The long arm of the lever 72 is nearly horizontal, and its outer end bears upon a vertically-moving rail 73. (See Figs. 1 and 19.) The devices for controlling the rail 73 and adjusting the width of the mold will be subsequently described. The upper mold-section is constantly drawn against the shorter arm of the lever 72 by a spring 74, which spring is connected to the link 63. Upon the opposite end of the mold-section 60 is an el-

bow-lever 75, which has one arm bearing upon the lower mold-section 61 and another arm extending into position to engage with a cam 76.

As the mold approaches the right-hand end of the guide-groove 62 the lever 75 comes in contact with the cam-surface 76 (see Figs. 2 and 6) and the mold is forced open. At the same moment a plunger 77 advances and forces the type out of the mold. The mechanism for assembling the type in lines and transferring the lines to the galley will be described in a future paragraph. It may be here stated that as the mold travels from the casting-point to the ejecting-point the rear end of the type is accurately trimmed by means of a fixed knife-blade 78. (See Fig. 2.)

After the mold is brought to the casting-point and the selected die brought opposite to it the mold-sections are firmly clamped together, the die is pressed against the forward end of the mold, and the rear end of the mold is put in communication with the nipple of the melting-pot. The mold-sections are clamped together by means of a plunger 79, operating vertically and centrally upon the upper mold-section 60. This plunger is pressed down by a lever 80, which in turn is moved by a lever 81, which is operated from the cam-shaft through the medium of a rod 82, lever 83, rock-shaft 84, cam-lever 85, and cam 86. The lever 80 is pivoted to a lug 87 upon the frame, and the lever 81 is centrally pivoted at 88 to the outer end of the lever 80. To the lever 81 is also connected a vertical sliding piece 89, to the lower end of which is pivoted a block 90, which rests against the rear end of the mold and in which the jet is formed. 91 indicates the "nipple" of the melting-pot, and 92 the "apron."

Referring to Figs. 7 to 10, inclusive, it will be seen that the dies 8 are loosely seated in the die-plate 9. They are provided with rectangular heads, which are normally drawn up against the die-plate by means of springs 93. After a die is positioned in front of the mold it is pressed firmly against the face of the mold by means of a pin 94, which forces the head of the die through an inclined directrix 95 in the plate 96. The pin 94 is loosely seated in a conical hole in the upper end of a lever 97, which is pivoted upon the front plate 4 and operated by a rod 98, which is connected to the lever 99 for moving the melting-pot. The lever 99 is operated by the cam 100.

Considerable importance is attached to the manner in which the dies 8 and the impression-pin 94 are mounted, as by this means the face of the die can be brought with absolute accuracy against the face of the mold and the formation of a perfect type secured, there being no crevices in which fins might be formed. This feature of the invention is claimed in another application filed by me September 5, 1894, Serial No. 522,211.

Fig. 7 illustrates the usual operation of pressing the die against the mold. In this figure the die and the impression-pin are both

shown in line with the mold. If, however, a die were slightly out of adjustment in the die-plate, the impression-pin would engage it, as shown in Fig. 8, and if the impression-pin were rigidly connected with its operating-lever the die would not be brought accurately against the mold, but instead would be inclined, as shown in said figure.

On account of the lateral freedom of the die and the impression-pin at their engaging ends the former seats itself accurately upon the mold, as shown in Fig. 9, and the latter is forced slightly to one side by the movement of the die. If the face of the matrix is not exactly at right angles to its stem, it would in a similar manner be seated accurately upon the mold by reason of the lateral yielding of the impression-pin, as shown in Fig. 10. In Figs. 8, 9, and 10 the errors of adjustment are exaggerated for the purpose of illustration. I have found, however, that when the dies and impression-pin are mounted as above described—that is to say, with freedom to yield laterally at their engaging ends—excellent results are always obtained, even when there are slight irregularities in the adjustment of the dies. It is of course essential that the faces of the dies be accurate planes and that the face of the mold should be a plane surface also.

While I have shown square dies it will be understood that any other desired form may be substituted, the directrix being made to correspond.

