E. M. M. RETAUX.

MACHINE FOR SETTING UP AND CASTING TYPE.

APPLICATION FILED JAN. 27, 1902.

919,951. Patented Apr. 27, 1909.

10 SHEETS—SHEET 1.

Fig.6.

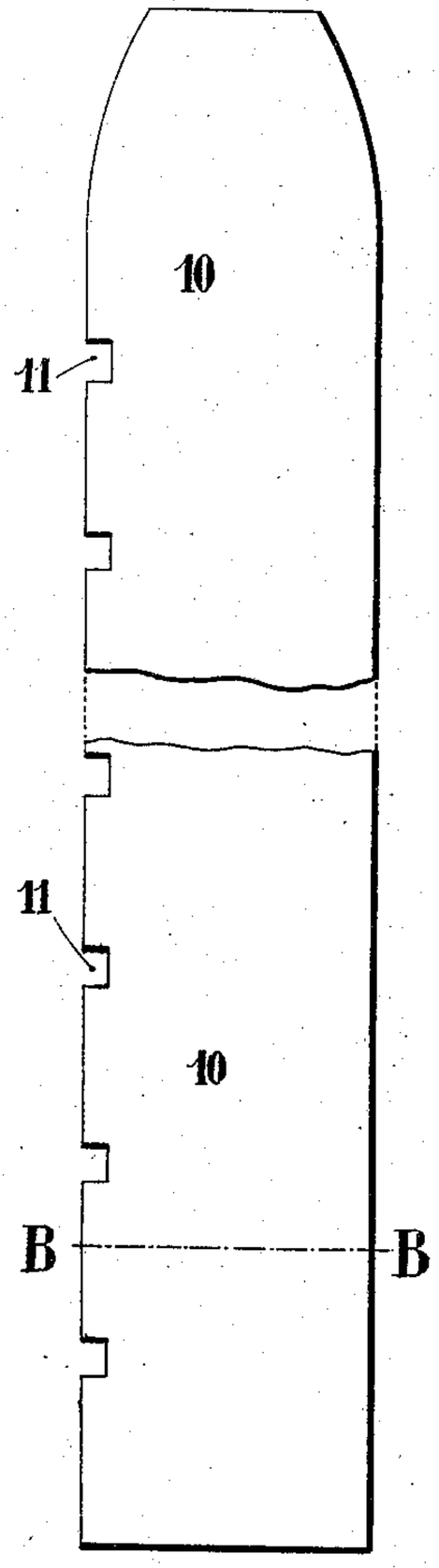

Fig.7.

Fig.1.

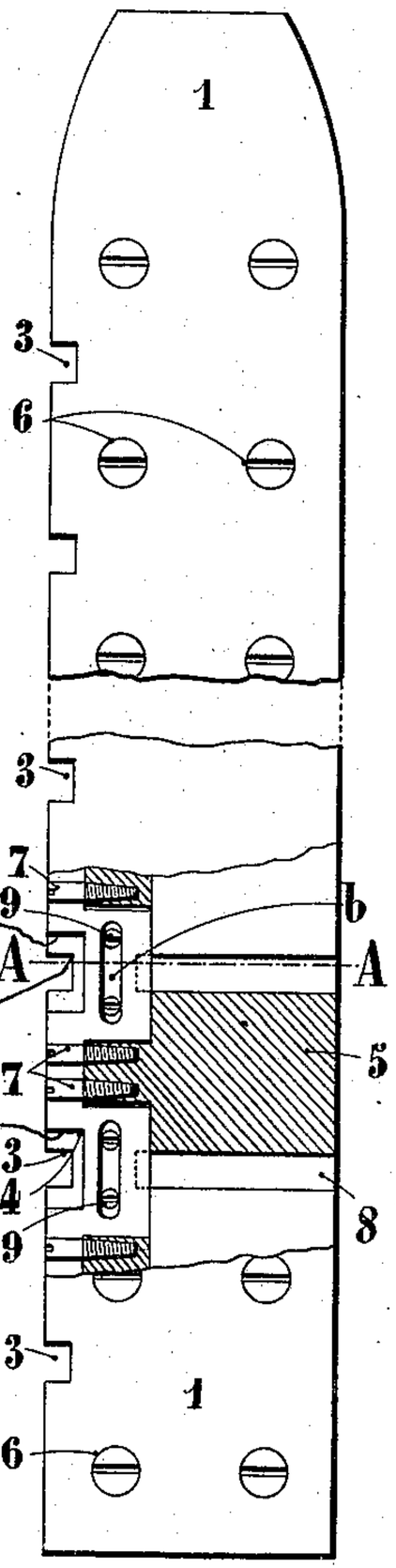

Fig.2.

Fig.4.

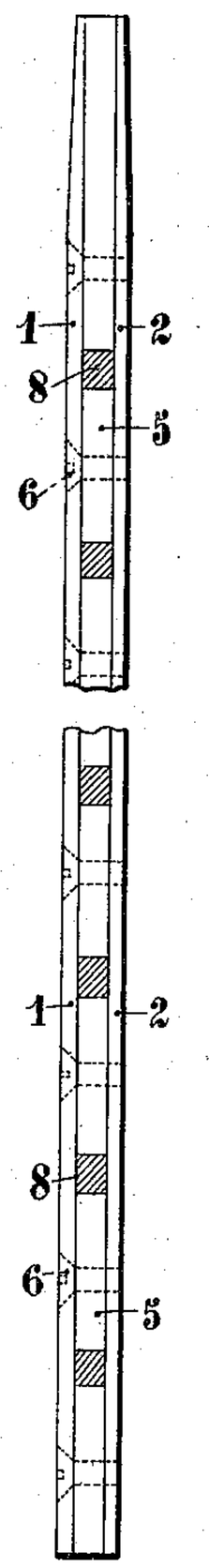

Fig.5.

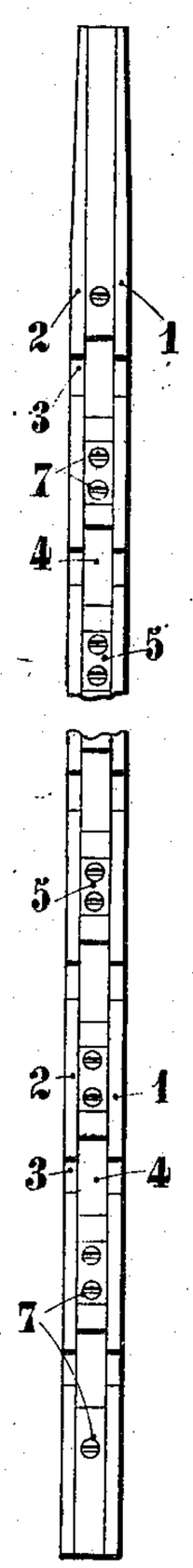

Fig.3.

Fig.3¹.

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10 SHEETS—SHEET 2.

Fig. 9.

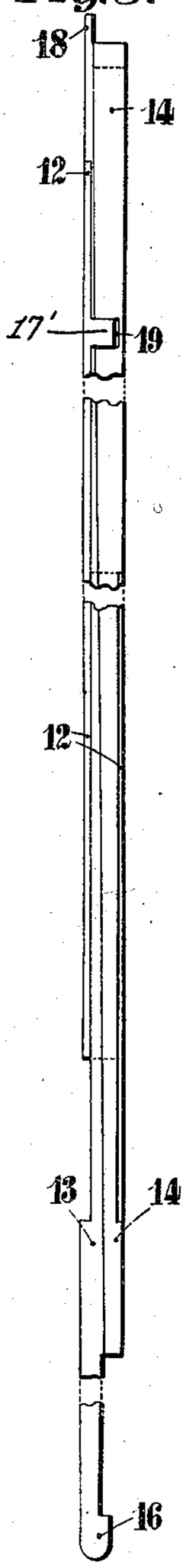


Fig. 8.

