

No. 705,525.

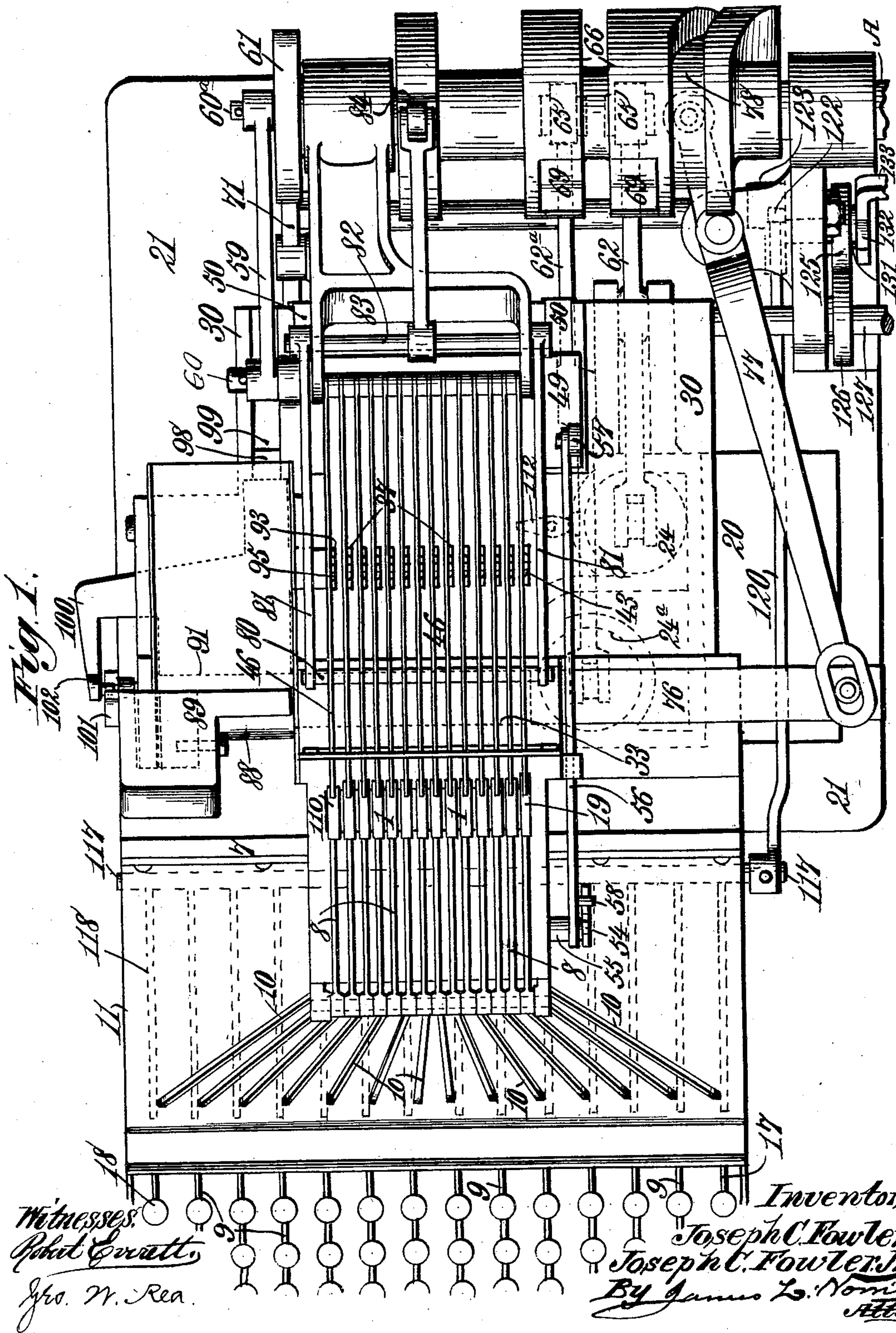
Patented July 22, 1902.

J. C. FOWLER & J. C. FOWLER, JR.
TYPE CASTING AND SETTING MACHINE.

(Application filed Aug. 16, 1901.)

(No Model.)

6 Sheets—Sheet I.



No. 705,525.

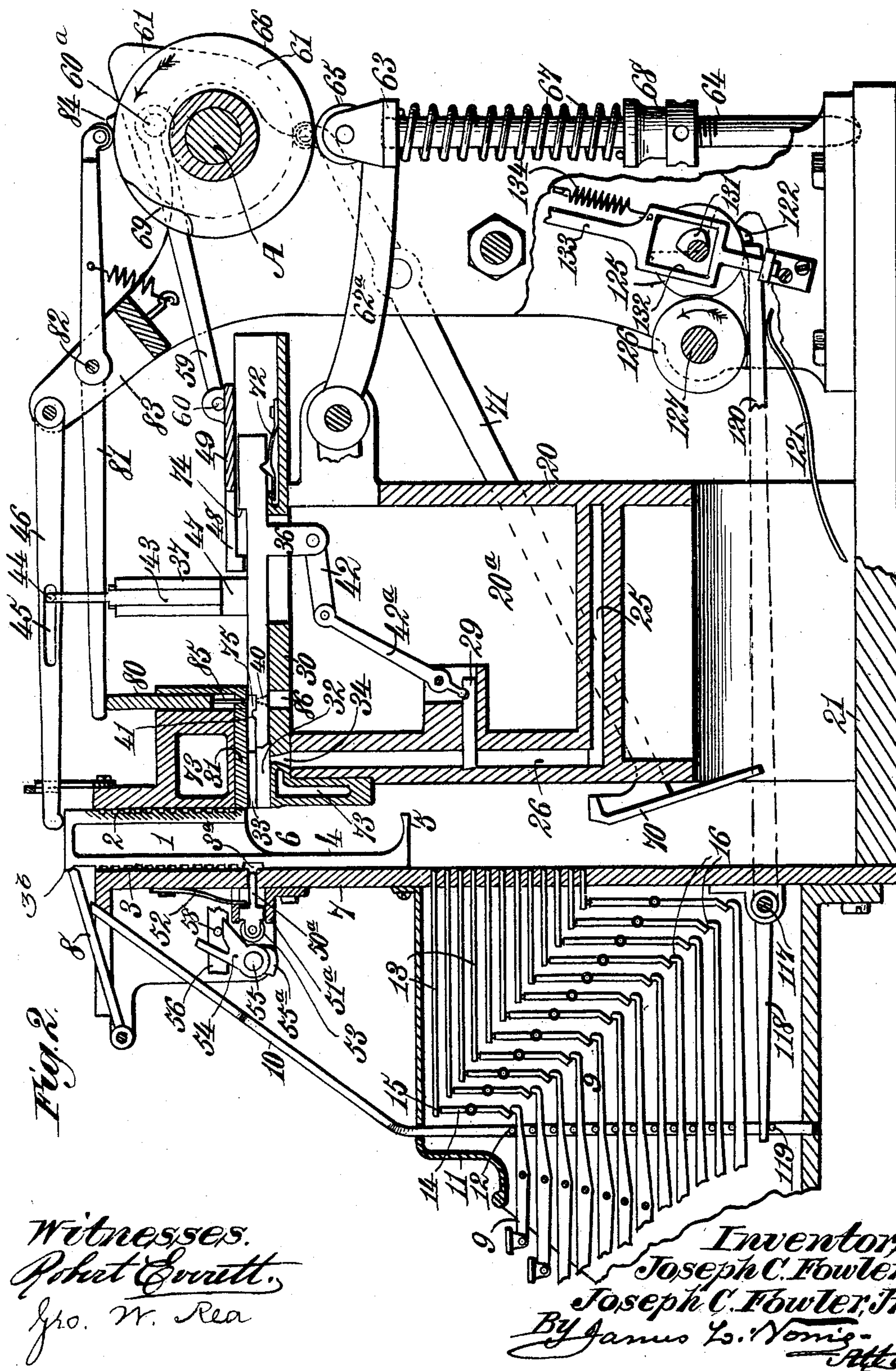
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(No Model.)

6 Sheets—Sheet 2.



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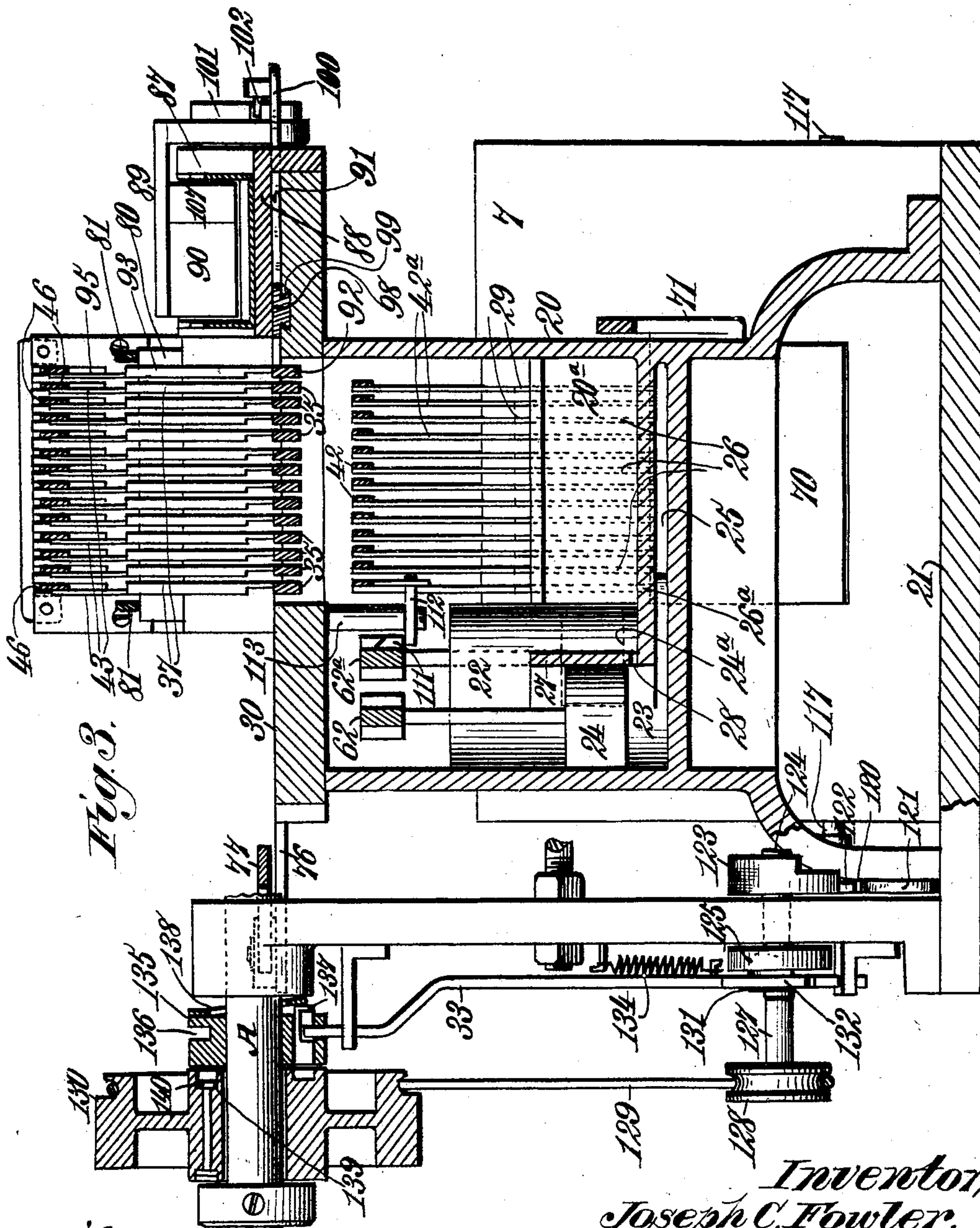
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6 Sheets—Sheet 3.