The melting-pot 101 and its connections are of ordinary construction and need only brief description. The pot 101 has an outer casing or fire-box 101^a, open at the top and back, which rests on suitable supports 3^b and is fastened to a transverse supporting plate or bar 3^a by bolt 3^c. (See Figs. 2 and 4.) In a flanged portion of the top of the pot there are four screws 114, cup-shaped on their bottom ends, which rest upon four movable legs 102, which are supported in sockets of four lugs or studs 113 in the outer casing 101^a. Being supported in this manner it is free to be rocked or vibrated back and forth. The pot is periodically rocked forward to bring the nipple against the rear side of the mold by means of the cam 100 acting through lever 99, the upper end of which lever is attached to and rocks a shaft 99^b, supported between the sides of the casing 101^a. On this shaft is an upwardly-projecting arm or lever 99^a, having an adjusting-screw 115 resting against the pot. (See Figs. 1, 2, and 3.) Four clips 101^b (two on each side of the casing 101^a) guide the melting-pot and keep it from lateral movement as it is rocked forward and backward. Upon its return movement arm 99^a engages a lug 116 and draws the pot back. The pump-plunger 103 is operated through lever 104, link 105, and lever 106 by a weight 117, (see Fig. 4,) which is raised by a cam 107. The choker-valve is connected to the depending arm of a rock-shaft 108, which is moved

periodically by means of an arm 109, connecting-rod 110, cam-lever 111, and cam 112.

The width of the opening in the mold is adjusted each time a type is cast to correspond with the proper width of the body of the type, and each time a space or quad is cast the width of the mold is regulated, so that the lines of type will be properly justified when completed. As heretofore stated, the width of the mold is regulated by means of an elbow-lever 72, one end of which rides upon the upper edge of a rail 73, which has a vertical movement. The rail 73 is carried by a vertical rod 120, to the lower end of which is pivotally connected a depending rod 127, which rod is periodically urged upward by means of a clip 31^a on the lever 31. (See Fig. 6.) Said lever acts upon and compresses a spring 122 against a collar 123, which is fixed upon the rod 127. The rod 120 carries a shoulder 124, (see Figs. 4 and 6,) which, if uninterrupted, moves past the lower ends of a series of elbow-levers 125. These levers are similar to the levers 25 and have at the extremities of their horizontal arms feelers 126, which are acted upon by a special set of perforations in the paper strip 13. As the lever 31 descends it engages a fixed collar 121 and draws the rail 73 down preparatory to setting the mold for a new type.

The operation of the spacing mechanism is as follows: At each rotation of the crank-shaft the paper-carrying roller 14 is raised and one of the feelers 126 drops into a perforation in the paper, and its corresponding lever 125 is not moved. The lower end of said lever therefore remains in the path of the shoulder 124 and limits the upward movement of the rod 120 and the rail 73. The feelers of the remaining levers 125 are raised by the paper strip, and their depending arms, which are of various lengths corresponding to the various widths of mold required, are thrown out of the path of the shoulder 124. It will thus be seen that a single perforation for each letter or word space in a line will control the elevation of the rail 73 and through the lever 72 the opening of the mold, so that the latter will produce a type or quad of proper width.

The type are driven by the ejecting-pin 77 from the mold into a channel 130 in a fixed block 131. The ejecting-pin 77 is supported in a guide 77^a, attached to right-hand standard 2, and is operated by means of a long vertical lever 77^b, the lower end of which has a roller-pin running in cam-slot 86^a of the cam 86. Within the channel 130 is a plunger 132, which is periodically pushed forward to eject the type from the channel 130 by means of a lever 133. (See Figs. 1, 11, 12, 14, and 15.) The lever 133 is operated periodically by connections 134 and 135 with the arm 64, as shown in Fig. 1. Upon the front of the plunger 132 is a small spring 136, and in front of the block 131 is a pair of spring-pawls 137. The spring 136 is bowed outward nearly to the pawls 137, and its chief function is to