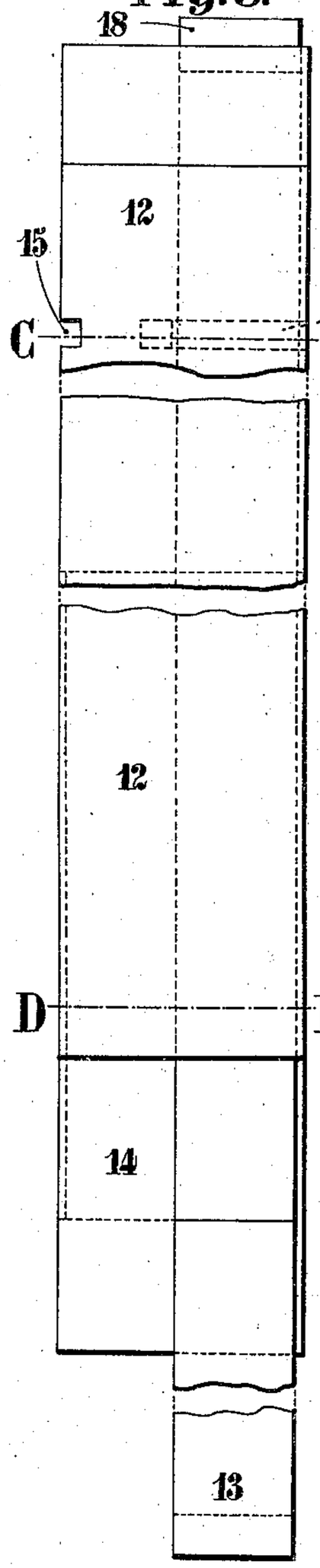


Fig. 10.

Fig. 17.

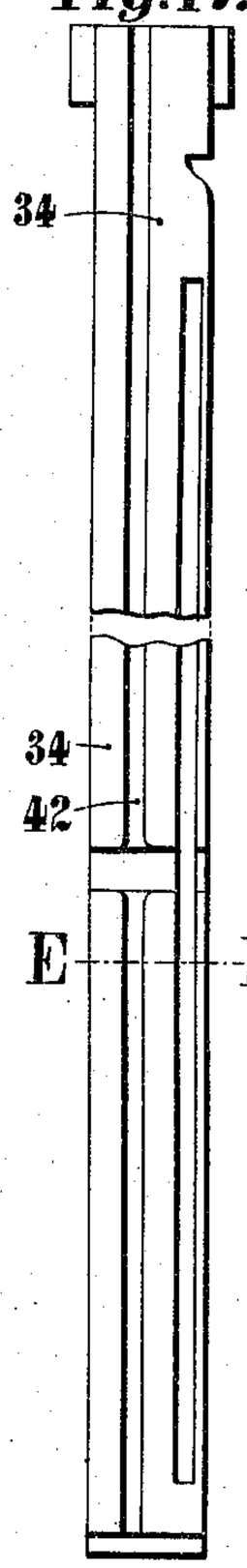


Fig. 19.

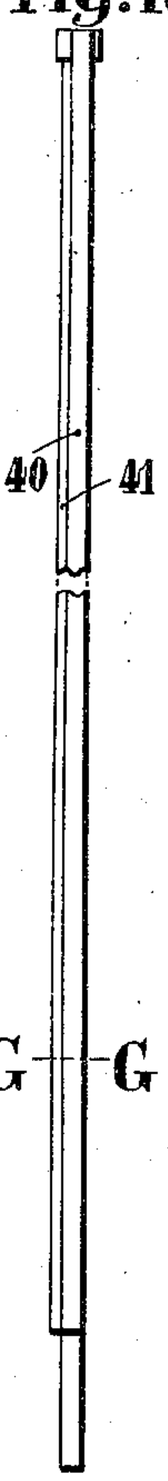


Fig. 16.

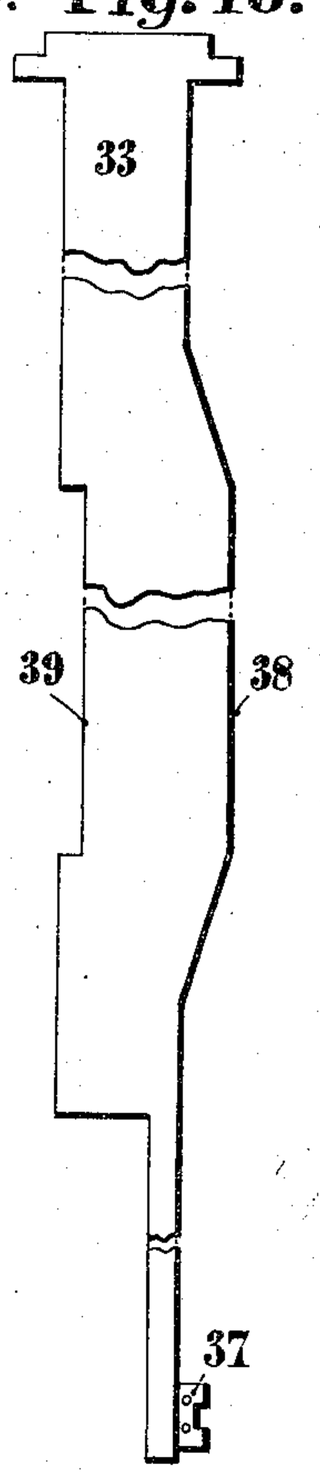


Fig. 18.

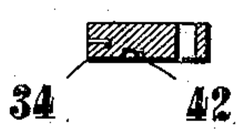


Fig. 20.

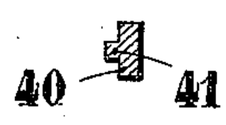
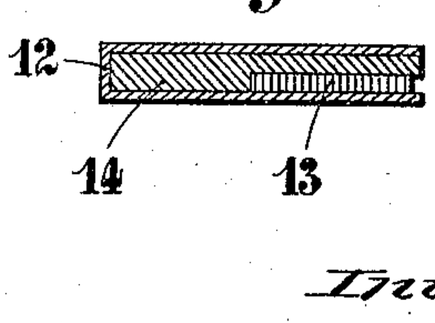


Fig. 11.



Witnesses:

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10 SHEETS—SHEET 3.

Fig. 12.

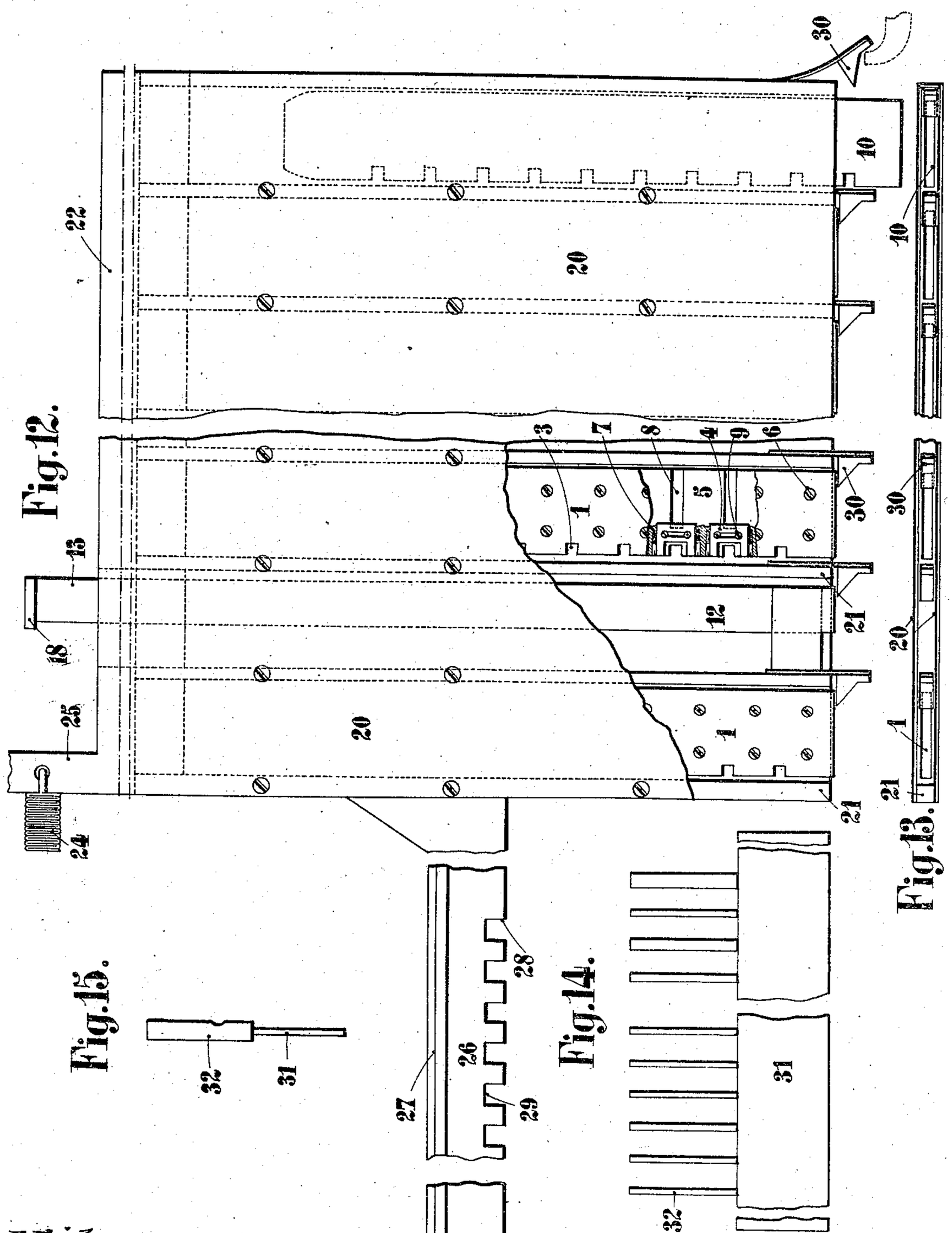

Fig. 13.