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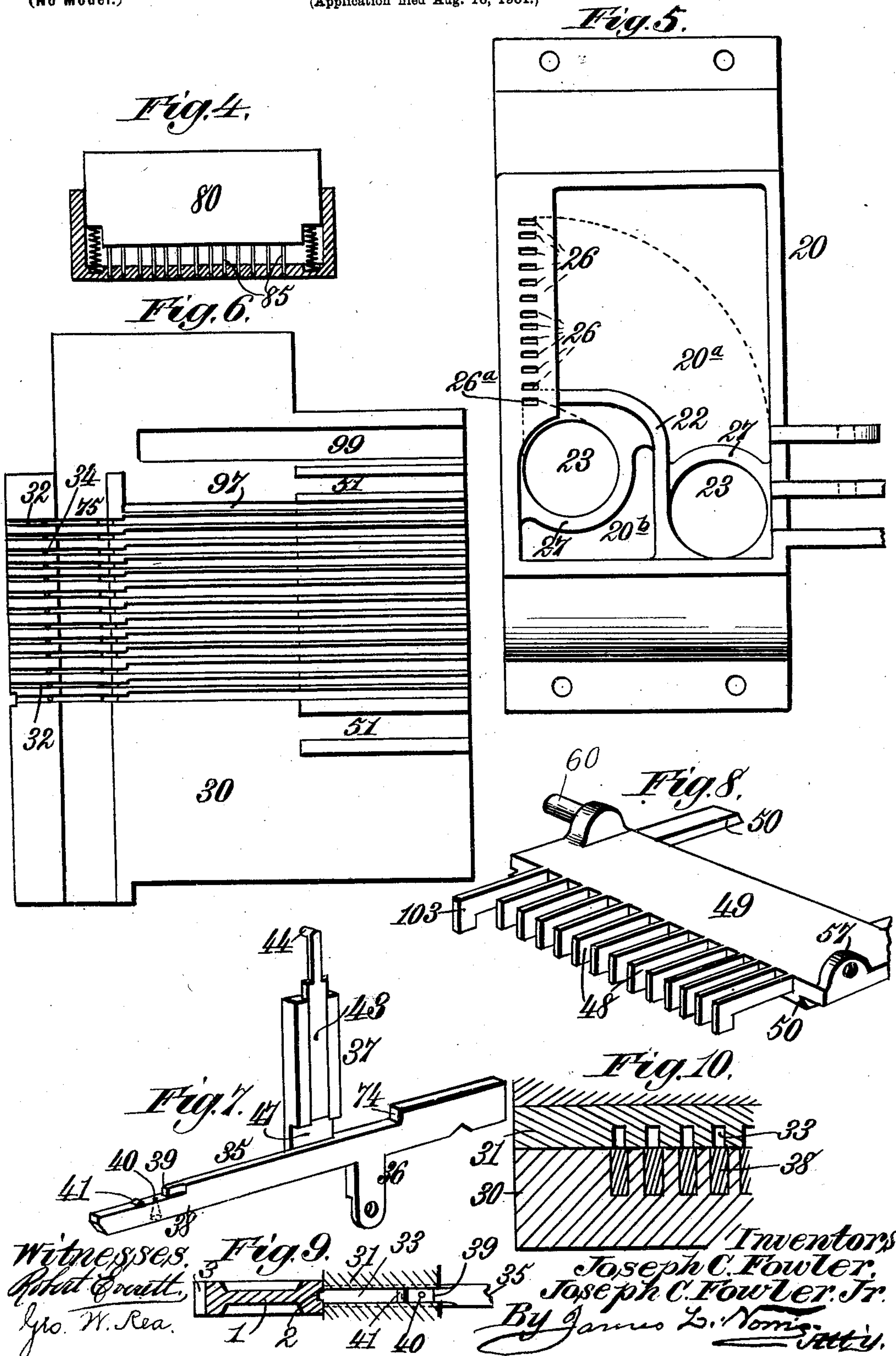
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6 Sheets—Sheet 4.



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TYPE CASTING AND SETTING MACHINE.

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(No Model.)

6 Sheets—Sheet 5.

Fig. 11.

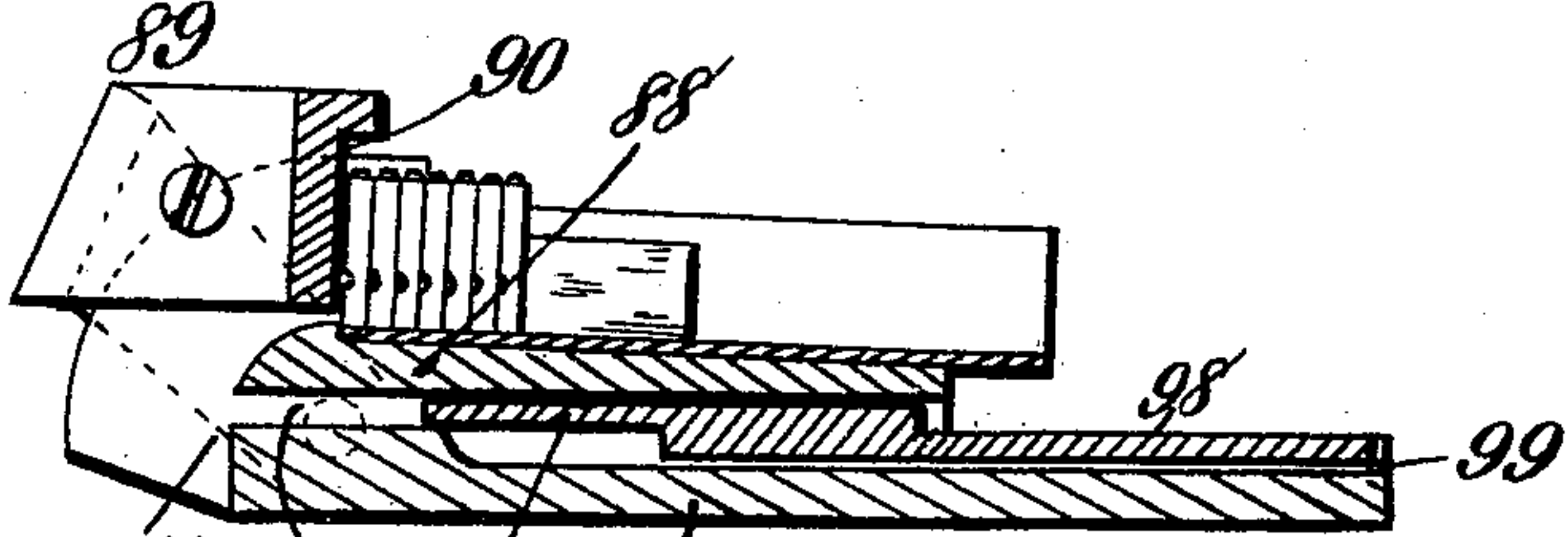


Fig. 12.

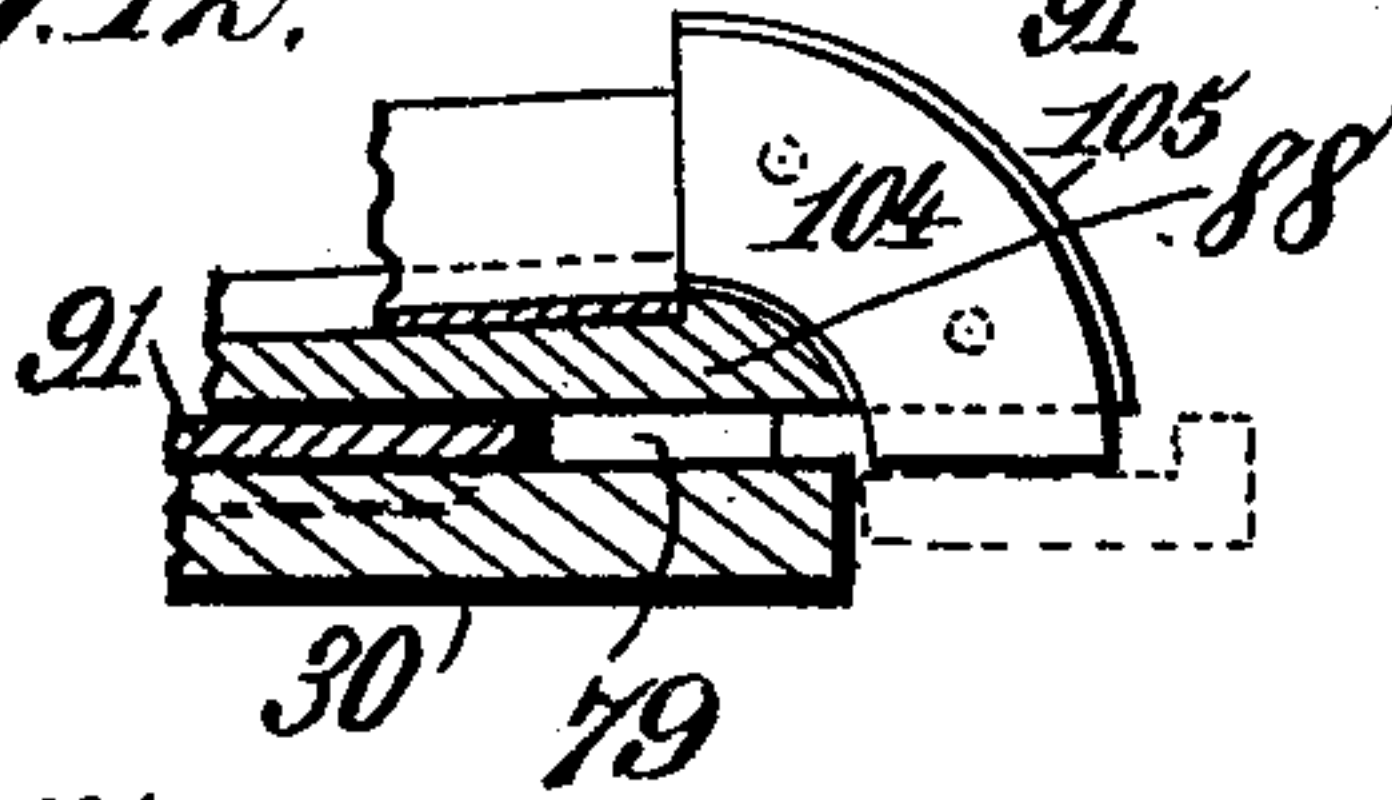


Fig. 13.

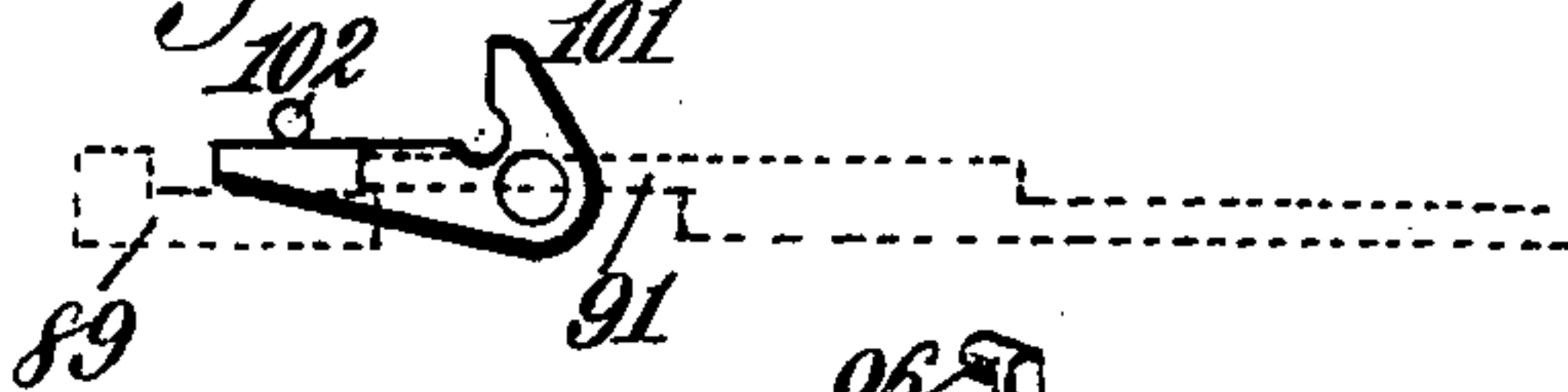


Fig. 14.

Fig. 15.

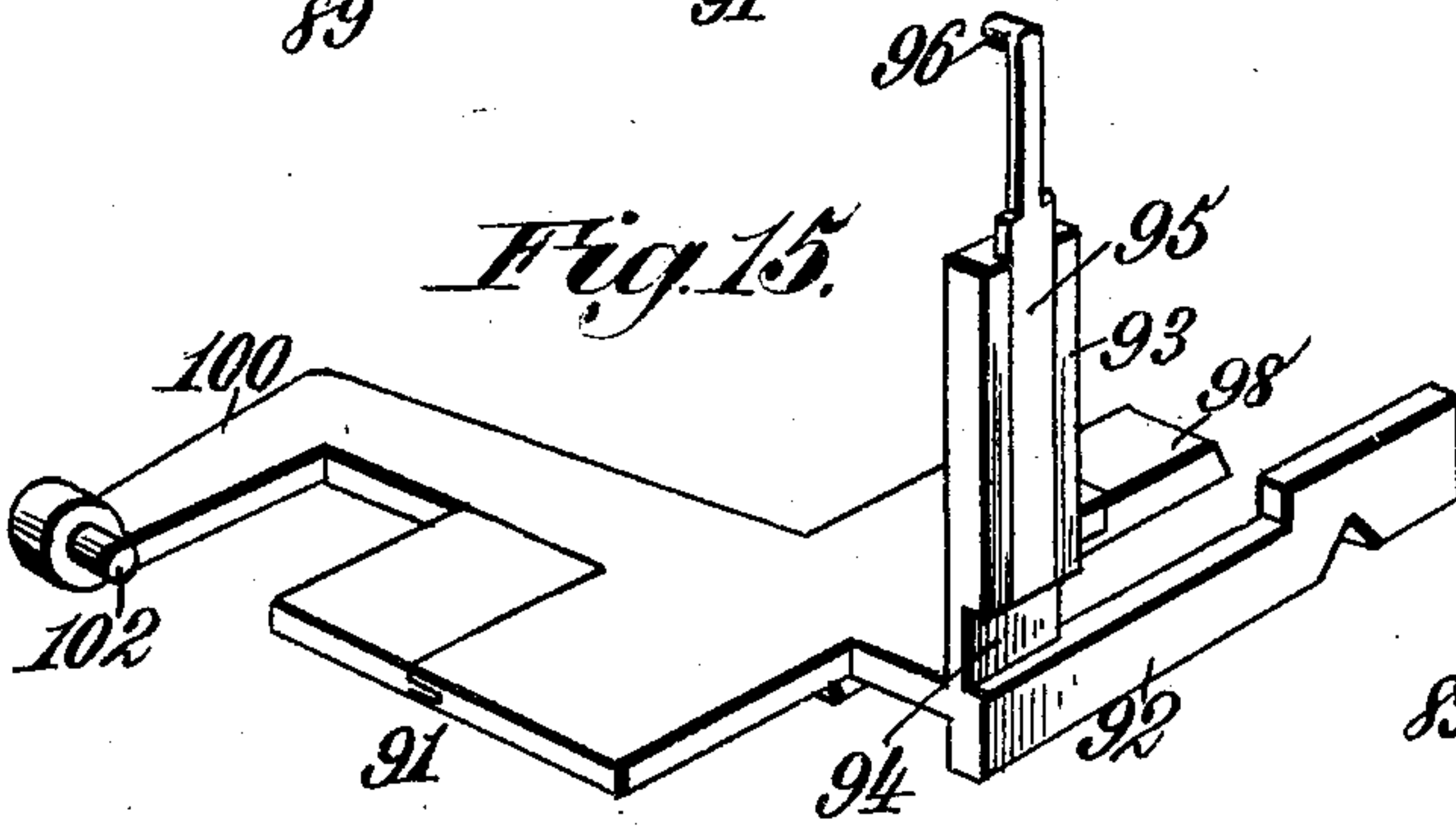


Fig. 16.