guide the type and press them gently against the pawls 137 as they are ejected from the mold, thus keeping the narrower type, which are ejected on edge, from falling over. The spring 136 also serves to hold the type frictionally and prevent their momentum from carrying them through the channel 130. The plunger 132 moves forward after the type is driven into the channel 130 and transfers the type onto ways 138 against the action of a movable stop 139, which is held against the type by the action of a cord and weight 140, Fig. 12. The springs 137 of the block 131 serve as pawls to prevent the type from re-entering the channel 130. In this manner the type are assembled a line at a time upon the ways 138. After a line of type is assembled upon the ways 138 it is transferred automatically to a galley 141 by means of the following devices: A vertical rod 142, arranged at the right-hand side of the machine, carries a sleeve or block 143, in which is mounted a shaft 144, carrying a pinion 145, which meshes with teeth upon the edge of the rack 142. (See Figs. 12 and 17.) Upon the shaft 144 is also mounted a block 146, which is normally held in a horizontal position by a spring 147, which presses the block against the pin 148 upon the sleeve 143.

Mounted in guides upon the swinging block 146 is a pair of slides 149, which are normally pressed against a central pin 150 by springs 151. These slides carry a pair of fingers 152, which when at rest lie beneath the ends of type on the ways 138. (See Figs. 11 and 12.) When the rack 142 is elevated, the line of type is raised upon the fingers 152, and when the fingers reach the galley 141 a fixed nut 153, upon a depending rod 154 from the sleeve 143, comes in contact with a lug upon the frame, and the upward movement of the sleeve and the parts supported by it is stopped. The rack, however, continues its upward movement and acting upon the pinion 145 rotates the block 146 through an angle of ninety degrees, more or less, which dumps the line of type from the fingers 152 into the galley, as shown in dotted lines in Fig. 13. The rack is then lowered, carrying the fingers down into position to receive the next line of type. As the fingers pass the partial line of type which may have been ejected from the mold during the operation just described they are spread apart, so as to pass around the type, by means of a pair of gravity-pawls 155. These pawls are pivoted to end plate 155^a. With the upward movement of the spring-fingers they swing out of the way, as clearly shown in Fig. 18. In the upper end of the rack 142 is a cam groove or slot 156, in which runs a crank-pin upon the outer end of an arm 157, which is fixed upon a rock-shaft 158. The shaft 158 carries a blade 159, (see Figs. 3 and 11,) which extends across the end of the galley. When the rack is raised, the slot 156 rotates the shaft 158 and throws the blade 159 into position (shown in dotted lines in Fig. 11) and

out of the way of the ascending line of type. After the line of type is deposited in the galley the blade is rotated into position, (shown in full lines in Fig. 11,) thus forcing the matter in the galley backward to provide room for the next line. A retreating friction-block 160 or some equivalent device is used to prevent the types from falling or moving too far in the galley.

When it is desired to produce leaded matter, I use a leading device. (Shown only in Figs. 11 and 12.) Referring to these figures, 161 indicates a magazine in which the leads 162 are placed. This magazine is arranged just above and adjacent to the ways 138, upon which the lines of type are assembled. A plunger 163 operates to push the lowermost lead from the magazine onto supporting-springs 174, and it is there sustained until the line of type is raised, when the lead is transferred with the type to the galley. The plunger 163 is operated by a lever 164, which is connected with a rock-shaft 158 by means of a link 165 and rock-arm 166.

The rack 142 is raised once for each line of type, its upward movement being regulated to commence immediately after the last type is inserted in the line. Referring to Figs. 2 and 3, it will be seen that the rack 142 is connected by a link 167 to an arm 168 upon a shaft 169, mounted in bearings upon the main frame. The shaft 169 carries a ratchet-wheel 170, which is driven by a pawl 171, which in turn is driven by a crank-pin 172 upon the end of the cam-shaft. The ratchet-wheel 170 has one long tooth 173, in which the pawl plays idly after each revolution. When, however, the ratchet-wheel is started forward a single tooth, the pawl engages the short teeth and turns the shaft 169 through a complete revolution, thereby raising and lowering the rack 142.

I shall now describe the devices by means of which the shaft 169 is started in order to raise the rack 142 after the completion of each line of matter.