Fig. 15.

Fig. 14.

Witnesses:

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10 SHEETS—SHEET 4.

Fig.21.

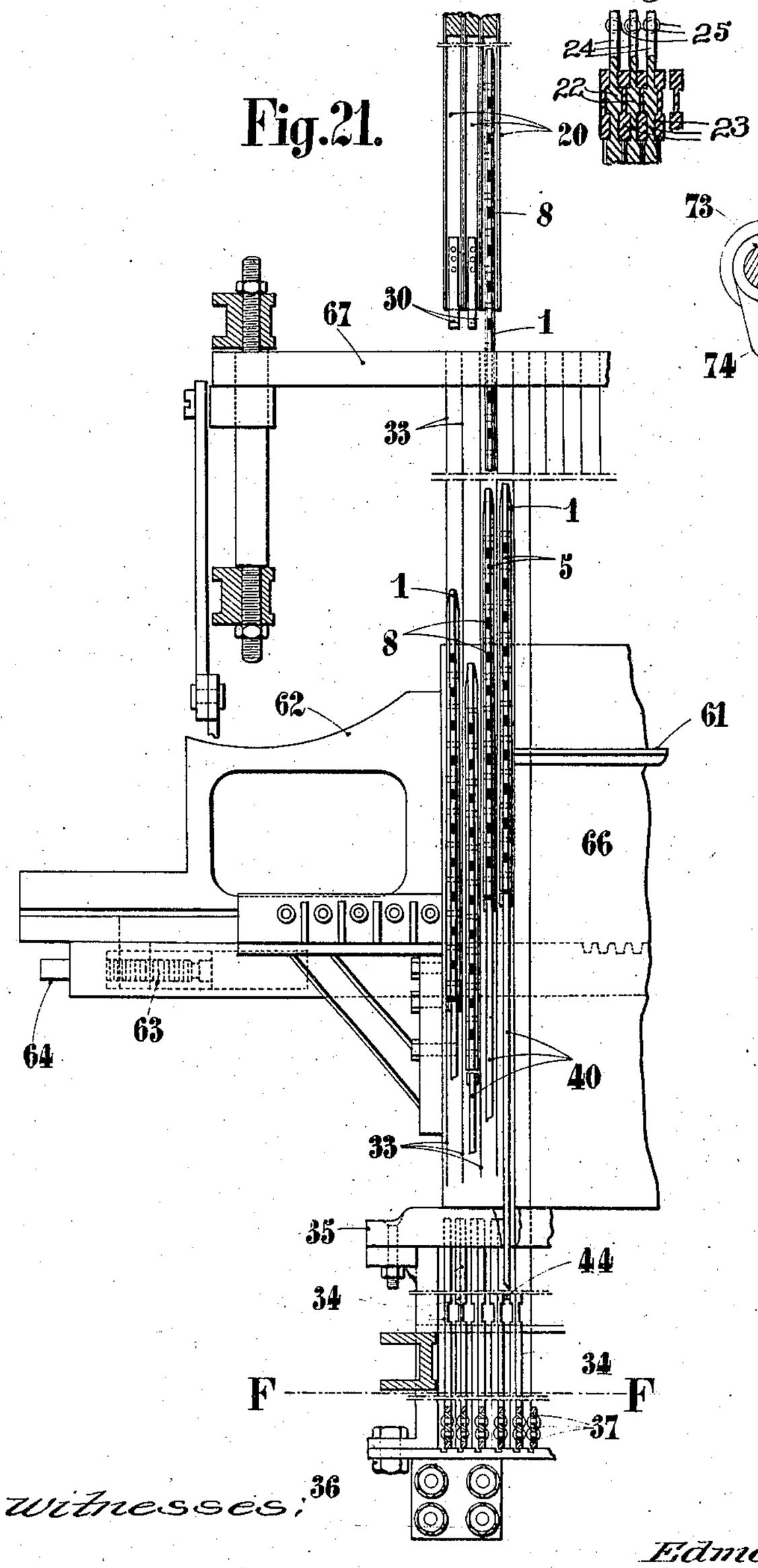

Fig.21ª

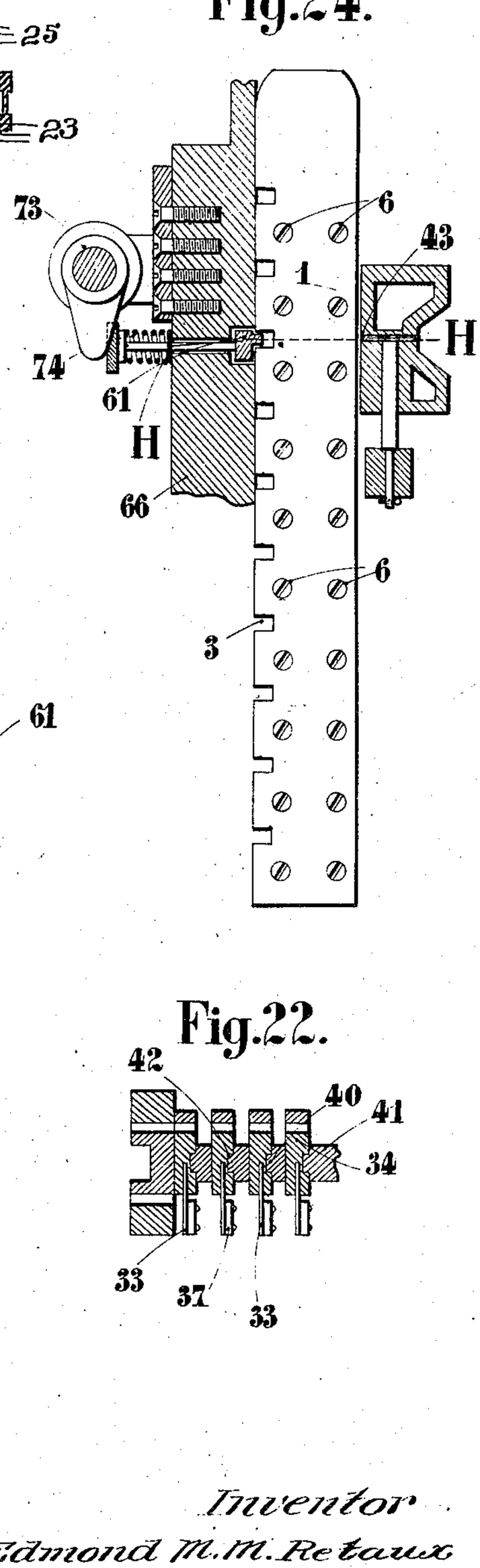

Fig.24.

Fig.22.