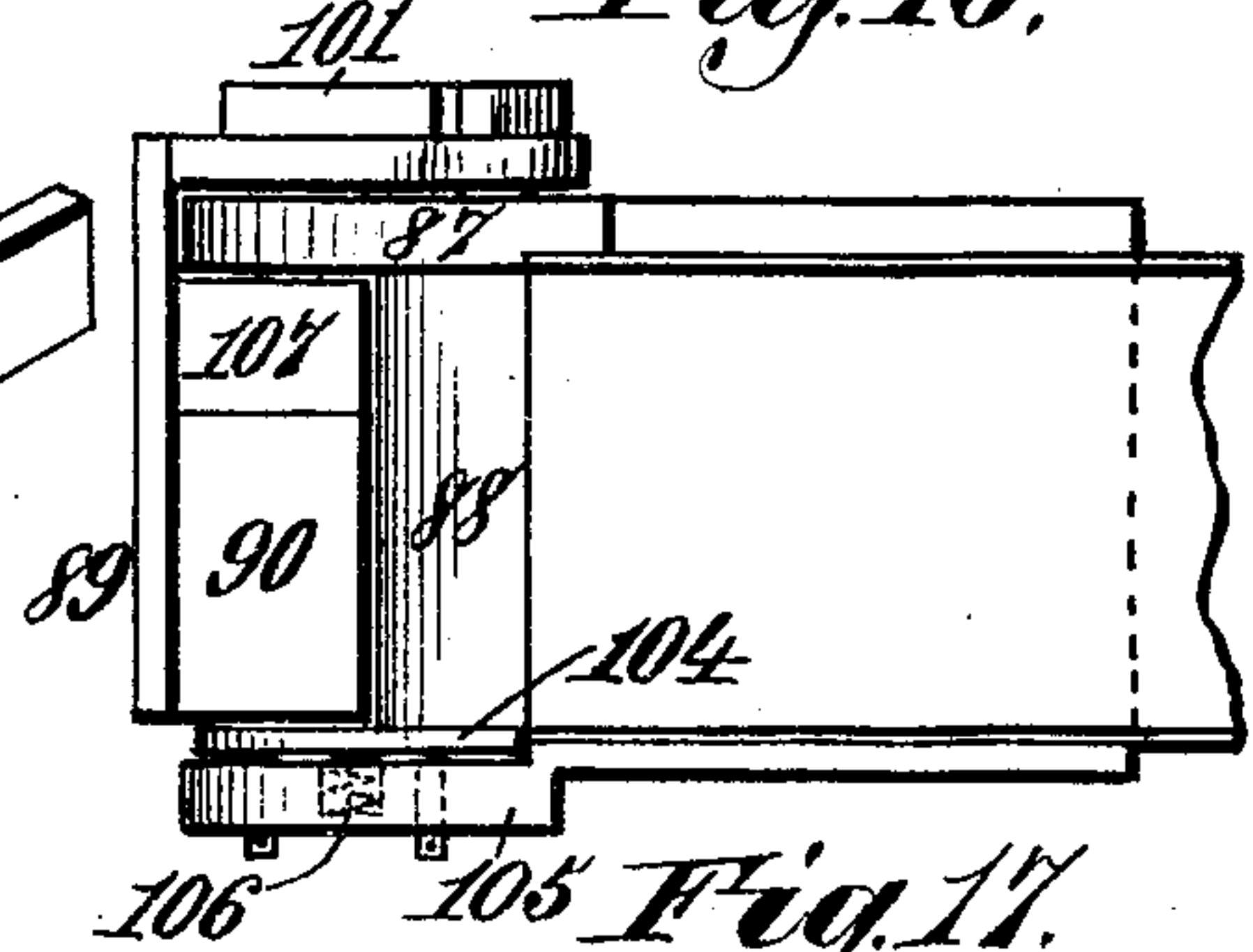


Fig. 18.

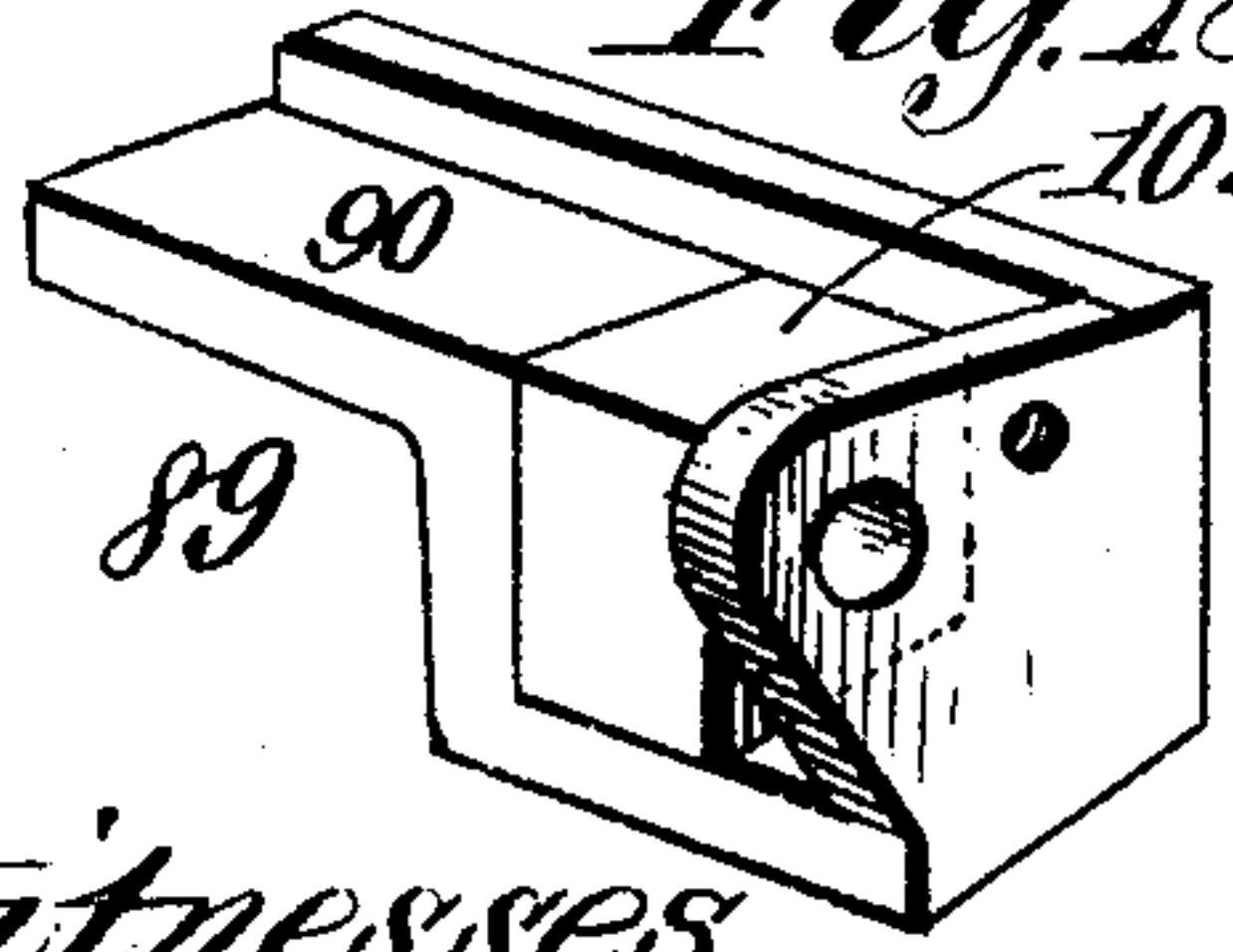
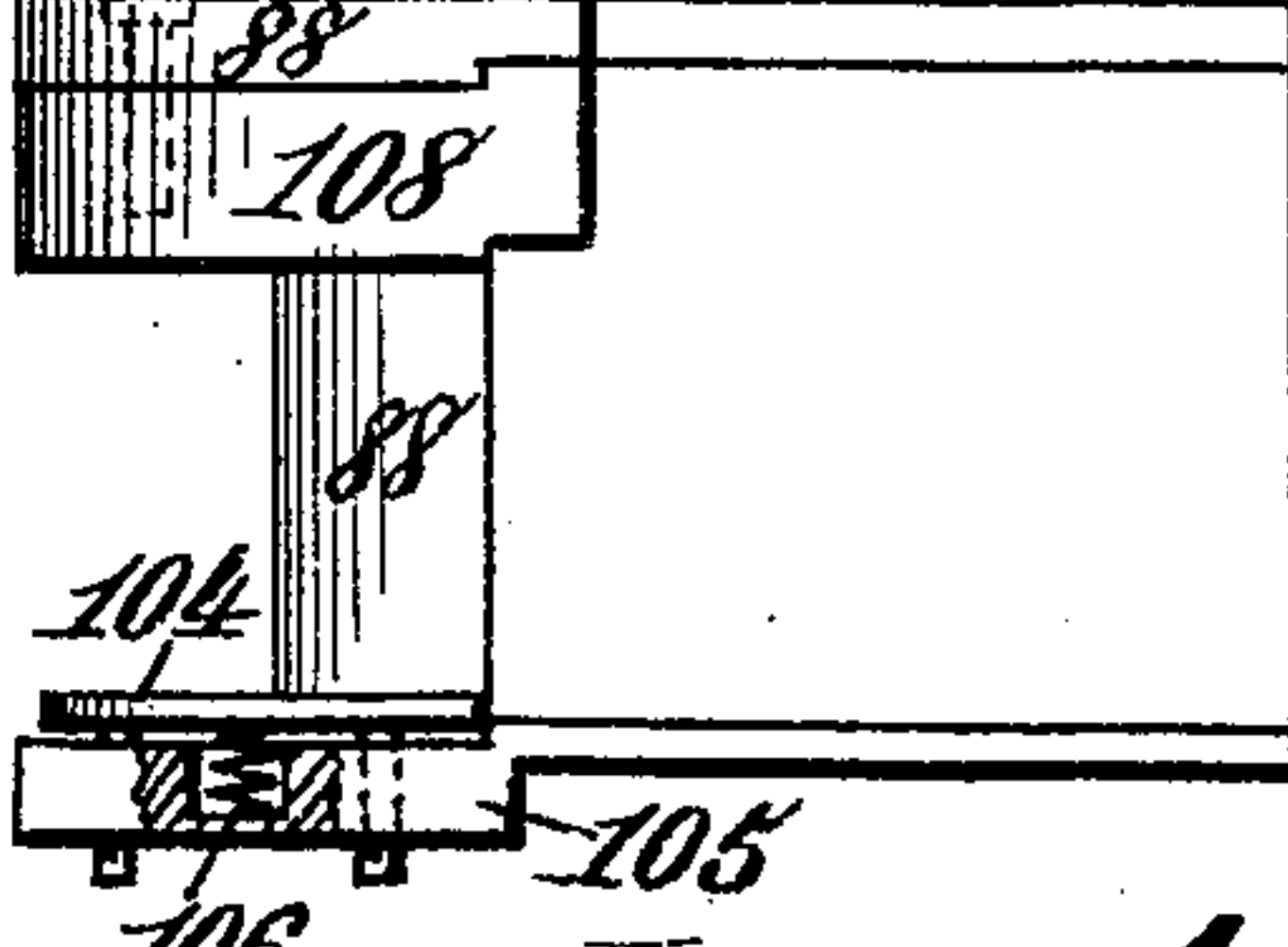


Fig. 19.



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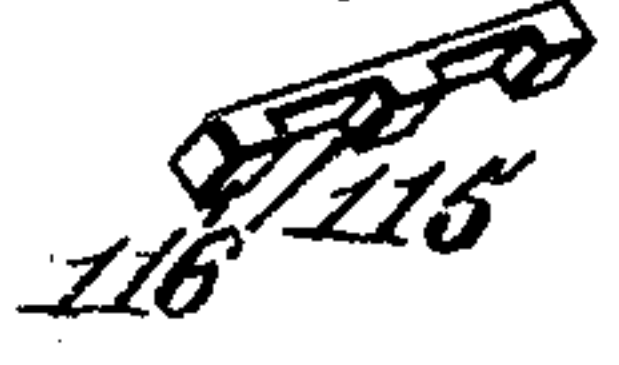
Atty.