Referring particularly to Figs. 1 and 4, 180 indicates a lever pivoted upon the base-plate 1, the upper end of which carries a cross-rod 181, which rests in notches 182 in the depending legs 50 of the special slides 46 when said slides are in their lowest positions. Upon the lever 180 is a sleeve 183, which has a toe 184, engaging a notch in the end of a lever 185, pivoted to the main frame. Upon the right-hand side of the sleeve 183 is a shoulder 184^a, which is engaged by a projection 185^a upon the T-shaped striker 28 when the lever 180 is permitted to swing to the right by reason of the bar 181 dropping into the notches 182. Upon the left end of the shaft 169 is a disk 186, which has upon its periphery a shoulder 187, which is normally in contact with a stop projection 188 upon a lever 189. This disk also has a shoulder 190, which is engaged by a pawl 191, pivoted upon the lever 189. Near the lower end of this lever is a cam-slot 192,

into which extends a pin 193 from the lever 185. The upper end of the lever 189 is in contact with one end of a rod 194, the other end of which is connected to the rod 110, which operates the choker-valve.

The operation of the devices last described is as follows: It will be remembered that each time a letter or space is to be cast one or two perforations in the paper strip throw into operation one or two of the slides 27. At the end of each line, however, there is a space on the strip without perforations, and during the passage of this space none of the slides 27 are operated. It will therefore be seen that each time that a type or space is cast one or both of the slides 46 will be raised by slides 27, one effect of which is to throw the bar 181 out of the notches 182 and at the same time to throw the shoulder 184^a out of the path of the projection 185^a upon the striker 28. When none of the slides 27 are operated to select a die, the slides 46 remain in their lowermost position and the bar 181 lies in the notches 182, thus permitting the projection 185^a upon the striker 28 to engage the shoulder 184^a upon the sleeve 183, whereby the sleeve is carried up with said striker. The toe 184 upon the sleeve raises the lever 185, which, operating upon the cam-slot 192, moves the lever 189. One effect of this movement is to throw the stop 188 to the right, away from the shoulder 187, and at the same time to start the shaft 169 by means of the pawl 191. The shaft is then carried around, as heretofore described, by the constantly-moving pawl 171. Another effect of the movement of the lever 189 is to throw the rod 110 out of engagement with the lever 111, leaving the choker-valve closed, and thus preventing any of the type-metal from escaping while the blank portion of the paper strip is passing the feelers. As soon as the feelers are operated to select the first type of a succeeding line the various parts of the starting mechanism are brought back to their normal positions, as shown in Fig. 4, by suitable springs, (not shown,) and they are not again operated until the end of the line is reached.

From the foregoing detailed description of the machine its mode of operation will be clear, and anything more than a general description of this operation will not be necessary. The die-plate is normally held as nearly as possible with its center opposite the casting-point. In the present instance there are ten rows of dies in each direction, and the die which is in the fifth rows, counting from the top and the left-hand side, is the one normally opposite the casting-point, as shown in Fig. 1. By arranging the dies which are used most frequently around this central die a minimum amount of movement of the die-plate is secured. The various operations performed by the machine in producing a finished type may be enumerated as follows, the various movements of the parts in the machine being properly timed by means of the

cams, as will be understood by those skilled in the art:

The feelers 24, operating through the slides 27, locate the die-plate so as to bring the desired die opposite the casting-point. At the same time the feelers 126, operating through the levers 125 and the movable rail 73, adjust the mold to the proper width for the letter or space selected. The mold is then clamped by the plunger 79, and the melting-pot is moved up to the rear of the mold, while the impression-pin simultaneously sets the die firmly upon the forward end of the mold. The pump is then operated to eject the metal into the mold, after which the melting-pot and the clamping-pin 79 are withdrawn. The mold then travels to the right and is automatically opened by the lever 75, after which the type is driven from the mold into the channel 130. Next the plunger 132 forces the type out onto the ways 138, upon which the line of type is assembled. After the last type of a line is cast the lifting mechanism is started by means of the parts 181 to 193, inclusive, and the line of type is carried upward and deposited in the galley.

The paper strip described (upon which the matter to be composed is to be preliminarily represented by a series of perforations) does not form part of my invention and is only one form of "preliminary representation" which I may use. Another form, which is also old, consists in a cylinder having movable pins which may be set to represent matter. My present machine may be controlled by these or any equivalent devices, and I shall hereinafter use the term "controller" as a broad term to include all of such controlling agents.