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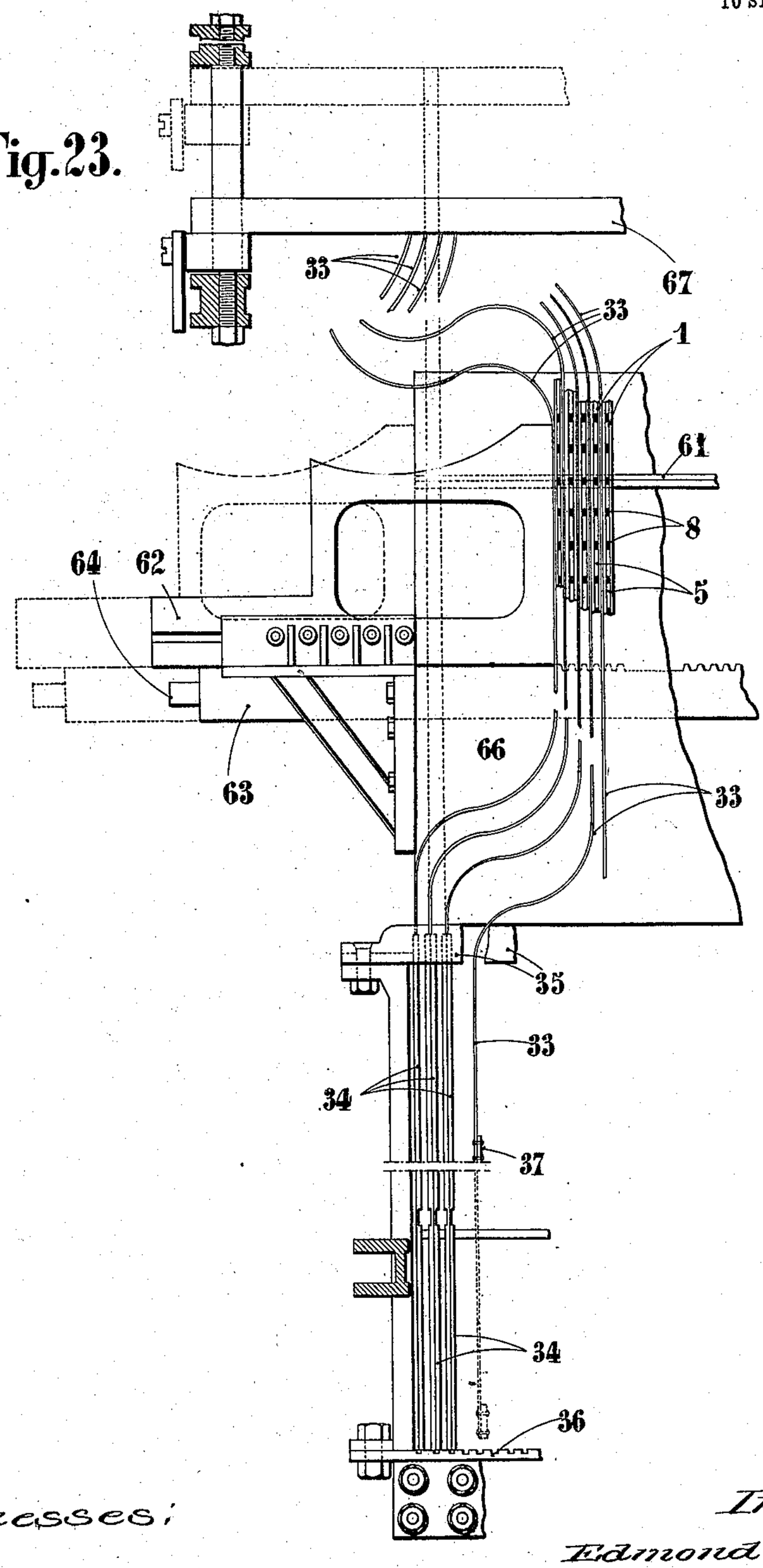
APPLICATION FILED JAN. 27, 1902.

919,951.

Patented Apr. 27, 1909.

10 SHEETS—SHEET 5.

Fig. 23.



Witnesses:

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MACHINE FOR SETTING UP AND CASTING TYPE.

APPLICATION FILED JAN. 27, 1902.

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10 SHEETS—SHEET 6.

Fig. 25.

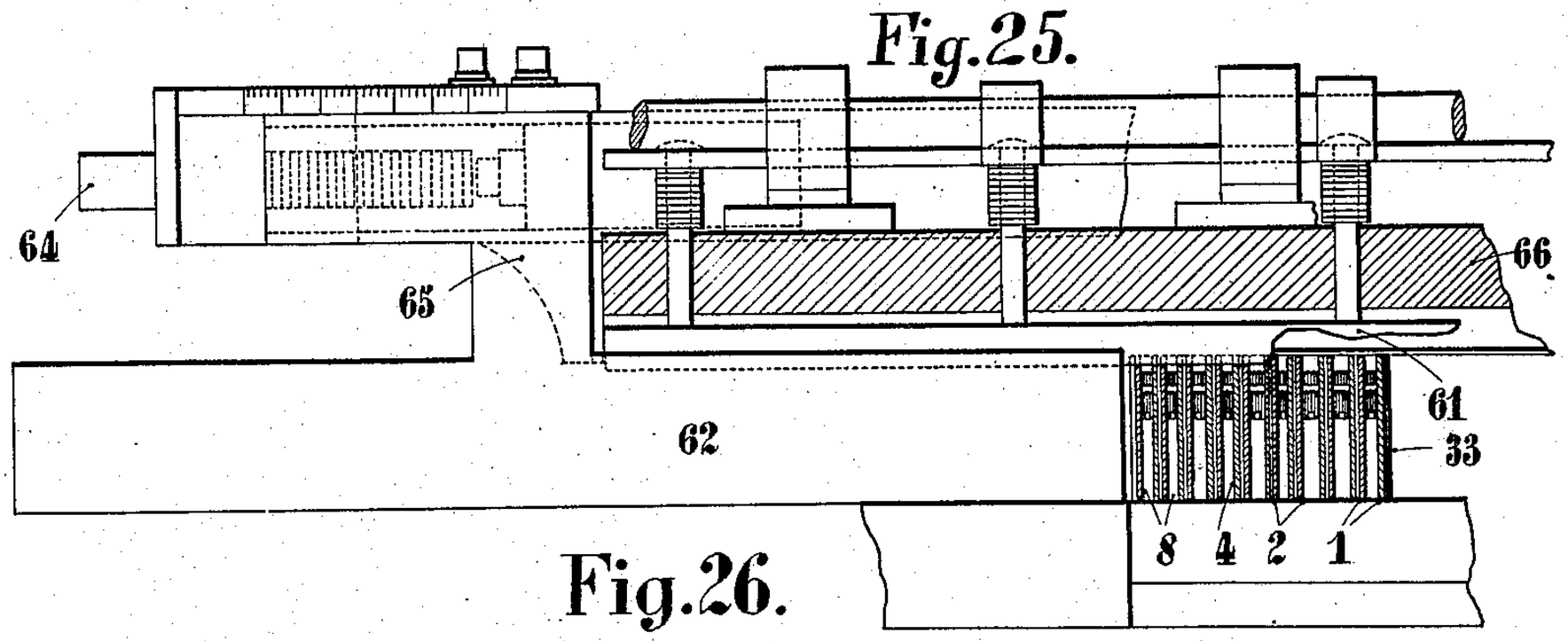
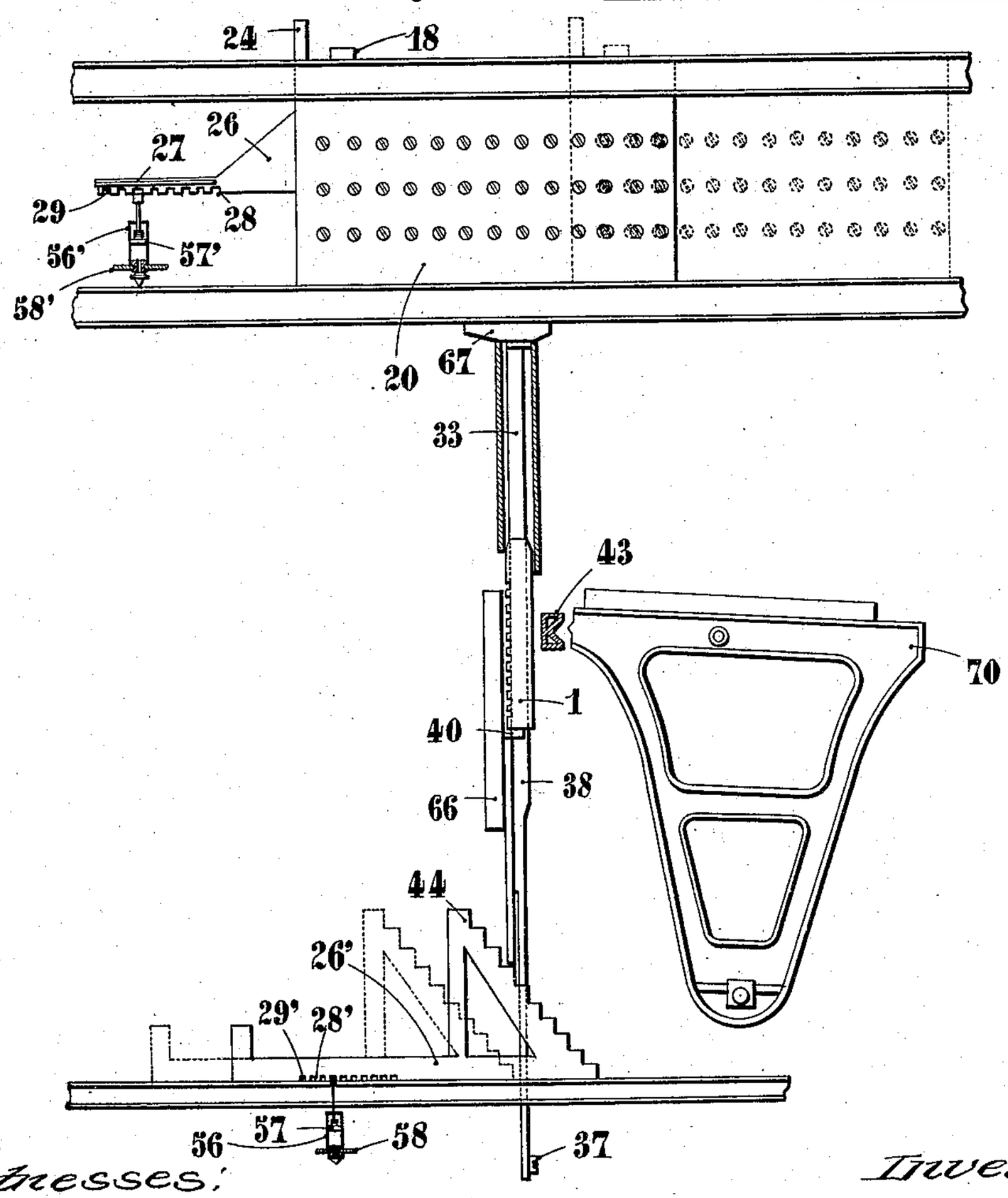