Witnesses,

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Fig. 28.



No. 705,525.

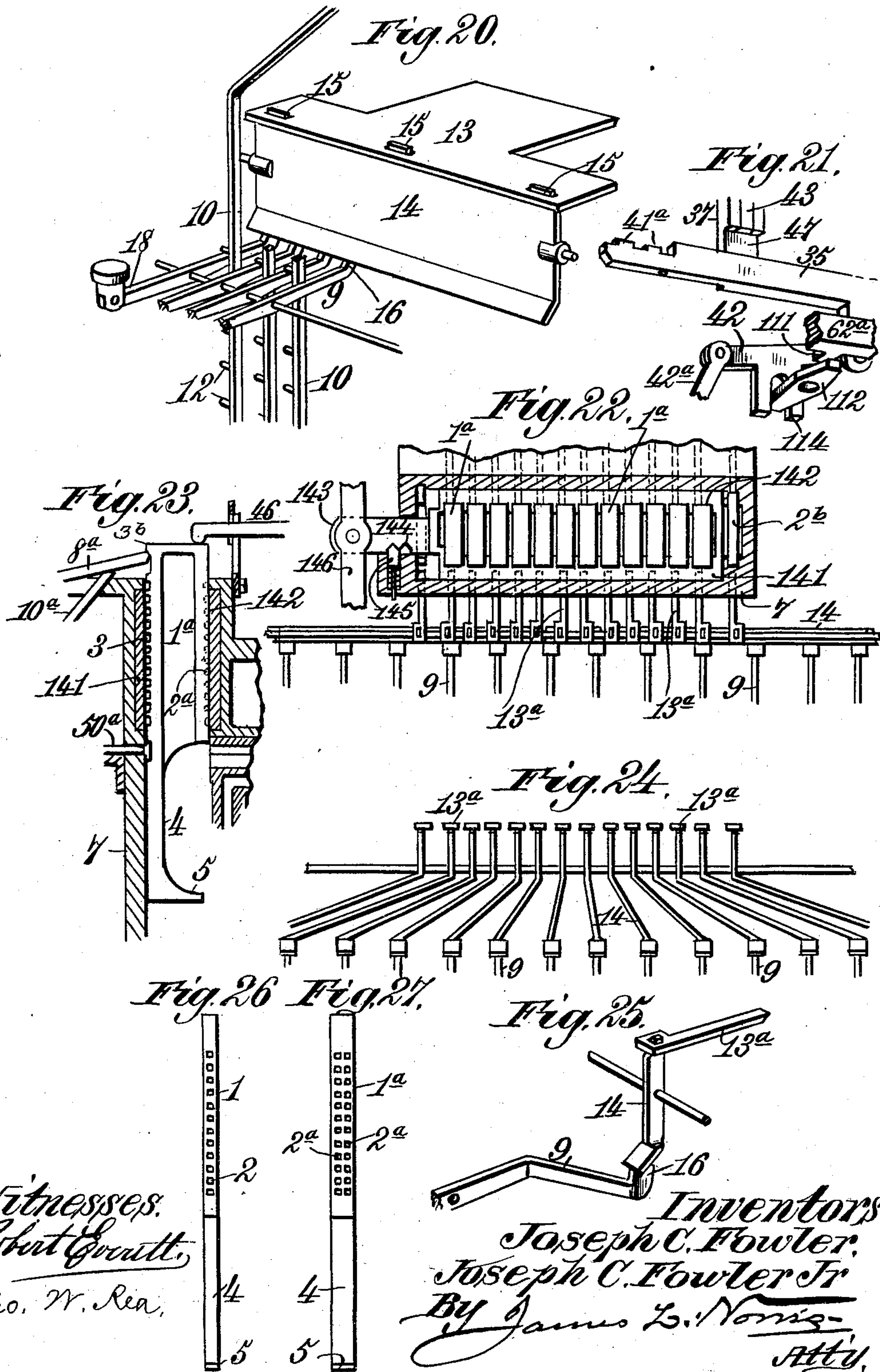
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TYPE CASTING AND SETTING MACHINE.

(Application filed Aug. 16, 1901.)

(No Model.)

6 Sheets—Sheet 6.



UNITED STATES PATENT OFFICE.

JOSEPH C. FOWLER AND JOSEPH C. FOWLER, JR., OF BALTIMORE, MARYLAND; ASSIGNORS TO TYPOGRAPHIC DEVELOPMENT COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

TYPE CASTING AND SETTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 705,525, dated July 22, 1902.

Application filed August 16, 1901. Serial No. 72,248. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH C. FOWLER and JOSEPH C. FOWLER, Jr., citizens of the United States, residing at Baltimore, in the State of Maryland, have invented new and useful Improvements in Type Casting and Setting Machines, of which the following is a specification.

Our invention relates to improvements in type casting and setting machines, and has for its object to provide a machine of improved construction and operation adapted to cast single or independent types, assemble them in a composed line or lines, justify such line or lines, and transfer them to a galley or printing-form.

The invention has also for its object to improve the elements and the mechanisms and mode of operation of the elements performing each of the stated operations. It has for its further object to provide a machine possessing elements and means whereby types of different font may be selectively cast.

To the ends stated the invention consists in the machine hereinafter described and illustrated, in the several combinations of elements recited in the appended clauses of claim, in the mode of operation of the machine as an entirety, in the mode of operation of the several mechanisms embodied in the machine, in the novel elements embodied in the machine, and in the novel arrangement of elements.

That which we regard as new in respect of the elements, their arrangement, combination, and mode of operation will be set forth in the appended clauses of claim.

In the accompanying drawings, which illustrate our invention, Figure 1 is a top plan view of the machine; Fig. 2, a vertical sectional view with the several elements and mechanisms of the machine disposed in position to begin a cycle of operation. Fig. 3 is a transverse section taken through the molten-metal pot; Fig. 4, a detail of the molten-metal-delivering-orifice clearer. Fig. 5 is a detail illustrating the arrangement of the molten-metal pot and the several distinct delivery-ducts leading therefrom. Fig. 6 is a detail plan of the channeled guide-plate for

the mold-closing and cast-type-extracting slides and other elements. Fig. 7 is an enlarged perspective view of one of the mold-closing and cast-type-extracting slides; Fig. 8, a detail perspective of the element for retracting the several slides; Fig. 9, a sectional view of a matrix closing the front end of a mouth of the mold and related parts in the position occupied during the casting of the type. Fig. 10 is a detail sectional view of a portion of the mold, showing the relative relation thereto of the mold-closing and cast-type-extracting slides on an enlarged scale. Fig. 11 is a sectional view of the type-line-transferring device, and it illustrates also the line-assembling channel. Fig. 12 is a fractional view, partly in section, partly in elevation, and partly in dotted lines, of the elements shown in Fig. 11. Fig. 13 is a detail showing in dotted lines the type-transferring device in position to receive a line of type, the type-line ejector, and the corresponding position of the means for shifting the line-transferrer to deposit a line of type in the galley or printing-form. Fig. 14 is a similar view showing the position of the parts when the line-transferrer has been shifted. Fig. 15 is an enlarged perspective of the type-line ejector and adjacent parts; Fig. 16, a top plan view of the line-transferrer and adjacent parts; Fig. 17, a detail view showing the application of a filling-block utilized to permit the composition and justification of type-lines of reduced length. Fig. 18 is a detail perspective view of the line-transferring device, illustrating the incorporation therein of a removable floor-section which is utilized when a line of the full capacity of the transferring device is composed. Fig. 19 is a detail perspective of the fork connected to the line-transferrer and which is actuated to shift the latter from its line-receiving to its line-depositing position. Fig. 20 is a detail perspective view of a matrix-arresting slide and connections whereby the same is thrown into action by finger-key mechanism; Fig. 21, a detail perspective of means whereby the operation of the plunger of the space-metal chamber of the casting-pot is withheld when a character-type is being cast.

Fig. 22 is a detail of a modified arrangement in which the matrices are arranged in a shift-able carrier, so that either of a plurality of fonts of characters with which the matrices
 5 utilized in this arrangement are provided may be brought into coöperative relation with the mold-mouths. Fig. 23 is a detail, partly in section and partly in elevation, illustrating the shiftable matrix-carrier and a matrix
 10 arranged therein, the latter being in side elevation. Fig. 24 is front view of the matrix-arresting slides and actuating means which we prefer to employ in the modified arrangement shown in Fig. 22. Fig. 25 is a perspec-
 15 tive view of a detail of this mechanism. Fig. 26 is an elevation of a matrix having a single line of characters of the same font; Fig. 27, a similar view of a matrix having like characters thereon of different font. Fig. 28 is a
 20 perspective view of a novel spacer which we prefer to cast in the machine.

The improved matrices which we prefer to utilize in the described machine constitute an important factor in the simplification and
 25 compactness of the mechanism. These matrices, one of which is shown in elevation in Fig. 26 of the drawings, consist of a bar 1, of metal or other suitable material, having formed in one face thereof a series of intaglio
 30 characters 2 arranged in a vertical line, and coincident or registering therewith in the opposite face are a series of recesses or sockets 3. A series of twelve of such matrices are employed, each of which has a series of twelve
 35 intaglio characters in its face, the aggregate of characters carried by the series of matrices being in the present instance one hundred and forty-four, which is adequate to permit the casting of all the characters in ordinary
 40 use in the art of printing. This arrangement of matrices and the disposition of characters thereon, in connection with the coöperating mechanism, is of material advantage in comparison with those types of machine constructed and arranged to utilize matrices hav-
 45 ing a single character only, as it results in a greatly-simplified machine and one of small space-occupying character.

The matrices shown are provided with
 50 stems 4 and tailpieces 5, which effect an economy of material in the construction thereof, and also with supplementary sockets or recesses 3^a, beneath the series of recesses or sockets 3, and with shoulders 3^b, for a purpose
 55 presently explained.

The matrices are arranged in a matrix-well 6, the front wall of which is formed by the front plate 7 of the frame of the machine and the rear wall by the hereinafter-described
 60 chilling-chambers. The matrices are normally held in an elevated position, as shown most clearly in Fig. 2 of the drawings, by means of a set of keepers 8, one for each matrix. This set of keepers is shown in plan in
 65 Fig. 1 of the drawings and in side elevation in Fig. 2, the latter figure illustrating more clearly the manner of engagement thereof

with the shoulders 3^b at the upper end of the matrices to hold them in their normally elevated or inactive position. The keepers are
 70 pivoted at one end in the machine-frame, rest loosely on the hereinafter-referred-to keeper-releasers, and at their free ends engage the matrices. This arrangement is of value in a
 75 machine of the present type, because on return of the type to their elevated positions they engage the keepers and push them out of the way without disturbing any other part of the machine.

The matrices are selectively released by the
 80 actuation of finger-key mechanism 9 through the medium of keeper-releasers 10, of which there are a series equal in number to the keepers. The coöperative relation of the matrices, the keepers, and keeper-releasers is
 85 clearly shown in Fig. 2 of the drawings. The key mechanism in the present instance consists of twelve vertical rows of pivoted keys, each vertical row comprising twelve keys arranged in twelve horizontal lines, totaling one
 90 hundred and forty-four keys, to correspond with the number of characters carried by the series of matrices. The characters of the first or uppermost line of keys correspond to the lower characters of the matrices throughout
 95 the series of matrices and correspond also to such first or lower characters of the matrices as they read from right to left when the matrices are arranged in operative position in the machine. In like manner the second line of
 100 keys carry characters which correspond with the second line of characters of the matrices. It follows, therefore, that the characters of any vertical row of keys correspond to the characters borne by the corresponding ma-
 105 trix. The keeper-releasers 10, of which, as before stated, there are a number corresponding to the number of keepers and matrices, extend down into the key-housing 11, one keeper-releaser adjacent each vertical row of
 110 keys. Said keeper-releasers are provided with lateral pins or projections 12, which rest upon the rear arms of the keys, so that upon a depression of the character end of any of the keys in a given vertical row the coöperating
 115 keeper-releaser is lifted, releasing the corresponding keeper from engagement with the matrix which carries the character corresponding to that of the key actuated, whereupon the selected and released matrix will
 120 by gravity drop in the matrix-well. The mold, as hereinafter described, is arranged with the mouths of its several channels in vertical alinement with the vertical series of characters of the matrices. The drop or fall
 125 of a released matrix is stopped at the proper point to accurately position the selected intaglio character thereof in front of the corresponding channel-mouth of the mold, the matrix closing the mouth thereof with its in-
 130 taglio character presented accurately for the injection of the molten type-metal. To accomplish this, there are a series of twelve matrix-arresters 13, arranged in a vertical line,

the distance of each arrester from the next adjacent one being equal to the distance between the characters of the vertical series of characters of the matrices. Each matrix-arrester is common to all the keys in a horizontal line of keys, the uppermost matrix-arrester cooperating with the upper line of keys, including the spacer-key and the line-ejector key, to be referred to, the contiguous matrix-arrester cooperating with or being actuated by any key in the second line of keys, and so on throughout the mechanism. Each matrix-arrester is also common to all the matrices, the upper arrester being so positioned with respect to the matrices and the mold that the uppermost arrester will stop and support any released matrix of the series with the lowermost character thereof in casting position. The next lower arrester will present the next higher character of the matrix in casting position, and so on. Normally the matrix-arresters are homed within the housing of the key mechanism; but when a key is depressed and the cooperating keeper-releaser actuated to release the keeper and permit the selected and released matrix to drop the corresponding matrix-arrester is projected through a slot in the front wall 7 of the well, so that its end enters the matrix-well and is interposed in the path of the released matrix-bar, arresting the fall thereof. This projection is accomplished in the present instance through the medium of a series of pivoted levers 14, corresponding in number with the series of matrix-arresters and the series of horizontal lines of keys. The levers have a loose connection, as at 15, at one end with the respective matrix-arresters and a sliding connection with the tails 16 of the finger-keys, as clearly shown in the sectional view of Fig. 2. When a given finger-key is depressed, the lever with which its tail is engaged is rocked and the attached matrix-arrester projected into the matrix-well. The matrix will rest upon the projected arrester and occupy a position with the selected character thereof accurately in front of or closing the mouth of one of the channels of the mold. The key mechanism, in addition to the character-keys, comprises a key 17 for casting spaces (shown at the right of the keyboard in Fig. 1) and a key 18 (shown at the left in said figure) for actuating the line-ejector. The line-ejector key and the mechanism actuated thereby will be hereinafter described.