It will be evident to those skilled in the art that the "feelers" in the present invention may be adapted to interpret any form of controller. I prefer, however, to use a paper strip, for the reason that it may be stored for future use, such as running off subsequent editions of books.

Referring to the devices for regulating the width of the mold, it will be obvious that instead of using levers or stops 125 of different lengths the same effect may be obtained by having levers of uniform length and a series of steps upon the part 124. This would be an obvious reversal. The essential feature is a "stepped" connection between the feelers and the device for regulating the mold.

In the foregoing specification I have confined myself to the description of my invention as applied to a type casting and composing machine. It will be evident, however, that some of the features of the invention, such as the die-selecting devices, may be used in matrix and type-writing machines, while other features, such as the mold-operating and type-assembling mechanisms, may be used in type-casting, type-setting, and linotype machines.

It will also be evident that various modifi-

cations of the invention may be made without departing from the spirit thereof. Hence I do not intend to limit my claims to the precise construction and arrangement of parts shown and described.

What I claim is—

1. The combination with a group of dies and a die-carrier movable to center selected dies, of a set of slides having cam-surfaces, means for rendering certain of said slides operative, and mechanism operated by said cam-surfaces and connected to move the die-carrier, substantially as described.

2. The combination with a group of dies and a die-carrier movable in two directions to center selected dies, of two sets of slides having cam-surfaces, means for rendering certain of said slides operative, and mechanism operated by said cam-surfaces and connected to move the die-carrier, substantially as described.

3. The combination with a group of dies and a die-carrier movable to center selected dies, of two rocking arms connected to move the die-carrier, yokes connected to the rocking arms, two sets of slides having cam-surfaces adapted to move the yokes, and means for selecting and operating the slides, substantially as described.

4. The combination with a carriage movable in guides upon the frame and a die-carrier having a series of dies and movable in guides upon the carriage, of two sets of slides having cam-surfaces, means for selecting and operating said slides, and connections between said sets of slides and the die-carrier and carriage respectively, substantially as described.

5. The combination with a die-carrier having a series of dies and movable in two directions to center selected dies, of a slide having a pin-and-slot engagement with the die-carrier for moving it in one direction, a yoke connected with said slide, a second yoke and connections for moving the die-carrier in the other direction, two sets of slides having cam-surfaces for moving the yokes, and means for selecting and operating the slides, substantially as described.

6. The combination with a carriage movable in guides upon the frame and a die-carrier having a series of dies and movable in guides upon the carriage, of a slide having a pin-and-slot engagement with the die-carrier, a rocker-arm connected to said slide by a link, a second rocker-arm connected by a link to the carriage, yokes connected to said rocker-arms, two sets of slides having cam-surfaces for moving the yokes, and means for selecting and operating the slides, substantially as described.

7. The combination with a group of dies and a die-carrier movable to bring selected dies to a common point, of selecting devices consisting of a controller, feelers upon which the controller operates, slides adapted to be brought into action by the feelers, a striker

for operating the selected slides, and connections between the carrier and the slides, substantially as described.

8. The combination with a group of dies and a die-carrier movable to bring selected dies to a common point, of selecting devices consisting of a controller, feelers upon which the controller operates, corresponding slides constructed to move the die-carrier, a constantly-reciprocating striker, movable shoes or parts adapted to be interposed by the feelers between the striker and the slides to select the latter, and connections between the carrier and the slides, substantially as described.

9. In die-selecting devices the combination with a controller, of a series of levers having feelers for engaging with the controller and movable shoes, a corresponding series of slides having cam-surfaces, and a constantly-reciprocating striker, the shoes of the levers being arranged to be interposed between the striker and the slides by the action of the controller upon the feelers, substantially as described.

10. The combination with a controller of a vertically-reciprocating frame in which the controller is mounted and a pawl for feeding the controller forward, two sets of elbow-levers having horizontal arms provided with feelers upon which the controller operates, and depending arms provided with sliding shoes, of two sets of slides provided with cam-surfaces and arranged opposite their respective levers, and a reciprocating striker, the said parts being arranged and operating substantially as described.