Fig. 26.



Witnesses:

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MACHINE FOR SETTING UP AND CASTING TYPE.

APPLICATION FILED JAN. 27, 1902.

919,951. Patented Apr. 27, 1909.

10 SHEETS—SHEET 7.

Fig. 27.

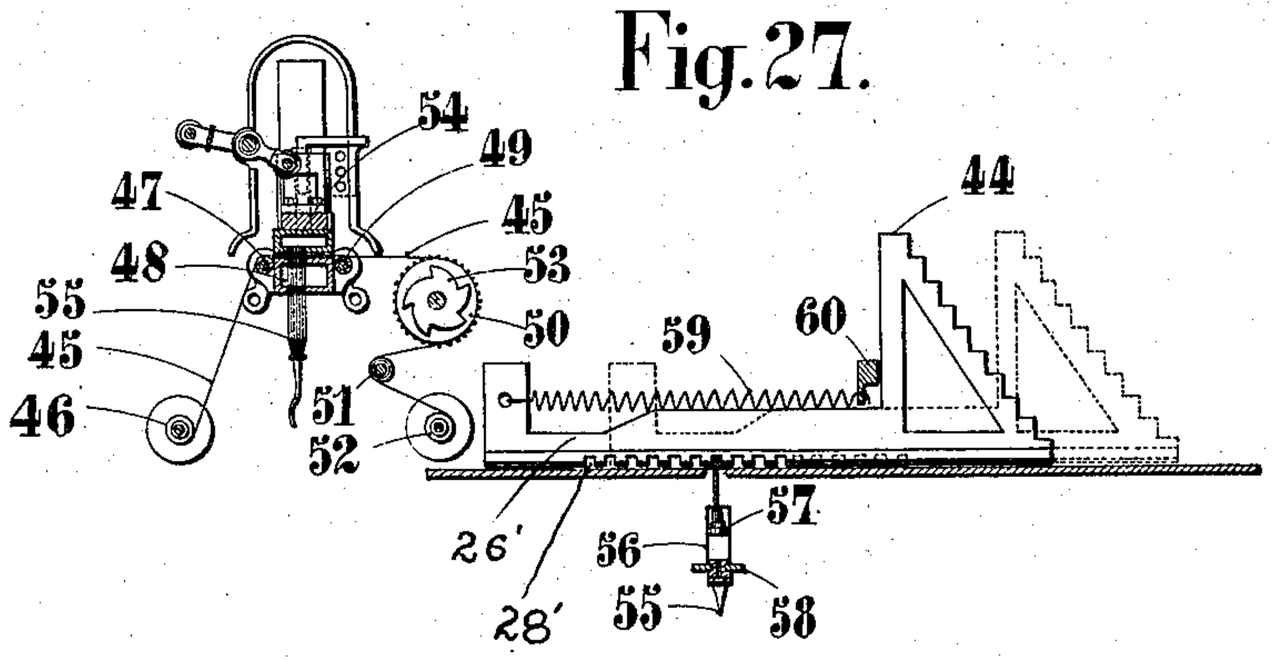
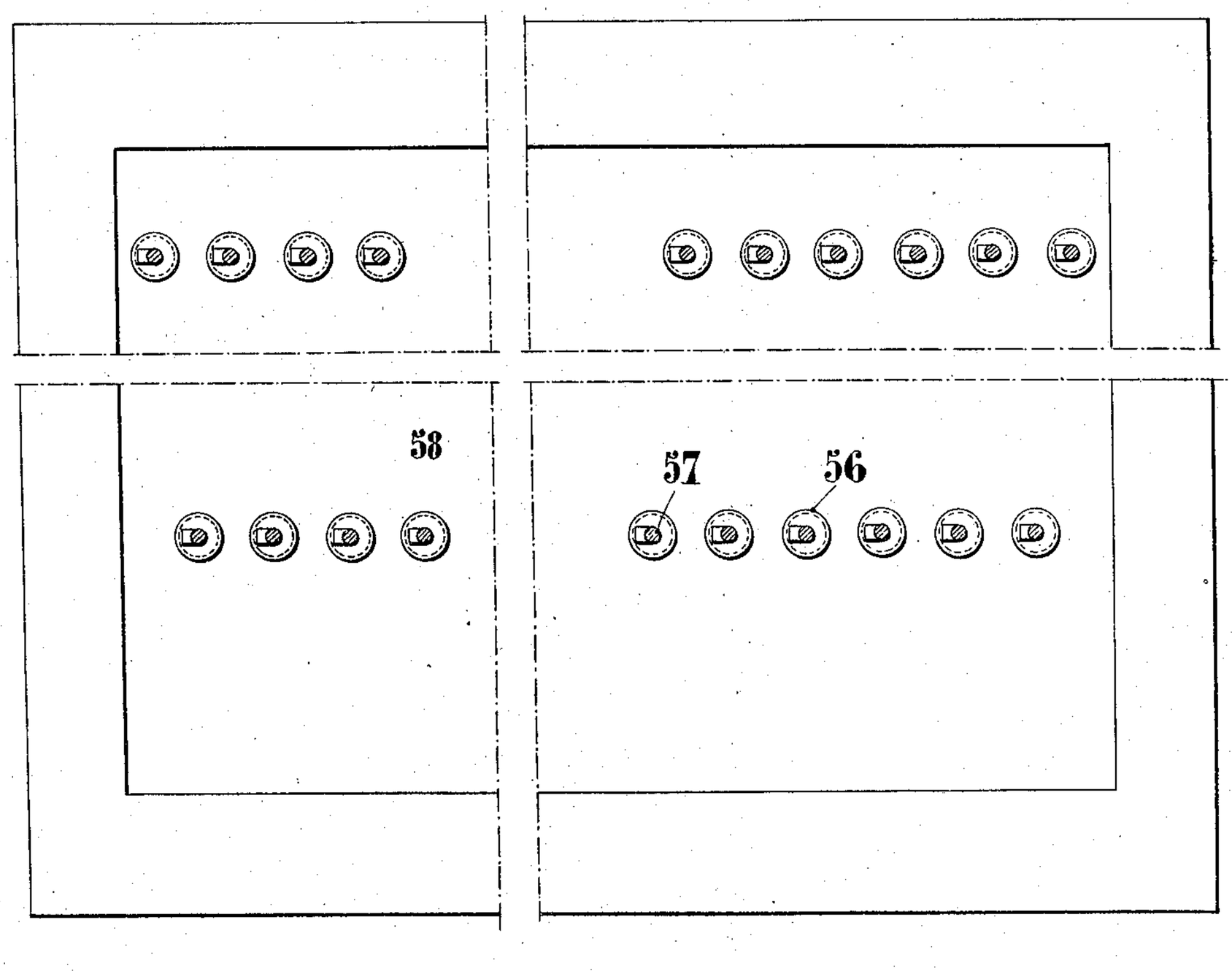


Fig. 28.