The spacer-matrix 19 is arranged at the right of the machine, and its keeper and keeper-releaser (not shown specially and apart from the keepers and keeper-releasers of the character-matrices) are similar in all respects to the corresponding elements which cooperate with the character-matrices and operate in the same manner, except that the releaser for the keeper thereof need have but one lateral projection 12, resting on the spacer-key. The spacer-matrix 19 is similar to the

character-matrices, except that its face presented to the mold-channel is blank or devoid of characters and it is of slightly-greater width, as shown at the right, Fig. 1, (the mold, as hereinafter set forth, having the mouth of its spacer-casting channel slightly in rear of the others,) so that the spacer will be of shorter length than the character-type and when assembled in the line will be inside the line of the characters.

The melting-pot 20 is supported on the bed-plate 21 of the frame of the machine in rear of the key mechanism, as shown in Fig. 2 of the drawings. It is provided with a plurality of compartments 20^a 20^b, divided by a partition 22, one, 20^a, for containing molten type-metal and the other, 20^b, for containing melted lead to be used in casting the spacers. Each compartment consists of a storage-chamber for the supply of molten material and a cylindrical chamber 23 to receive the plungers or pistons 24 24^a for ejecting the metal into the mold, as hereinafter described. The cylindrical plunger-chamber of the compartment 20^a for containing the molten type-metal opens at its bottom into a canal 25, formed in the present instance in the bottom wall of the melting-pot and which is common to and leads to a series of ducts 26, formed in the front wall of said pot. The series of ducts discharge in a common line and correspond in number to the number of matrices employed and also to the number of mold-channels hereinafter described. The cylindrical chamber 20^b for the plunger of the compartment for molten lead for casting spaces is also open at its bottom to a canal leading to the single duct 26^a for conducting metal to the spacer-casting chamber of the mold. The plungers or pistons are actuated by means hereinafter referred to.

The wall of each plunger-chamber is of reduced height as compared with that of the partition 22, as shown most clearly at 27 in Fig. 3 of the drawings, and at the base thereof a port 28 is provided through which the molten metal passes from the storage part of the respective compartments into its plunger-chamber beneath the plunger or piston. The reduction in the height of a part of the walls of the piston or plunger chambers is to increase the storage capacity of the respective compartments by utilizing that portion of each plunger-chamber above the piston for the molten metal. This may be done satisfactorily, as the quantity of molten metal which will rest upon the upper surface of the piston or plunger will be comparatively little and yet materially increase the capacity of the melting-pot.

The wall of the type-metal compartment of the melting-pot is provided with a series of gate-openings communicating with the series of ducts 26 at a convenient place, and within these openings are arranged independent gates 29, that normally close or cut off the ducts and are actuated selectively to open

the proper duct and establish communication therethrough between the plunger-chamber and the corresponding mold-channel, all other gates in the series remaining at rest and closing or cutting off their ducts. This arrangement provides against the plunger forcing the metal up into all the ducts of the series and permits of a reduced stroke of the piston or plunger, as it is required to force the metal through the single selected duct only.

The mold shown consists of a bottom plate 30, which rests upon a melting-pot, as shown more clearly in Fig. 2 of the drawings, and a top plate 31. The bottom plate is shown in plan view in Fig. 6 of the drawings. It is provided with a series of grooves 32, corresponding in number to the number of matrices and melting-pot ducts, as well as additional grooves, hereinafter referred to. The top plate of the mold, as shown, is shorter than the lower plate and is provided also with grooves 33, corresponding in number to the matrices and melting-pot ducts, which, with the coincident grooves 32 of the bottom plate, constitute the several mold-channels. A series of eduction-openings 34 are formed in the bottom plate and communicate with the ducts of the melting-pot. Arranged in these grooves or channels 32 are a series of reciprocating slides 35, which serve to constitute the practical bottom of the several mold-chambers during the operation of casting and also to close the rear end of the mold-chambers and to extract the type from the mold. The form and construction of the slides 35 are shown in perspective in Fig. 7 of the drawings. They each comprise horizontal members, which work or slide in the grooves or channels 32, a depending ear 36, and a perpendicular abutment-guide 37. The forward portion 38 of the horizontal member is reduced, the reduction corresponding to the thickness of the type to be cast, and at the rear of the reduced portion is an abutment or shoulder 39. In advance of this shoulder a conical nozzle 40 is formed, which when the slide is in its forward position registers with the openings 34 in the bottom plate of the mold, forming continuations thereof and opening into the casting-space of the several mold-channels, such casting-space being bounded by the top plate of the mold, the surface of the reduced portion of the slide, and at the rear by the mold-closing shoulder 39. The several slides are also provided with ribs 41 upon the reduced portion, which serve to withdraw the cast type from the mold when the slide is retracted. The ear 36 of each slide is connected with the corresponding duct-closing gate 29 by means of a pivoted link 42 and a rock-lever 42^a. The perpendicular abutment-guide 37 receives a movable abutment 43, which is provided with a lateral stud 44, that enters and works in an elongated slot 45 in an arm 46, pivoted at its rear end to an arm of the frame and at its forward and free end resting upon and held in elevated position by

the several matrices when they are in their normally-elevated position, as shown most clearly in Fig. 2 of the drawings. The guide is cut away at its lower portion where it adjoins the slide, leaving a passage 47 beneath the movable abutment when the latter is in its inactive or raised position. The several slides are operated to be projected into the mold-chambers and withdrawn therefrom by means of fingers 48, attached to a reciprocating hand 49. This hand is guided by dovetail tongues 50, provided at its under surface, which move in the correspondingly-shaped grooves 51 of the plate 30, and the fingers overhang the slides, as shown clearly in Fig. 2. When a selected matrix has been released, falls, and is arrested with the selected character in front of the mouth of the corresponding mold-chamber, the forward end of the pivoted arm 46 drops, shifting the movable abutment 43, so that it bars the passage 47. At this time the hand 49 moves forward, one of its fingers engaging said abutment, and forces the slide forward with its reduced end into the mold-chamber. All other slides remain inactive as the other fingers of the hand pass through the passages 47. The forward movement of the slide retracts the gate with which it is connected, opening a corresponding duct of the melting-pot. In this position the conical nozzles in the reduced ends of the slide register or form continuations of the openings 34 in the plate and the molten metal is forced by the plunger into the casting-space before described, the metal being forced against the character which closes the mouth of the mold-chamber, and the type is cast. The operation is the same in casting a spacer.

When a type or spacer is being cast, it is desirable that the matrix be held in alignment and immovable and without liability of displacement during the casting operation, and to accomplish this function we provide an alining-blade 50^a, (common to all the matrices,) which slides in a guide-bracket 51^a, secured to the front wall of the matrix-well and working through a slot in said wall. It is normally held retracted, as shown in Fig. 2 of the drawings, by means of a spring 52. This alining-blade is provided with an antifric-tion-roll 53. In alinement with this roll is a rocking-trigger 54, hung on a shaft 55 in the framework of the machine and provided with a cam 55^a. When the trigger is rocked, the cam engages the roll and projects the alining-blade into the type-well, where it enters the proper recess of the matrix, forcing the latter firmly against the front wall of the mold and holding it immovable. The rocking-trigger is actuated by a rod 56, connected to an ear 57, carried by the fingered hand 49, and it partakes of the forward and rearward movements of said hand. At its front or free end, which coöperates with the rocking trigger, it is provided with a lateral pin 58, that normally rests on one arm of the trigger, holding

the cam out of contact with the friction-wheel of the alining-blade. When the rod is moved forward by the fingered hand, the lateral pin thereof rides off the short arm of the trigger and engages the long arm of the same, rocking the trigger on its fulcrum and bringing the cam thereof into engagement with the roll. On the retraction of the rod its pin rides out upon the short arm of the fork, rocking it in the reverse direction and withdrawing the cam from engagement with said roll, whereupon the spring 52 acts to retract the blade.

The alining-bar is projected each time a finger-key is actuated, and since it is common to all the matrices provision for its entrance in those matrices which are not released by the actuation of the key is essential, and this is accomplished by providing the matrices with a supplemental recess or socket 3^a, as most clearly shown in Fig. 2 of the drawings. When the matrices are in their elevated position, their supplemental recesses or sockets register with the alining-blade, and the latter is free to enter the same. This supplemental recess or socket is shown as of greater length than those sockets or recesses of the matrices which correspond to the characters borne thereby, and this enlargement is desirable, so as to avoid any possible engagement of the alining-bar with the walls of the supplemental recesses or sockets and the possibility of disturbing the position of any of the matrices.

The reciprocating hand 49 is driven through the medium of a pitman 59, connected to a stud 60 on the hand and to a wrist-pin 60^a on a cam-disk 61, fixed on the main driving-shaft A.

The plungers or pistons 24 24^a are operated by levers 62 62^a, connected at their forward ends to the plungers and at their rear ends to caps 63, loosely mounted on pedestals 64, standing beneath the main driving-shaft A. (See Fig. 2.) The caps are provided with anti-friction-wheels 65, which are pressed against the peripheries of a cam 66, fixed on the main shaft, by means of coiled springs 67, mounted on the pedestals and engaging said caps and abutments 68. These abutments, as shown, are in the form of nuts, so that the tension of the springs may be regulated.

The cam 66 is provided at the proper point with peripheral cavities 69, into which in each cycle of operation of the machine the caps are forced by the springs, resulting in the action of the plungers or pistons. We have shown but one of the connections for operating the plungers in Fig. 2, as it fully illustrates the operation, and the connections for the other plunger are a duplicate thereof.

After a type has been cast the matrix is returned by a shoe 70, which is carried by a lever 71, pivoted to the frame of the machine, and the short arm of which rides on the cam-disk 61, carried by the main shaft of the machine. At the proper time the active part of

this cam lifts the shoe, which engages the lower end of the matrix and raises the latter to its normally-elevated position, where it is engaged and held by its keeper. During the movement of the shoe it engages also the matrix-arrester, which held the matrix, forcing the same to its normal or inactive position. The mold is preferably chilled by circulation of a cooling fluid, such as water, therethrough, for which purpose chambers 73 are formed in the bottom plate of the mold and in the framework of the machine contiguous to the upper plate thereof. The amount of metal necessary to cast a single type is quite little and is immediately chilled to a sufficient hardness to permit of its withdrawal from the mold-chamber. This is accomplished by the return stroke of the fingered hand 49, the proper finger of which engages with an abutment 74, formed at the rear portion of the slide. The several slides are normally retained in their rearward position by means of springs 72, which engage notches formed in the slides.

In Fig. 2 of the drawings the retracted position of the slide shown is illustrated, and when the type has been cast and the slide retracted the former will occupy this position and be in coincidence with the type-race 75, formed in the bottom plate of the mold, as shown most clearly in plan in the detail Fig. 6 and also indicated partially in full and partially in dotted lines in Fig. 1 of the drawings. Arranged to periodically reciprocate in the type-race is pusher 76, loosely connected to the long arm of a lever 77, the short arm of which works in the cam-race 78 of the cam 66, mounted on the main shaft of the machine. The pusher operates, as stated, periodically to release the cast type from the extractor-slide and convey it along the type-race to a position in the composing-box 79. During the casting of a type there may be a possibility that on the back stroke of a plunger or piston it will leave a small particle of the type-metal projecting into the conical nozzle 40, formed in the slide, and when the pusher acts upon the type, as described, this particle, if it shall have formed, may remain in the orifice, closing or obstructing the same. To clear the orifice of any such possible obstruction, we provide a vertically-movable comb 80, having contact with the free ends of a forked lever 81, mounted on a rock-shaft 82, journaled in arms 83 of a standard of the machine. The lever 81 is actuated at the beginning of each cycle of operation of the machine by a lifting projection 84, formed on a disk mounted on the main shaft. This comb is arranged to move in a path in line with the nozzles 40 when the slides are in retracted position and is suitably guided in the frame of the machine, as shown. The comb is provided with a number of teeth 85, equal to and registering with the orifices of the slides when the latter are in retracted position. Upon the elevation of the rear end of the lever the

comb is lowered, and its teeth enter and clear the orifices, forcing any particles of metal that may be lodged therein through a slot 86, formed in the bottom plate of the mold and into the melting-pot. The teeth of the comb operate at the beginning of each operation of the machine and enter all the orifices of the slides while in their retracted position, thus insuring that the orifice of the slide which responds to the key actuated will be unobstructed.