11. In die-selecting mechanism the combination with a group of dies and a die-carrier, of two sets of slides having cam-surfaces for moving the carrier to center selected dies and two special slides provided with means for returning the slides of said sets to their normal positions, a striker for operating all of said slides, and connections between the die-carrier and the slides, substantially as described.

12. In die-selecting mechanism the combination with a group of dies and a die-carrier, two sets of slides having cam-surfaces for moving the carrier to center selected dies, and a striker for lifting said slides, of two special slides having slots for locking the dies in their normal position, foot-plates for restoring the slides to their normal positions, depending legs adapted to be engaged by the striker-plate on its return movement, and connections between the die-carrier and the slides, substantially as described.

13. The combination with a group of dies and a die-carrier, rocking yokes, and connections between said yokes and the die-carrier for centering selected dies of the group, of two sets of slides having cam-surfaces to engage with the yokes, special slides arranged adjacent to said slides and having foot-plates extending through and engaging the same,

depending legs upon said special slides, and a striker arranged to raise selected slides to center the dies and to depress the special slides to restore the parts to their normal positions, substantially as described.

14. The combination with a mold having sections which are relatively movable to vary the mold-opening, of a lever operatively connected to said sections, and means for adjusting said lever, substantially as described.

15. The combination with a mold having a bodily movement to and from the casting-point, and having sections sliding upon each other to vary the mold-opening, of a lever operatively connected to said sections, and means for adjusting the lever, substantially as described.

16. The combination with a mold having sections which are relatively movable to vary the mold-opening, of a lever having its fulcrum and shorter arm engaging said mold-sections, and devices for moving the longer arm of the lever, substantially as described.

17. The combination with a mold having two parts relatively movable to vary its opening, of a lever having its fulcrum and shorter arm engaging said sections and its longer arm engaging an adjustable guide or rail, substantially as described.

18. The combination with a mold having sections which are relatively movable to vary the mold-opening, of a lever operatively connected to said sections, and means for controlling the lever consisting of a movable rail or guide, means for moving said guide, and a series of stops for limiting its movement, substantially as described.

19. The combination with a mold having relatively movable sections of an elbow-lever pivoted to one mold-section and engaging the other section, and devices for controlling the lever consisting of a guide, a rod connected to the guide, and a series of stops for intercepting the movement of the rod at different points, substantially as described.

20. The combination with a mold having relatively movable sections, of a lever pivoted to one section and engaging the other section, a movable guide for controlling the position of the lever, means for imparting movement to said guide, a series of movable stops for limiting the movement of the guide, and a controller for controlling the stops, substantially as described.

21. The combination with a sectional mold and a reciprocating rod, of connections between the rod and the mold for varying the opening of the latter, a series of levers of different lengths arranged to variably intercept the reciprocating rod, and a vertically-reciprocating controller for controlling the movement of the levers, substantially as described.

22. The combination with a sectional mold, the elbow-lever operatively connected with the mold, and the guide or rail, of the rod connected with the guide and having a shoulder, a fixed collar, a spring and means for

compressing the spring to lift the rod and rail, a controller, a series of elbow-levers having depending arms of different lengths and horizontal arms normally in the path of the controller, and means for reciprocating the controller, substantially as described.

23. The combination with the frame, of a sectional mold arranged to move between the casting-point and the ejecting-point, with means for automatically and variably adjusting the width of the mold at the casting-point, means for clamping the mold - sections together at the casting-point, and means for opening the mold at the ejecting-point, substantially as described.

24. The combination with the frame having a guide-groove and a mold adapted to slide bodily in said groove and having sections sliding upon each other, of a lever pivoted to one mold-section and bearing upon the other mold-section, and means for operating said lever to open the mold at the ejecting-point, substantially as described.

25. The combination with the main frame, a sectional mold movable in guides upon said frame from the casting-point to the ejecting-point, and an ejecting-plunger movable transversely to the line of movement of the mold and adapted to drive the type from the mold, substantially as described.

26. The combination with the melting-pot, the mold movable in guides from the casting-point to the ejecting-point, a plunger for ejecting type from the mold, ways upon which a line of type is assembled, a galley, and means for transferring an assembled line from the ways to the galley, substantially as described.