Witnesses:

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MACHINE FOR SETTING UP AND CASTING TYPE.

APPLICATION FILED JAN. 27, 1902.

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Patented Apr. 27, 1909.

10 SHEETS—SHEET 8.

Fig. 31b.

Fig. 29.

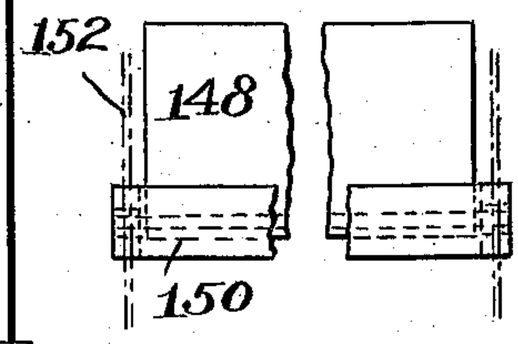


Fig. 29a

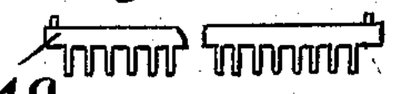
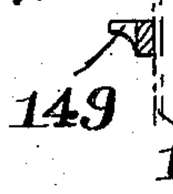


Fig. 29b



Witnesses

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MACHINE FOR SETTING UP AND CASTING TYPE.

APPLICATION FILED JAN. 27, 1902.

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10 SHEETS—SHEET 9.

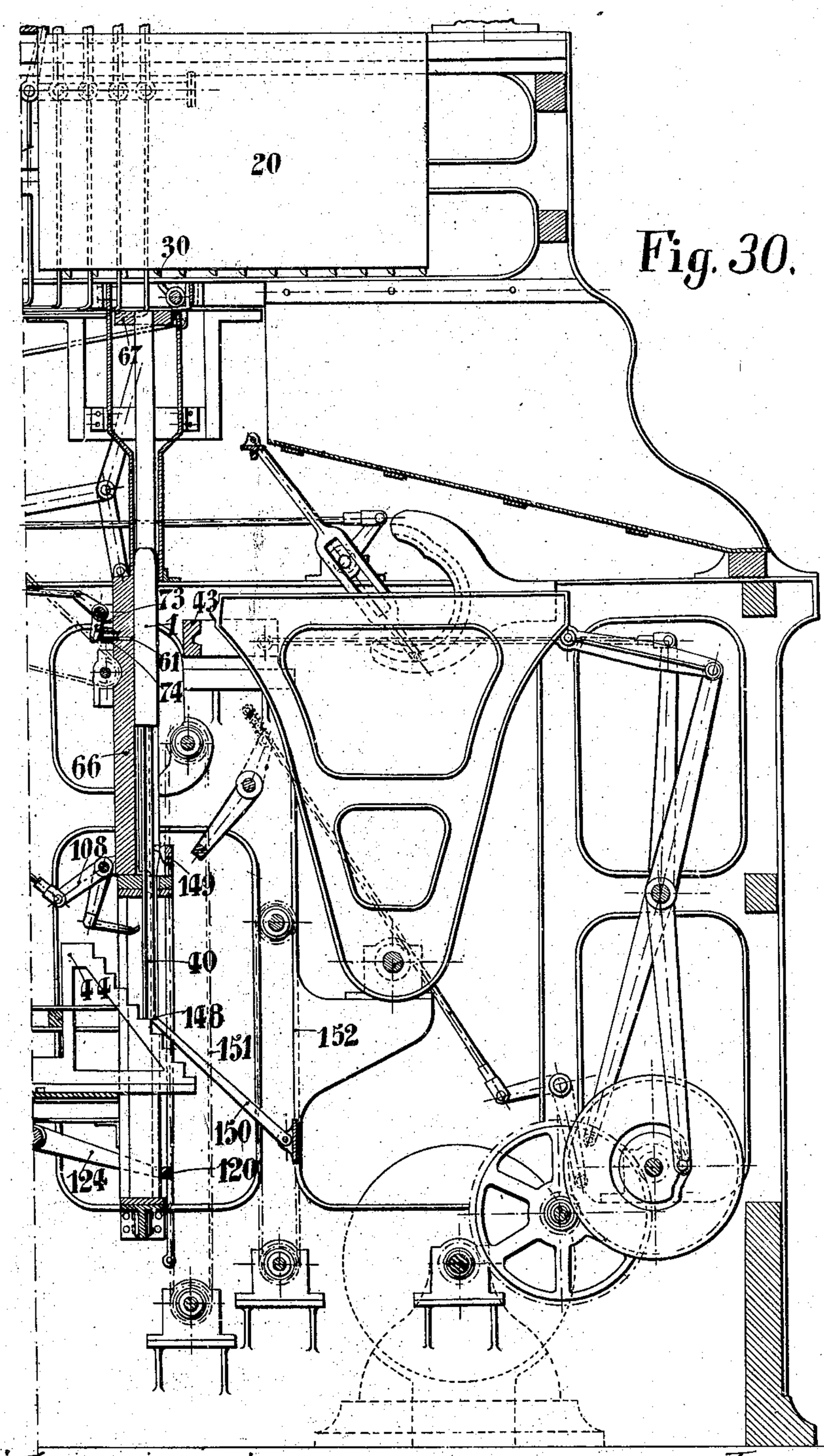

Fig. 30.

Witnesses:

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MACHINE FOR SETTING UP AND CASTING TYPE.

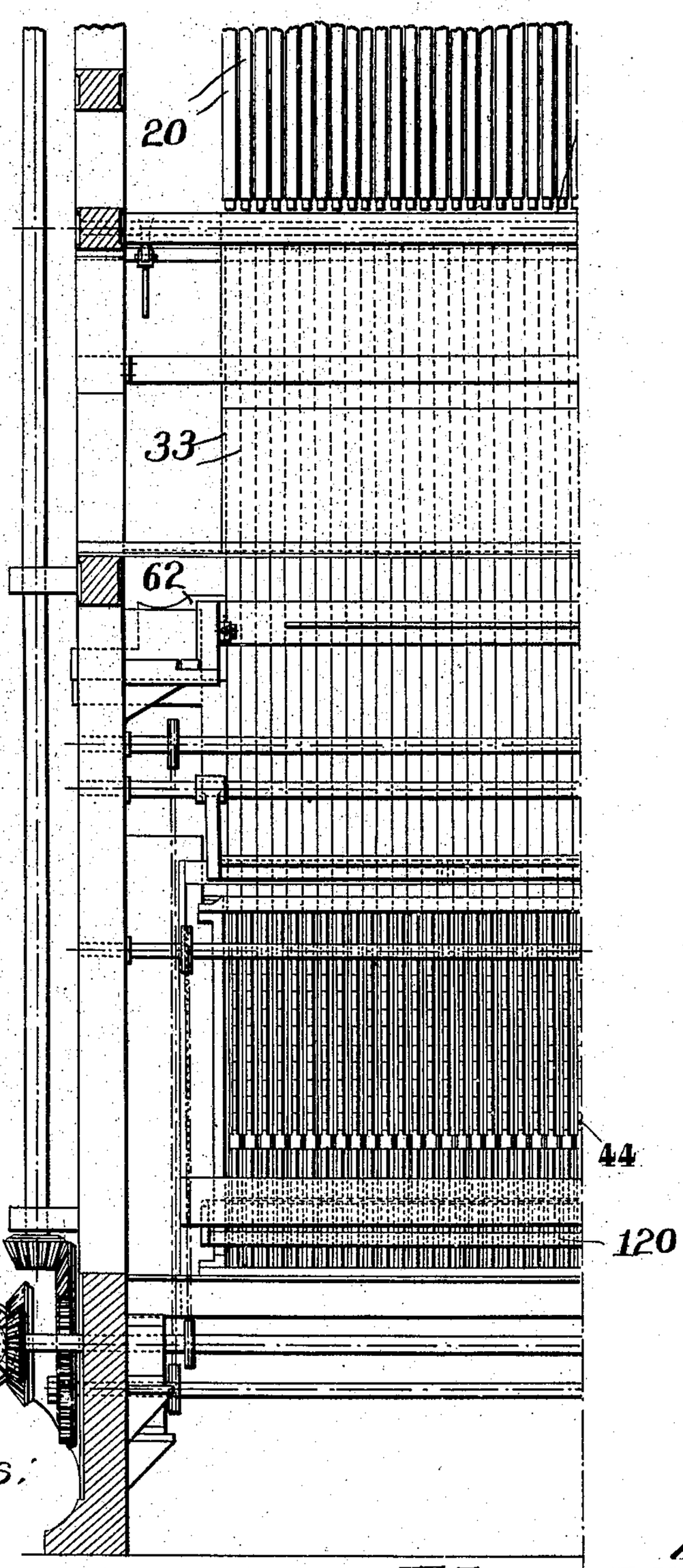
APPLICATION FILED JAN. 27, 1902.