The type-pusher 76 operates, as stated, to push the type as they are cast, one at a time, through the type-race and into the composing-box 79, pushing the type as they accumulate along said composing-box until the first type deposited reaches the abutment 87, arranged at the end of the composing-box. When a sufficient number of type and spacers to constitute a line have been arranged in the composing-box, the type-pusher operates to compress the line between itself and the abutment 87, thus justifying the line.

The composing-box 79 consists of a portion of the plate 30, which constitutes the bottom of the mold, and a roof-plate 88, secured thereto, as most clearly shown in the sectional view, Fig. 3. To this plate 88 is pivoted the line-transferrer 89, which extends around in front of the open end of the composing-box, as shown in detail in Figs. 11 and 16 of the drawings, and is provided with a floor 90 to receive a line of type when ejected from the composing-box. The line-receiving position of the line-transferrer is that shown in dotted lines, Fig. 12 of the drawings. While the transferring device is in this position, a line-ejector 91 operates to eject the line from the composing-box and deposit it on the floor of the transferrer. The line-ejector is shown in detail perspective in Fig. 15 of the drawings, and consists of a slide 92, having an overhanging guide 93, with a passage-way 94 at its base, and a movable abutment 95, with a lateral lug 96, similar to the guides and abutments of the type-extracting and mold-closing slides 35, heretofore described. This ejector-slide moves in an additional groove or channel 97 of the plate 30 and is formed with a lateral extension provided with a dovetail rib 98 on its lower surface, which rib is fitted to and moves in a dovetail channel 99 in the plate. The lateral extension constitutes the line-ejecting blade 91, which when the slide is projected forwardly enters the composing-box and pushes the line out therefrom onto the floor of the line-transferrer. An arm 100 extends from the line-ejector around to the side of the line-transferrer, and there engages with a fork 101, rigidly secured to line-transferrer, as shown in Figs. 1, 3, and 16 of the drawings. A fragment of the line-transferrer and the fork detached therefrom is illustrated in Figs. 18 and 19. A pin 102, carried by the arm 100, plays upon this fork. When the line-transferrer is in its normal position, as shown in Fig. 11 of the drawings, the position of the

fork is as illustrated in Fig. 14, with the pin resting in the crotch thereof. When the line-ejector is projected into the composing-box by the finger 103 of the fingered hand 49, the pin operates in the crotch against the long arm of the fork, a slight movement of the pin sufficing to swing the line-transferrer to its position in front of the composing-box, which position is illustrated in dotted lines in Fig. 12 and in full lines in Fig. 16 of the drawings. The pin then rides out on the long arm of the fork, as shown in Fig. 13, while the line is being deposited on the floor of the transferrer. On the retraction of the line-ejector the pin 102 moves back on the long arm, enters the crotch of the fork, and acts against the short arm of said fork, where a slight movement suffices to swing the line-transferrer to the vertical position shown in Figs. 11 and 14 of the drawings, where it deposits the line upon the galley or printing-form. This operation of the movement of the line-transferrer is graphically shown in Figs. 13 and 14 of the drawings. Other lines are deposited on the floor of the line-transferrer in like manner, and when the lines have been transferred to the galley they may be dealt with as usual in the art of printing.

The abutment 87 at the end of the line-composing box and an abutment 104 serve to close the ends of the line-transferring device and hold the line properly therein while being transferred to the galley. The abutment 104 is a yielding one, as illustrated particularly in Figs. 16 and 17, being supported by a sliding-pin connection with a bracket 105, arranged upon the top plate 88 of the composing-box, and is acted upon by a spring 106, as shown. This yielding abutment acts gently against the line of type, yet sufficiently to maintain the line accurately and avoiding any possible jamming of the line against the abutments and the possible disruption thereof in the movement of the transferring device. This possible disruption of the line might occur if the abutment were not a yielding one, as after the pressure exerted by the type-pusher upon the line to justify it compressing the spaces upon the release of the line from such pressure when it is deposited on the floor of the line-transferring device there will likely be a tendency to expand against the abutments which close the ends of the said transferring device, and on the movement of the latter the line might possibly be jammed and discomposed.

When a line of type commensurate with the full capacity of the composing-box and line-transfer is to be composed, a removable floor-section 107 is fitted in place in the line-transfer, as shown in Figs. 16 and 18 of the drawings, to give support to the line throughout its length. When it is desired to compose a line of less length than the maximum capacity of the elements mentioned, a removable filling-block 108 is inserted at the end of the composing-box, as shown in Fig. 17, the

face of which block serves as the abutment for the line of types, and the removable floor-section 107 is detached from the transferring device, the main floor thereof being of sufficient dimensions to afford proper support for the line of type deposited thereon. The removal of the floor-section in this case is necessary in order to provide a space for the movement of the filling-block which enters the transferring device, as will appear by Figs. 16 and 17 of the drawings. The line-ejector blade may, as shown in Fig. 15, be provided with a removable section to adapt it to a line of reduced length, or a new ejector mechanism with narrow ejector-blade may be substituted.

The operation of the line-ejector is effected by the depression of the line-ejector key 18, a dummy matrix 110 being arranged in the matrix-well, which is normally retained, as are the matrices, by a keeper 8 and released by a keeper-releaser 10. When the key is actuated, the dummy matrix falls in the well, the upper matrix-arrester 13 being projected into its path and arresting it. When this dummy falls, the arm 46, in the slot of which the lateral lug 96 of the movable abutment 95 plays, will fall, closing the passage-way 94, so that on the forward movement of the fingered hand the finger 103 thereof will engage the abutment and project the line-ejector and actuate the arm 100, which acts upon the fork to operate the line-transferrer. The retraction of the line-ejector and appurtenances is effected in the same manner as the retraction of the slides 35.

The operation of the plunger for the spacer-metal chamber of the melting-pot is cut off when a type is being cast and at all times except when a spacer is to be cast, and this is accomplished by the means illustrated most clearly in Fig. 3 of the drawings and in detail perspective in Fig. 21 thereof. The plunger-lever 62^a is provided, as shown best in Fig. 21, with a lateral offset 111, beneath which a button 112, carried by a stem 113, normally projects, preventing the action of the plunger. To permit its operation when a spacer is to be cast, the link 42, connected to the ear of the slide 35, is provided with a fork 114, which embraces the tail end of the button. When the spacer-slide is moved forward, carrying the link 42 with it, the button is turned so that its end leaves engagement with the lateral offset 111, permitting the operation of the spacer-plunger in the manner before described.

The slide 35 for closing the spacer-casting channel of the mold is similar to the other slides 35, except that it is provided on its reduced forward end with two ribs 41^a, which not only serve to extract the spacer from the mold, but result in the novel construction of spacer 115. (Shown in Fig. 28.) The compressible spacer 115 has a solid body and is formed with a plurality of lateral offsets 116, which give body or substantial space-occu-

pying capacity thereto and also permit compression thereof in justifying the line without liability of the metal crowding out to or beyond the type characters of the line.

The machine as thus far described is intended to cast separate or single types and spaces, which are separately conveyed to the composing-box, where they are assembled into a line and justified. It is arranged that the several elements concerned in the casting and subsequent handling of a selected type or a spacer presented in casting position shall go through a complete cycle of operation for each type or spacer cast. A cycle of operation is set up on the actuation of any key of the mechanism in the manner and by the means now described, having particular reference to Figs. 1, 2, and 3.

Upon a rock-shaft 117, arranged in operative relation to the keeper-releasers journaled to the front wall 7 of the machine within the key-mechanism housing, in the example shown, are arranged trip-arms 118, corresponding in number to the number of vertical rows of character-keys and the spacer and line-ejector keys. The forward ends of these trip-arms rest upon supplemental pins 119, carried by the keeper-releasers. At one end the rock-shaft carries a release-arm 120, the rear free end of which is normally held by a spring 121 in front of a stop 122, formed on or secured to a weighted disk 123, mounted on a stud-shaft 124. A mutilated friction-disk 125 is mounted on said stud-shaft in operative line with a transmitting-disk 126, fixed on a counter-shaft 127 and constantly driven by a pulley 128 and belt 129 connection from a loose pulley 130, which is loose on the main shaft A and constantly driven from any suitable source of power. Formed with the mutilated friction-disk or fixed to the stud-shaft contiguous to said disk is a cam 131, which works against a wall of the yoke 132 of a clutch-arm 133.

When a key is depressed, the corresponding keeper-releaser is elevated and lifts the free end of the cooperative trip-arm 118, rocking the shaft 117 and withdrawing the end of the releaser-arm from engagement with the stop 122, whereupon the weighted disk 123 is partially rotated by reason of the weighted portion thereof seeking the center of gravity, the stud-shaft 124 and mutilated friction-disk 125 being also partially rotated therewith. This operation brings the active periphery of the mutilated disk into frictional engagement with the constantly-driven transmitting-disk and brings the cam 131 into action, depressing the clutch-arm 133 and permitting the automatic clutching of the loose pulley 130 to the main shaft, one complete revolution and one cycle of operation of the mechanisms driven thereby being accomplished. When the idle portion of the mutilated friction-disk arrives opposite the transmitting-disk, the release-arm will engage the stop 122 and the cam will have left its engagement

with the yoke of the clutch-arm, whereupon the latter will be lifted by the action of the spring 134, connected thereto and to the frame of the machine, unclutching the loose pulley 130, and the operation of the mechanisms referred to will cease until again set in motion by the actuation of a finger-key.

The clutch 135 for connecting the loose pulley 130 with the main shaft A to drive the latter is fixed to the main shaft and is provided with a peripheral groove 136, which receives the end of the clutch-lever. It is also provided with a coupler 137, fitted to slide therein. This coupler is maintained inactive by the clutch-arm, which enters a socket in the same and maintains it retracted within the clutch. A spring 138 bears against the coupler, as shown in Fig. 3 of the drawings, and tends to project the same when free to be moved upon the withdrawal of the clutch-arm into engagement with one of a series of sockets 139, formed in the loose pulley. These sockets, of which there may be a suitable number, are provided with thrust-sustaining surfaces 140. When the clutch-lever is withdrawn, the coupler is thrown by the spring 138 into one of the series of sockets in the loose pulley, thereby coupling or clutching the latter to the main shaft.

When the clutch-arm upon a complete rotation of the main shaft and a cycle of operation of the parts driven thereby is lifted by the spring 134, as before described, it engages an inclined wall of the recess in the coupler 137 and withdraws the same from engagement with the socket or recess of the loose pulley, whereupon the operation of the machine ceases until again started by the operation of a finger-key.

The operation of the several submechanisms of the machine have been hereinbefore set forth in the description of said mechanisms and their elements.

A brief generalization of the operation of the machine may be stated as follows: The several cams, projections, and other elements hereinbefore described carried by the main shaft are so positioned thereon that they will actuate the respective mechanisms with which they cooperate at the proper time in the sequence of operation of casting a type or spacer. A specific description of the particular arrangement of these elements is not deemed essential, as their arrangement is within the province of the skilled in the art. Assuming the parts to be in the position indicated in Fig. 2 of the drawings, when a character-key is depressed the keeper-releaser in engagement therewith by one of its lateral pins is elevated, releasing the keeper from the matrix with which it is engaged, allowing the latter to drop in the matrix-well. Simultaneously the proper matrix-arrester is projected into the well and arrests the fall of the matrix at the proper point to present the selected character at the mouth of one of the mold-channels. At the same time the trip-

arm resting on the supplementary pin of the keeper-releaser is acted upon, withdrawing its rear end from engagement with the stop-rib on the weighted disk, and the latter, under the influence of the weight, partially rotates, rotating partially, also, the stud-shaft on which it is mounted, as well as the mutilated friction-disk, bringing the active periphery of said mutilated disk into frictional engagement with the transmitting-disk, which is constantly driven from the loose pulley on the main shaft. The cam on the stud-shaft at the same time engages a wall of the yoke of the clutch-arm, withdrawing the end of said arm from the recess in the coupler, whereupon the said coupler is thrown by the cooperating spring into engagement with one of the sockets or recesses of the loose pulley on the main shaft, whereby motion is imparted to the main shaft and the elements carried thereby. The clearing-comb is immediately operated to clear the nozzles in the mold-closing and type-extracting slide, after performing which function it is immediately returned by means of its spring. During the fall of the released matrix the slotted arm, which is supported thereby, also falls and interposes the movable abutment in the path of the fingered hand, which is now advanced and by reason of the engagement of one of its fingers with the abutment projects the proper mold-closing and type-extracting slide, the forward end of which enters the corresponding mold-channel. In the movement of said slide the gate which normally closes the corresponding duct of the melting-pot is opened. At this time a cavity 69 in the cam 66 will have arrived opposite the loose cap carried by the pedestal, which cap is forced into the cavity by the action of the engaging spring, resulting in the operation of the connected plunger, whereupon the molten metal is forced through the opened duct and the registering-nozzle of the slide into the casting-space of the mold-channel and against the type character disposed in front thereof. In the meantime the alining-bar will have been actuated by the mechanism described to press the matrix firmly against the mold and hold it there immovably while the type or spacer is cast. The cast type or spacer is at once chilled in the manner hereinbefore set forth. The fingered hand is now retracted and by engagement with the cooperating abutment of the slide retracts the latter, withdrawing the cast type or spacer from the mold-channel into line with the type-race, whereupon the type-pusher is actuated to convey the type to the composing-box. When a sufficient number of types or spacers to constitute a line have been cast, conveyed to the composing-box, and justified by the type-pusher, as before described, the line-ejector key is actuated, whereupon the line-ejector slide is projected, the transferring device moved to a position to receive the line, and the line deposited on the transferrer and

transferred to the galley or printing-form. In the meantime the matrix-restoring shoe will have been actuated to restore the matrix to its elevated position and the projected matrix-arrester to its inactive position and the cam will have left its engagement with the wall of the yoke of the clutch-lever, whereupon the latter will be lifted, and its end engaging the inclined wall of the socket in the coupler withdraws the latter from clutching engagement with the loose pulley, when the rotation of the main shaft ceases until again actuated by the operation of a finger-key. The mutilated friction-disk will have taken one complete rotation, bringing its idle part opposite the friction-transmitting disk, so that the rotation of the latter will have no influence upon the mechanism.