27. The combination with the melting-pot, the mold movable in guides from the casting-point to the ejecting-point, a block having a channel opposite the ejecting-point, a plunger for driving the type endwise into said channel, ways upon which the type are assembled in a line, and a plunger for driving the type laterally from said channel onto said ways, substantially as described.

28. The combination with the melting-pot, the mold, the ejecting-pin and the ways upon which the line is assembled, of the block having a channel, a plunger in the channel, a spring on the face of the plunger, and spring-pawls at the outer edge of the channel, whereby the type is ejected from the mold and transferred to the ways, substantially as described.

29. The combination with the ways for receiving the type and with a galley, of a transferring device consisting of a pair of fingers adapted to receive the line of type and devices for elevating and rocking the fingers whereby said line is dumped into the galley, substantially as described.

30. The combination with the ways and the elevating-fingers having movable supports, of means for elevating the fingers to lift a line of type, and pawls arranged to spread the fingers as they are lowered to receive the suc-

ceeding line, whereby the fingers may pass around the assembled type of said succeeding line, substantially as described.

31. The combination with the ways and devices for assembling a line of type thereon, of an elevating-rack, a sleeve upon the rack and carrying a pinion in mesh with the teeth of said rack, a swinging block upon the shaft of the pinion, a pair of fingers carried by said block, and means for stopping the sleeve opposite the galley whereby the block is revolved and the type dumped upon the galley, substantially as described.

32. The combination with the ways, and means for assembling a line of type thereon, of an elevating-rack, a sleeve thereon, a pinion mounted on the sleeve and in mesh with the rack, a swinging block connected with the pinion, a pair of spring-actuated slides having projecting fingers and moving in guides upon said block, means for elevating the rack, a stop to arrest the sleeve opposite the galley and pawls opposite the ways arranged to spread the fingers as the rack descends, substantially as described.

33. The combination with the elevating-rack, the fingers for elevating the type and means for dumping the type into the galley, of the rock-shaft at the mouth of the galley having an arm, a pin on said arm engaging a cam upon the rack, and a pivoted leaf upon said rock-shaft extending across the galley, whereby when the rack is raised the leaf swings away from the galley, and when the rack is lowered the leaf swings into the galley to feed the assembled matter forward, substantially as described.

34. The combination with ways, and means for assembling a line of type thereon, of an elevator arranged to transfer the type from the ways to a galley, a leading device consisting of a magazine for leads, and a plunger arranged to feed one lead at a time from the magazine, and connections between the elevator and the leading device whereby the latter is operated once for each line of type assembled, substantially as described.

35. In a type-casting and composing machine, the combination with a galley and mechanism for casting and assembling lines of type, of an elevator for transferring type to the galley, spring-supports in the path of the elevator, and a leading device constructed and arranged to feed leads onto said supports, whereby they are carried up by the lines as they are transferred to the galley, substantially as described.

36. The combination with ways, means for assembling a line of type thereon, a galley and mechanism for transferring the completed lines to the galley, of a shaft for operating said mechanism, a ratchet-wheel upon the shaft having a series of short teeth and a long tooth, a constantly-reciprocating pawl arranged to play idly in the long tooth during the assembling of the line, and devices ar-

ranged to start said ratchet-wheel upon the completion of the line, substantially as described.

37. In a type-casting and composing machine the combination with ways, means for assembling a line of type upon said ways, a galley and mechanism for transferring the lines of type to the galley, of devices for starting said transfer mechanism into operation at the completion of each line, consisting of a ratchet-wheel having short teeth and a long tooth, a constantly-moving pawl normally playing idly in the long tooth, a pair of special slides, a lever having a cross-rod adapted to

rest in notches in said slides, a reciprocating 15
striker, a sleeve upon the lever adapted to be engaged by the striker, and connections between the said sleeve and said ratchet-wheel whereby when the sleeve is elevated by the 20
striker the ratchet-wheel is started, substantially as described.

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

FRANK AMOS JOHNSON.

Witnesses:

R. H. SANFORD,

E. A. HENDRICKSON.