919,951.

Patented Apr. 27, 1909.

10 SHEETS—SHEET 10.

Fig. 31ª



Witnesses:

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Inventor:
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By
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UNITED STATES PATENT OFFICE.

EDMOND MARIE MAURICE RETAUX, OF ABBEVILLE, FRANCE.

MACHINE FOR SETTING UP AND CASTING TYPE.

No. 919,951. Specification of Letters Patent. Patented April 27, 1909.

Application filed January 27, 1902. Serial No. 91,433.

To all whom it may concern:

Be it known that I, EDMOND MARIE MAURICE RETAUX, citizen of the Republic of France, residing at 84 Chaussée Marcadé, Abbeville, Somme, France, (postal address,) printer, have invented a certain new and useful Improvement in Machines for Setting Up and Casting Type, (for which I have secured Letters Patent in France, under date of July 13, 1901, No. 312,686, and in England, complete, under date of December 18, 1901, No. 25,868;) and I do hereby declare that the following is a full, clear, and exact specification of the same.

This invention has for its object the provision of an effective machine for casting and setting type.

In one kind of type casting and setting machine with which I am familiar the operator successively positions the matrices to form a line, at which time a cast in type metal is made at a single operation of such line to form a solid bar having characters upon one side thereof; in another kind of machine the line is obtained by means of types which are separately cast. The present machine is based upon an entirely different mode of operation; it simultaneously and automatically places all the molds of types (or matrices) to form a line in position; the matrices of a line being placed and, always automatically, justified, the line is cast in a single operation, but the body of each type is left absolutely separate from the body of the adjacent type, and the line set up, justified, cast and finished by means of this machine is exactly such as would have been obtained by setting up isolated type by hand.

My machine assures that the cast type will be perfectly alined by peculiar means for regulating the positions of the matrices, that the lines will be perfectly justified, and the presence between the type of projections of alloy which may leave traces in printing is wholly avoided. Corrections and modifications can therefore be very easily made, which is not the case with existing machines which cast a line in a single piece.

The machine contains as many alphabets as there may be characters and spaces in a line to be set up, for instance, forty-five alphabets. Each alphabet contains ten type-molds, which I shall designate as "compounds" or "matrix bars." Each matrix bar contains ten matrices. One alphabet therefore contains one hundred matrices. In each matrix of one alphabet is a different character of the typographic alphabet; small letter, capital letter, cipher, or other desired sign. Hence one alphabet contains one hundred different matrices and permits of obtaining one hundred different letters or signs. The matrices of an alphabet are grouped together according to their width, and in an order which may be of any kind but which must be the same in all the alphabets of the machine.

The machine contains forty-five times the same matrix, one matrix being contained one time and one single time in each alphabet. All the produced characters are of the same kind, that is to say, that one group of forty-five alphabets contains only matrices for Egyptian characters, for example. This group may be replaced by another group of forty-five alphabets, containing matrices for italic characters, and so forth. A matrix of each one of the forty-five alphabets is brought at the required point before the casting nozzle to secure simultaneously the casting of all the characters which compose a line. The setting up of the matrices is obtained by compressed air passing through perforations previously made in a strip of paper, two perforations corresponding to one character to be set up as hereinafter explained. Each alphabet is first moved horizontally in order that the matrix-bar carrying the matrix of the character to be set up comes into a certain position; this matrix-bar is then released and descends the desired distance as hereinafter described. When the forty-five alphabets have been moved and the matrix of each letter or space of the lines has come into the desired position, the alloy is cast simultaneously in the forty-five matrices perfectly alined. The line is cast in such a manner that the bodies of the type are left absolutely separate one from another but connected together at their butts or bases by a separable bar of alloy. The cast line is taken automatically from the machine; the compounds are returned to their respective alphabets, and the alphabets are returned to their respective initial positions to begin a new line in the same manner.

In order that my invention may be clearly understood, I shall describe it with reference to the accompanying drawings, in which:

Figure 1 is a side elevation of a type-mold hereinbefore referred to as "compound" or

"matrix-bar." Fig. 2 is a transverse section through line A—A, of Fig. 1. Fig. 3 is a perspective view of a matrix serving to mold a character, for example, the letter "e." Fig. 3′ is a detail view of one of the matrices, and also shows a portion of one of the supporting plates therefor. Fig. 4 is a front view of a matrix-bar. Fig. 5 is a rear view of the same. Fig. 6 is a side elevation of a solid or blank compound or bar which does not carry matrices and which is utilized only when the line is not composed of a predetermined number of characters or signs, as hereinafter described. Fig. 7 is a transverse section through line B—B of Fig. 6. Fig. 8 is a side elevation of a peculiar compound or spacing bar which is adapted to cast the spaces and to assure the justification of the lines. Fig. 9 is a front view of the same. Fig. 10 is a section through line C— of Fig. 8. Fig. 11 is a section through line D—D of Fig. 8. The side of a compound which is called here the "front" one is the side through which the alloy comes into the compound, during the casting. The rear side is the opposed one. Fig. 12 is a view in elevation of a magazine containing an alphabet. Fig. 13 is a plan of this magazine. Fig. 14 shows a cast line. Fig. 15 is an end view of the same. Fig. 16 shows in elevation one of the flexible steel blades which serve as guides for the compounds. Fig. 17 shows in elevation one of the pieces in which the ends of the flexible steel blades slide. Fig. 18 is a section through line E—E of Fig. 17. Fig. 19 is an elevation of the supports carrying the compounds during the casting. Fig. 20 is a section through line G—G of Fig. 19. Figs. 21 and 21ª show a section of the machine through the flexible blades 33, hereinafter described, when said blades are stretched to permit a matrix-bar to fall into position for casting. In said Figs. 21 and 21ª, contrary to the manner in which the machine is worked, two compounds are shown in the same channel; this is only for indicating the path taken by the compounds during their descent. Fig. 22 is a section through line F—F of Fig. 21. Fig. 23 shows the same section of the machine as Figs. 21 and 21ª during the casting. Fig. 24 is a side view of a compound at the time of casting, showing the manner in which it is kept in position and the piece through which the alloy is cast. Fig. 25 is a plan showing the compounds during the casting and a part of a vise which brings the compounds together. Fig. 26 shows diagrammatically the connections between the essential parts of the machine. Fig. 27 shows the manner in which the descent of the compounds is regulated. Fig. 28 shows a plan of the disposition of the pistons set in motion by compressed air, and which serve to regulate the descent of the compounds, each piston corresponding to a different alphabet. Fig. 29 is a detail view of the means for giving the initial lift to the supports for the "compounds" or matrix bars. Fig. 29ª, is a plan view of the comb which, after the device shown in Fig. 29 has lifted the supports part of the way engages the upper ends of such supports to fully restore them to their initial position. Fig. 29ᵇ is a transverse section of Fig. 29ª. Fig. 30 is an elevation of one half of the machine, showing the means for limiting the downward movement of the supports for the "compounds" or matrix bars; the means for straightening out the blades forming the channels for the matrix bars; and the means for restoring the supports for the matrix bars to their initial positions. Figs. 31ª and 31ᵇ are together a transverse section of the machine showing the vise for the matrix bars.