In Figs. 22, 23, 24, 25, and 27 of the drawings I have illustrated a modified arrangement of matrix, a carrier therefor, and matrix-releasing mechanism. The purpose of this modified arrangement is mainly to provide means whereby in the same machine type characters of different font may be cast and whereby, with facility, characters which commonly occur in sequence in ordinary composition may be simultaneously presented before the respective mold-channels and the types thereof cast during a single cycle of operation of the machine. The other elements coöperating with this modified arrangement are the same as those before described. Having particular reference to the figures of drawing illustrating the modified mechanism, the reference-numerals 8^a and 10^a indicate the matrix-keepers and keeper-releasers, which are of the same construction and have the same appurtenances as those heretofore described. The matrices 1^a, utilized in this modified arrangement of machine, are illustrated in Fig. 27 of the drawings and comprise a plurality of vertical series of characters 2^a, the characters of one series being of a different font from those of the other, but except in matter of font are the same characters and have the same relative arrangement upon the matrices. These matrices are disposed in a shiftable carrier 141, arranged in guideways 142, as more particularly illustrated in Fig. 23 of the drawings. The spacer-matrix 2^b, as illustrated in Fig. 22 of the drawings, is not carried in the shiftable carrier, as it is not essential that it be shifted, since the spacers, irrespective of the character of font of type, will be always the same. The shiftable carrier is provided with an extension 143, (see Fig. 22,) provided with a plurality of sockets 144, in which a spring-pressed catch 145 is adapted to automatically seat and hold the matrix-carrier with the matrices carried therein in adjusted position. The matrix-carrier is shifted so as to present one or other of the different font of characters formed thereon in alinement with the mouths of the channels of the molds

by a shifting-lever 146, connected to the extension 143. The connection of this lever to the machine-frame is not illustrated; but it will be readily understood that it will have a pivotal connection with the machine-frame at one end and an operating-handle at the other. From this description it will be obvious that the matrix-carrier, with the matrices therein, may be shifted so as to bring one or the other series of characters in line with the mouths of the mold-channel, and when so shifted the spring-catch will automatically engage the proper notch in the extension of the carrier to hold it in the adjusted position, so that when the matrices are released they will drop and present the selected character of the proper font in casting position.

To facilitate the presentation of a plurality of matrices bearing characters, which frequently occur in sequence in ordinary composition, the matrix-arresters instead of being common to all the keys of a given horizontal line of keys are composed of individual strips or bars 13^a, as illustrated in Figs. 22, 24, and 25, the several bars of each horizontal line of bars coöperating with the individual keys of the corresponding horizontal line of finger-keys. It will be understood that there will be as many horizontal lines of individual matrix-arresters as there are characters in a vertical series on the matrices. This arrangement permits a simultaneous pressure of a plurality of character-keys bearing characters which occur in sequence in ordinary composition, provided the characters thereof are borne by different matrices, and the actuation of such plurality of keys will release the matrices bearing the corresponding characters and project into the type-well the proper matrix-arresters to arrest the fall of the matrices at the proper position to present the selected characters in front of the mouth of the mold-channels. The simultaneous operation of the finger-keys, irrespective of the number actuated, will act equally on the several corresponding trip-arms of the rock-shaft and produce but a single rocking thereof and permit a single cycle of operation of the other mechanisms of the machine.

By the improved machine herein described rapidity of action and great compactness is secured and clear distinct type cast. The machine is organized as shown, so that the respective mechanisms thereof remain inactive or motionless until the depression of a finger-key, which starts the operation of all the mechanisms in proper sequence for the cycle of operation of the machine, after the performance of which the active mechanisms come to rest until the next depression of a key.

The construction, specific arrangement, and mode of operation of the machine herein described are the best now known to us. We do not, however, confine ourselves to these details of construction and specific arrangement and operation, as many changes thereof may

be made without departing from the spirit of our invention as set forth in the accompanying claims.

Having thus described our invention, what we claim is—

1. In a type-casting machine, the combination with a series of matrices, keepers pivoted at one end, engaging the matrices at their free ends and resting loosely on the keeper-releasers, the keeper-releasers and finger-key mechanism for lifting the keeper-releasers, substantially as described.

2. In a type-casting machine, the combination with a series of matrices, of a series of pivoted keepers engaging the matrices at their free ends and resting loosely on the keeper-releasers, a series of bodily-movable keeper-releasers, and finger-key mechanism engaged with said keeper-releasers for actuating the same, substantially as described.

3. In a type-casting machine, the combination of a series of matrix-keepers, pivoted at one end, engaging the matrices at their free ends and resting loosely on the keeper-releasers, a series of keeper-releasers provided with lateral pins, and finger-key mechanism for actuating the keeper-releasers, substantially as described.

4. In a type-casting machine, the combination with a series of matrix-keepers pivoted at one end, free at their other ends, and finger-key mechanism, of a series of keeper-releasers interposed between the keepers and finger-key mechanism and upon which the keepers rest loosely, substantially as described.

5. The combination with a series of matrix-keepers and finger-key mechanism, of a series of keeper-releasers interposed between the keepers and the key mechanism and provided with a series of lateral pins resting upon the finger-keys, substantially as described.

6. In a type-casting machine, the combination with a series of matrix-keepers and a series of matrix-arresters, of finger-key mechanism, a series of keeper-releasers engaging the keepers and having lateral pins engaging the finger-keys, and a series of levers engaging the matrix-arresters and the finger-keys, substantially as described.

7. In a type-casting machine a melting-pot having a series of ducts, having their discharge in a common line and a series of duct-cut-off gates, substantially as described.

8. In a type-casting machine, a melting-pot having a series of ducts, a series of duct-cut-off gates, and means for automatically operating said gates.

9. In a type-casting machine, a melting-pot provided with a type-metal compartment and a spacer-metal compartment, a series of ducts in communication with the type-metal compartment, and duct-cut-off gates arranged in said compartment, substantially as described.

10. In a type-casting machine, a melting-pot having a type-metal compartment and a spacer-metal compartment, plunger-cham-

bers arranged in said compartments, a canal leading from the plunger-chamber of the type-metal compartment to a series of ducts, and a duct in communication with the plunger-chamber of the spacer-metal compartment, substantially as described.

11. In a type-casting machine, a mold comprising a bottom plate which rests upon the melting-pot, and is constructed with a series of grooves and mold-closing and type-extracting slides arranged to operate with said grooves, and means for introducing casting material into said grooves.

12. In a type-casting machine, a mold comprising a bottom plate provided with a type-race, means for introducing casting material into said mold, means for withdrawing type cast in said mold and means for pushing the type along the race.

13. In a type-casting machine, a mold comprising a bottom plate provided with slide-grooves and a type-race intersecting said grooves, in combination with mold-closing and type-extracting slides, means for introducing casting material into said grooves, and a type-pusher operating in the type-race.

14. In a type-casting machine, the combination with a melting-pot provided with a series of ducts, of a mold the bottom plate of which rests on said melting-pot and is provided with openings registering with the ducts of the melting-pot, substantially as described.

15. A mold the bottom plate of which rests upon the melting-pot and is provided with a waste-metal slot, substantially as described.

16. In a type-casting machine, the combination with a mold, of a slide provided with means to close an end of the mold and having a part to enter the mold, which part is provided with means to extract a type therefrom, substantially as described.

17. In a type-casting machine, a mold, and a slide constructed to enter the mold, close one end thereof and constitute the bottom of the casting-space thereof, substantially as described.

18. In a type-casting machine, a mold-closing and type-extracting slide provided with a reduced forward portion to enter the mold, a shoulder to close the end of the mold, and means for extracting the type, substantially as described.

19. In a type-casting machine, a mold-closing and type-extracting slide provided with a reduced forward portion to enter the mold, a shoulder to close the end of the mold, and means for extracting the type, and an abutment for engagement with a slide-retracting device.

20. In a type-casting machine, a mold-closing and type-extracting slide provided with a reduced forward portion to enter the mold, a shoulder to close the end of the mold, means for extracting the type, and a nozzle, substantially as described.

21. In a type-casting machine, a mold hav-

ing a movable casting-space bottom provided with type-extracting means, substantially as described.

22. In a type-casting machine, the combination with a mold, of a mold-closing and type-extracting slide provided with a guide and a movable abutment arranged therein, means for operating said abutment and means for operating said slide, substantially as described.

23. In a type-casting machine, the combination with a mold, of a mold-closing and type-extracting slide having a reduced forward portion to enter the mold, a shoulder to close the end of the mold, a nozzle leading to the casting-space of the mold, means for extracting the type, a guide, and a movable abutment arranged in said guide, means for operating said abutment, means for operating said slide, a type-metal pot, and means for introducing type-metal into the mold, substantially as described.

24. In a type-casting machine, the combination with a mold, of a mold-closing and type-extracting slide provided with a portion to enter the mold, having a nozzle leading to the casting-space of the mold, type-extracting means, a guide, a movable abutment arranged therein, and a depending ear, means for operating said abutment, means for operating said slide, a type-metal pot, and means connected to said ear and operated by the movement of the slide to permit metal to be introduced into the mold, substantially as described.

25. In a type-casting machine, the combination with a mold, of a slide constructed to enter the mold and close the rear end thereof and provided with type-extracting means, substantially as described.

26. In a type-casting machine, the combination with a mold, of a mold-closing and type-extracting slide provided with a movable abutment and a depending ear, means for operating said abutment, means for operating said slide, and means connected with said ear and operated by the movement of the slide to permit type-metal to be introduced into the mold.

27. In a type-casting machine, the combination with a melting-pot and a mold, of a mold-closing and type-extracting slide provided with a nozzle for the passage of molten metal into the casting-space of the mold, substantially as described.

28. In a type-casting machine, the combination with a melting-pot having a series of ducts, of gates arranged in said ducts, a mold, mold-closing and type-extracting slides and mechanism connected with said slides for operating the gates, substantially as described.

29. In a type-casting machine, the combination with a mold, of a melting-pot having a series of ducts and gates for opening and closing said ducts, and slides constructed to enter and close the mold and provided with means

for actuating said gates, substantially as described.

30. In a type-casting machine, the combination with a mold, of slides arranged to move in said mold, and a slide-retracting hand provided with a series of fingers, substantially as described.

31. In a type-casting machine, the combination of a mold, a matrix-alining blade arranged in coöperative relation thereto, slides arranged to move in said mold, a slide-operating hand provided with a series of fingers and means for attachment of the matrix-alining-blade-operating arm, and means for introducing type-metal into said mold.

32. In a type-casting machine, the combination with a mold and mold-closing and type-extracting slides, of a slide-operating hand having a series of fingers which overlie the slides, substantially as described.

33. In a type-casting machine, the combination with a mold, of a mold-closing and type-extracting slide having a movable abutment, and an arm arranged to rest at its free end on a matrix and connected to said abutment, substantially as described.

34. In a type-casting machine, the combination with a melting-pot provided with a series of ducts, of gates for opening and closing said ducts, a mold having a series of channels, mold-closing and type-extracting slides provided with movable abutments, connections between said slides and said gates, arms adapted to rest at their free ends on matrices and connected to said movable abutments, and a fingered hand for operating said slide, substantially as described.

35. In a type-casting machine, the combination with a mold and mold-closing and type-extracting slides provided with nozzles, of a nozzle-clearing comb, substantially as described.

36. In a type-casting machine, the combination with a mold and mold-closing and type-extracting slides provided with nozzles, of a nozzle-clearing device consisting of a plate provided with a series of teeth adapted to enter and clear the nozzles, substantially as described.

37. In a type-casting machine, the combination with a mold and mold-closing and type-extracting slides, of a nozzle-clearing device provided with a series of pins, and means for projecting said pins into said nozzles when the slides are in retracted position, substantially as described.

38. In a type-casting machine, the combination with a melting-pot, a plunger arranged in the melting-pot, a pedestal, a spring-pressed cap loosely mounted thereon, and a lever connected to said plunger and cap.

39. In a type-casting machine, the combination with a mold, of a type-race, a composing-box at its end, means for bringing type and compressible spaces from the mold to the race,

a pusher reciprocating in said type-race, and means for operating said pusher to convey the type to the composing-box and justify the line of type therein, substantially as described.

40. In a type-casting machine, the combination with casting mechanism, a composing-box, and means for assembling the cast type and spaces into a line, of a line-ejector slide provided with a movable abutment and a blade to enter the composing-box and eject the line of type therefrom, means for operating the slide, and means brought into action by finger-key mechanism to cause the abutment to engage the slide - operating means, substantially as described.

41. In a type-casting machine, the combination of casting mechanism, a composing-box, means for conveying cast type and spaces to said box, a line-transferrer and a line-ejector having a blade to enter the composing-box and an arm for operating the line-transferrer, substantially as described.

42. In a type-casting machine, the combination of casting mechanism, a composing-box, and means for conveying cast type and spaces to said box, a slide and a line-ejecting blade carried thereby, a movable abutment connected to and a fixed abutment on said slide and a slide-operating hand arranged to engage said abutment, substantially as described.

43. In a type casting and composing machine, the combination with casting mechanism, a composing-box, and means for conveying cast type to said composing-box, of a swinging line-transferrer provided with a fork, a line-ejecting blade having a part to engage said fork and means for operating said line-ejecting blade.

44. In a type-casting machine, the combination of a pivoted line-transferrer arranged in cooperative relation to the composing-box, a fork connected to said line-transferrer, a line-ejecting blade, and means carried thereby for engaging the fork to operate the line-transferrer.

45. In a type-casting machine, a line-transferrer having a removable floor-section, substantially as described.

46. In a type-casting machine, the combination with a composing-box, of a filling-block and means for securing the latter in said box, substantially as described.

47. In a type-casting machine, the combination with a composing-box, a line-transferrer open at one end, and a yielding line-abutment closing the open end of the line-transferrer, substantially as described.

48. In a type-casting machine, a matrix-alining blade, a rocking trigger provided with a cam to operate said blade, and means for actuating said trigger to cause the cam to project the alining-blade into engagement with a matrix, substantially as described.

49. In a type-casting machine, the combination with a matrix-alining blade, a trigger pro-

vided with a cam arranged in operative relation to said blade, the fingered hand, an arm connected with said hand and having a pin engaging said trigger, substantially as described.

50. In a type-casting machine, the combination with a mold having a channel for casting spacers, of a slide constructed to enter and close said channel and constitute the bottom of the casting-space thereof, and provided with a plurality of projections and a nozzle, substantially as described.

51. In a type-casting-machine, the combination with a melting-pot having a spacer-metal compartment, a duct leading therefrom, a gate for opening and closing said duct, a plunger therein, a mold having a spacer-casting channel, a slide cooperating with said channel, means connecting said slide with said gate comprising a link having a fork, a plunger-lever, and an abutment engaging said fork and adapted to be engaged with said lever to prevent the action of the plunger, substantially as described.

52. In a type-casting machine, the combination with a matrix, a mold, and means operated by finger-keys for releasing and positioning said matrix in front of the mold, of a mold-closing and type-extracting slide, means for projecting said slide into and withdrawing the same from the mold, and means for injecting metal into the mold, substantially as described.

53. In a type-casting machine, the combination with a matrix, a mold, and means operated by finger-keys for releasing and positioning said matrix in front of the mold, of a mold-closing and type-extracting slide, means for projecting said slide into and withdrawing the same from the mold, means for injecting metal into the mold, and means for releasing the cast type from the slide, substantially as described.

54. In a type-casting machine, the combination with matrices, a mold having a series of channels, means operated by finger-keys for selectively releasing and presenting the matrices to the mold, a melting-pot having a series of ducts, gates for said ducts, mold-closing and type-extracting slides connected to said gates, means for operating said slides, and means for injecting metal into the mold, substantially as described.

55. In a type-casting machine the combination with finger-key-released matrices, of a mold having a series of channels, a series of mold-closing and type-extracting slides adapted to said mold-channels, means for operating said slides and means brought into action by the fall of a matrix whereby the cooperating slide is made active, substantially as described.

56. In a type-casting machine the combination with finger-key-released matrices, of a mold having a series of channels, a series of independent mold-closing and type-extract-

ing slides, movable abutments connected to said slides normally held out of action by the matrices and brought into action by the fall of the cooperating matrix, and means for engaging said abutment to project the slide into a mold-channel, substantially as described.

57. In a type-casting machine, the combination with a mold, matrices and means for presenting them to the mold, of a melting-pot, a mold-closing and type-extracting slide, having a nozzle adapted to communicate at the proper time with the melting-pot, means for projecting metal through said nozzle, means for releasing the cast type from the slide, and means for cleaning the nozzle, substantially as described.

58. In a machine for casting and composing individual type, the combination of a series of movable matrices bearing a plurality of characters, a mold having a series of channels, finger-key-actuated mechanism for selectively presenting the matrices to the corresponding channel of the mold, casting mechanism, means for extracting the cast type, means for composing and justifying the type, and means for transferring the composed and justified line to a galley, substantially as described.

59. In a machine for casting and composing individual type, the combination of a series of independent matrices bearing a plurality of characters, finger-key-actuated matrix keepers, releasers and arresters, a mold, having a series of channels, a melting-pot having a series of ducts, a series of mold-closing and type-extracting slides, means actuated thereby for opening and closing the mold-ducts, means for projecting metal into the mold, and means for composing and justifying the type in a line, substantially as described.

60. In a machine for casting and composing individual type, the combination of a series of independent matrices bearing a plurality of characters, a mold having a series of channels, finger-key-actuated mechanism for selectively presenting the matrices to the mold, casting mechanism, means for conveying and composing the individual type into a line, a line-transferrer, and a line-ejector for depositing the composed line thereon, substantially as described.

61. In a machine for casting and composing individual type, the combination of a series of independent movable matrices bearing a plurality of characters, a mold having a series of channels, finger-key-actuated mechanism for selectively presenting the matrices to the mold, casting mechanism and means for composing the individual type into a line, substantially as described.

62. In a machine for casting individual type, the combination of a series of independent movable matrices bearing a plurality of characters, a mold having a series of channels, finger-key-actuated mechanism for selectively presenting the matrices to the mold, casting mechanism comprising a pot having a series

of normally-closed ducts leading to the several mold-channels, a metal projector and means for opening one of the ducts while the others remain closed, substantially as described.

63. In a machine for casting individual type, the combination of a series of independent movable matrices bearing a plurality of characters, a mold having a series of channels, finger-key-actuated mechanism for selectively presenting the matrices to the mold, casting mechanism comprising a pot with a series of normally-closed ducts, and means brought into action by the movement of the selected matrix for opening the proper duct, substantially as described.

64. In a machine for casting individual type the combination of a series of independent movable matrices bearing a plurality of characters, a mold having a series of channels, finger-key-actuated mechanism for selectively presenting the matrices to the mold, a melting-pot having a series of normally gate-closed ducts, a metal-projector plunger, mold-closing and type-extracting slides, connected to the duct-gates, and means for operating said gates, substantially as described.

65. In a type-casting machine, the combination of a series of matrices, a mold having a series of channels, means for selectively presenting the matrices to the mold, mold-closing and type-extracting slides, a molten-metal pot having a series of ducts, gates for said ducts connected to and operated by said slides, a fingered slide-operating hand, and movable abutments connected to the slides, pivoted arms connected to said abutments and resting on the matrices, a plunger in the molten-metal pot, and means for operating the slide-operating hand and the plunger, substantially as described.

66. In a type casting and composing machine, the combination of a series of matrices, a mold having a series of channels, means for selectively presenting the matrices to the mold, mold-closing and type-extracting slides, a molten-metal pot having a series of ducts, a metal-projecting plunger in said pot, gates for said ducts connected to and operated by said slides, a composing-box, means for conveying the cast type thereto, a line-ejector, a fingered hand for operating the slides and line-ejector, movable abutments connected to the slides and line-ejector, pivoted arms connected to said abutments and resting on the matrices, and means for operating said slides, plunger and line-ejector, substantially as described.

67. In a machine for casting and composing individual type, a line-ejector, a dummy matrix cooperating therewith, means for projecting the line-ejector, finger-key-actuated device for releasing the dummy matrix, and means made active by the movement of the dummy matrix for subjecting the line-ejector to the action of the projecting means, substantially as described.

68. In a casting-machine, a series of movable matrices bearing a plurality of characters, a mold having a series of channels, in alinement with said matrices, finger-key mechanism for selectively presenting the matrices to the mold, and casting mechanism, substantially as described.

69. In a machine for casting and composing individual type, the combination of a series of independent movable matrices bearing a plurality of characters, a mold having a series of channels, finger-key-actuated mechanism for selectively presenting the matrices to the mold, casting mechanism and means for extracting the cast type from the mold, substantially as described.

70. In a type-casting machine, the combination of a series of matrices, a mold, finger-key mechanism for selectively presenting the matrices to the mold, casting mechanism, a matrix-returning shoe, and mechanism set in operation by the actuation of the finger-key mechanism in selecting a matrix for actuating said shoe at the conclusion of each cycle of operation.

71. In a type-casting machine, the combination of a series of movable matrices each bearing a plurality of characters, a mold having a series of channels in alinement with said matrices, finger-key mechanism for selectively presenting the matrices to said mold, casting mechanism, means for extracting the cast type from the mold, a matrix-returning shoe, and mechanism set in operation by the actuation of the finger-key mechanism in selecting a matrix for actuating said shoe at the conclusion of each cycle of operation.

72. In a type-casting machine, the combination of a series of movable matrices each bearing a plurality of characters, a mold having a series of channels in alinement with said matrices, finger-key mechanism for selectively presenting the matrices to the mold, casting mechanism, means for extracting the cast type from the mold, and means for returning the matrices to normal position.

73. In a type-casting machine, the combination of a series of movable matrices each bearing a plurality of characters, a mold having a series of channels in alinement with said matrices, finger-key mechanism for selectively presenting the matrices to the mold, casting mechanism, means for extracting the cast type from the mold, and a matrix-returning shoe.

74. A matrix for type-casting machines provided with a plurality of series of characters of different font.

75. In a type-casting machine, a series of matrices bearing a plurality of series of characters of different font, a mold having a series of channels, finger-key-actuated mechanism for selectively presenting the matrices to the mold, and a casting mechanism, substantially as described.

76. In a type-casting machine, a series of matrices bearing a plurality of series of char-

acters of different font, a shiftable carrier therefor, a mold having a series of channels, finger-key-actuated mechanism for selectively presenting the matrices to the mold, and a casting mechanism.

77. In a type-casting machine a series of matrices bearing a plurality of series of characters of different font, a mold having a series of channels, means for shifting the matrices to bring either font of characters into operative relation to the mold, finger-key-actuated mechanism for selectively presenting the matrices to the mold, and a casting mechanism, substantially as described.

78. In a type-casting machine a series of matrices, bearing a plurality of characters, a mold having a series of channels in alinement with said matrices, finger-keys for selectively releasing the matrices, and individual matrix-arresters connected to and operated by its respective key, substantially as described.

79. In a type-casting machine, the combination with a driving-shaft, a normally loose pulley thereon, of an automatically-actuated pulley-engaging clutch, a clutch-arm engaging the clutch to hold it normally out of engagement with the pulley, a release-arm, finger-key mechanism, means arranged to be operated by any key of the mechanism to actuate the release-arm, and means operating to withdraw the clutch-arm from engagement with the clutch when the release-arm is actuated, substantially as described.

80. In a type-casting machine, a driving-shaft, a normally loose pulley thereon, of a clutch, and mechanism to permit the clutch to act comprising a clutch-arm engaging and normally holding the clutch inactive, a rock-shaft, a release-arm carried thereby, means for withdrawing the clutch-arm when the release-arm is actuated, trip-arms carried by the rock-shaft, finger-key mechanism and connections between the trip-arms and the finger-keys whereby the release-arm is actuated, substantially as described.

81. In a type-casting machine, the combination with releasably-stored matrices and means for casting type therefrom, of a driving-shaft, a normally loose pulley thereon, an automatic clutch, releasable means for normally holding the clutch from engagement with the pulley, finger-key mechanism, and matrix-release and clutch-holder-release connections operated by the finger-keys, substantially as described.

82. In a type-casting machine, a machine-starting mechanism comprising a clutch-arm, a weighted disk, a mutilated friction-disk operatively connected to said weighted disk, a cam also operatively connected to and partaking of the movement of said weighted disk and adapted to engage and operate the clutch-arm, means for imparting motion to the mutilated friction-disk, means for holding the weighted disk from operation and connections actuated by depression of finger-key mechanism for releasing the weighted disk

from the holding means, substantially as described.

83. In a type-casting machine, a machine-
starting mechanism comprising a weighted
5 disk provided with a lock-rib, a release-arm
normally holding said disk inactive, means
actuated by a finger-key for withdrawing said
arm from engagement with the disk, a clutch-
arm, and means actuated by said weighted
10 disk for withdrawing such clutch-arm, sub-
stantially as described.

84. In a type-casting machine, a machine-
starting mechanism comprising a clutch-arm,
a friction-transmitting disk, a mutilated disk,
15 a weighted disk for bringing said mutilated
disk into frictional engagement with the
transmitting-disk, a cam operatively con-
nected to and partaking of the movement of
said weighted disk to engage and withdraw
20 the clutch-arm, a release-arm for holding said
weighted disk inactive, and finger-key mech-

anism for withdrawing the release-arm and
permitting operation of the weighted disk,
substantially as described.

85. In a type-casting machine, the combina- 25
tion with independent, releasably-stored mat-
rices, mechanism for casting therefrom, driv-
ing mechanism, finger-key mechanism for
releasing the matrices and presenting the
same in casting position and connections be- 30
tween said finger-key mechanism and the
driving mechanism whereby the latter is
made active on the actuation of any key of
the mechanism, substantially as described.

In testimony whereof we have hereunto set 35
our hands in presence of two subscribing wit-
nesses.

JOSEPH C. FOWLER.
JOS. C. FOWLER, JR.

Witnesses:

GEO. W. REA,
GEO. F. SULLIVAN.