In several figures the represented parts have been broken in order to obtain more clearness in the drawings.

Like characters refer to like parts throughout the several figures of the drawings.

An alphabet composed of one hundred different molds having typographic characters or signs is contained in a special box called a magazine. This magazine contains ten matrix bars, each of which carries ten matrices. A character matrix bar includes in its make-up two plates 1 and 2 each provided on its rear edge with ten notches 3 serving to stop the matrix bar in the desired position for casting, by means of a cross bar 61 (Figs. 21, 23, 24 and 25) which comes into one of said notches 3. Between the plates 1 and 2 there are located ten matrices 4 and eleven blocks 5. The blocks 5 are fixedly secured in position by means of screws 6, screwed into the plate 2. This position of the blocks 5 is so as they form ten channels 8 situated at the same level as the notches 3 and for forming the bodies of the type. Each matrix 4 is situated between two adjacent blocks 5 and is provided with means for permitting its adjustment longitudinally of its bar, whereby the character on said matrix 4 can be brought just opposite to the rear end of the channel 8 formed by the two blocks 5 embracing said matrix 4. A matrix 4 (Fig. 3′) is formed by a metal piece on the front of which is engraved a character or other typographic sign (for example, the letter "e.") As shown in Figs. 1 and 3′, the matrix 4 is provided at its rear with a notch 3′ which is of greater area than the notches 3 in the plates 1 and 2. This arrangement makes it possible to adjust the matrices upwardly or downwardly with reference to the plates 1 and 2 without having the horizontal walls of said notches 3′ come into register with or overlap the corresponding horizontal walls of the notches 3 of said plates. The entrance of the alining bar 61 into the notches

3 of the plates 1 and 2 (as shown in Figs. 21, 23, 24 and 25) is thus not interfered with by the adjustment of the matrices 4. The height of the matrices 4 is adjusted by the screws 7 tapped in the blocks 5, while the adjustment is retained by the screws 9 tapped into the plate 2, the screws 9 passing through elongated slots in said matrices for the purpose set forth. Beside the ten matrix bars, the alphabet contains a solid compound or blank compound 10 (Figs. 6 and 7) the width of which is equal to that of a character matrix bar composed of the plates 1 and 2 and the parts carried thereby.

The object of the use of the blank compound is as follows: The line to be cast is a line of forty-five characters, signs, or spaces. It will be assumed that a line has been made up composed of fifteen words containing thirty characters; said line is therefore composed of thirty characters and fourteen spaces. For the casting of the line the matrix bars and the space bars (hereinafter described) drop before the casting nozzle, from the forty-four magazines. The forty-fifth magazine has neither a matrix bar nor a space bar to furnish; it provides a blank or quad compound or plain bar 10 which takes the place of the forty-fifth character of the line. So, for the justification of the line the space occupied by matrix bars composed in part of the plates 1 and 2 or by the pieces which take their places, remains always the same, and this space is never varied whatever may be the number of characters which constitute the line.

The solid compounds are provided with notches 11, corresponding exactly with the notches 3 of the matrix bars and which are used for the same object. Each alphabet contains also a peculiar compound which is intended for the casting of the spaces, and which I call a spacer. The spacer (Figs. 8 to 11) is constituted by a casing 12 formed preferably of sheet metal bent in U-shape (Fig. 11). The right hand side of the casing 12 shown in Fig. 9 has its upper end and lower ends and the left-hand side has its lower end cut away. In each casing 12 are located two plates 13 and 14 having a portion of their opposing faces oppositely beveled, that is to say, the face of the plate 13 adjacent to the plate 14 is inclined near its upper end toward said upper end, and the upper portion of the face of the plate 14 adjacent to the plate 13 is inclined toward the lower end of said plate. The object of this construction is that when the plate 13 is moved upwardly in the casing 12 its beveled face will slide upon the beveled face of the plate 14 and thus expand the casing. The right-hand side of the casing (Fig. 9) is seated in a depression in the outer face of the plate 14 to secure said parts together and prevent longitudinal movement of the plate 14 with reference to the casing. The plate 14 is provided with a transverse groove 19 in which is located a tongue 17′ cut in the metal sheet used for making the casing 12 and at the same time as the casing. This tongue is bent on itself to form a channel 17, as shown in Fig. 10. The casing 12 and the plate 14 are both provided with an alining notch 15 used for the same object as the notches 3 of the matrix bars, and the notches 11 of the blank compound 10. The other plate 13 has its beveled upper end extending through the channel 17. The plate 13 is longitudinally movable in the casing 12, and is provided at its two ends with shoulders 16 and 18 which serve for the purpose of limiting its travel, as hereinafter explained. The mold of the space is constituted by the play existing between the bottom of the groove 19 and the tongue 17′ (Fig. 10.) When the plate 13 is moved endwise its beveled face slides upon the beveled face of the plate 14 to expand the spacer and the line of matrix bars is justified by moving several of said plates in such manner to expand the line. The plate 13 is longer than the casing 12 (see Figs. 8 and 12) and, as stated, is provided at its lower end with a shoulder 16 which engages the lower end of the plate 14 to limit its upward movement, and at its upper end with a shoulder 18 which engages the upper end of said plate 14 to limit its downward movement. By reason of the fact that the plate 13 is longer than the casing 12 the upper end of said plate, when in its normal position in the magazine, projects above the upper end of said casing and its magazine, as shown in Fig. 12. When, however, the casing 12 is dropped to cast a space the plate 13 drops so that its shoulder 18 abuts on the upper end of the plate 14, to reduce the space between the tongue 17′ and the wall of the groove 19, unless such downward movement is limited by coming into contact with the support for the casing as hereinafter explained.

Ten matrix bars each carrying ten characters or signs, the spacer, and the blank compound (forming a typographic alphabet) are contained in a magazine. Each magazine consists of a box 20 open at the bottom and divided into twelve compartments by means of vertical partitions 21. I may adopt the following arrangement of the compounds in a magazine or box 20. The compartment situated at the extreme right of the Fig. 12 contains the blank compound; each one of the nine following compartments contains a matrix bar; the eleventh compartment contains the spacer; the twelfth and last compartment contains a matrix bar. It is evident that the invention is not limited to such a distribution of the compounds. The compartment which contains the spacer is open at both ends, in order to permit the upward vertical move-

ment of the projection or shoulder 18 of the plate 13, when said spacer is in its compartment. Beneath each compartment is a spring hook 30 which serves to normally retain the compounds in their respective compartments. Each magazine is provided at its top with a rib 22 which slides between two fixed rails 23 (Fig. 21) forming parts of the frame of the machine. The said rib 22 carries at one end a vertical bar 24 to which one end of a return spring is attached, the other end of said spring being fixed to the frame of the machine. As stated, a line is made up of forty-five characters, signs, or spaces, each character being formed by one of the matrix bars, blanks, or spaces contained in one of the magazines. That is to say, the first character, sign, or space produced from a matrix bar, blank or spacer from the first magazine; the second from the second magazine, and so on. It is therefore necessary to have forty-five magazines. Because there are forty-five magazines, there are forty-five bars 24, forty-five springs 25 and forty-six rails 23. A transverse bar, not shown, bears against the vertical bars 24; it serves for simultaneously moving the forty-five magazines against the return springs 25.

The several magazines are arranged side by side, and have a longitudinal movement, that is to say, toward the right in Figs. 12 and 26, in order that the matrix bar, solid compound, or spacer selected from each magazine may be brought over the channel for that magazine to permit such selected matrix bar, solid compound or spacer to drop into such channel in front of the casting nozzle as shown in Fig. 24. Each magazine is provided with a tail piece 26 provided at its top with a rib 27 which slides into a groove made in the frame of the machine, in order to guide the magazine; this tail piece is provided at its bottom with a rack 28 having twelve teeth 29 between any two of which the stem of a piston 57′ is adapted to engage. Each of the teeth 29 of the racks 28 corresponds with one of the compartments of the magazine, so that when the stem of the piston 57′ engages any one of the teeth it will stop the magazine in such position as to bring the compartment of that magazine which corresponds to such tooth over the channel for such magazine to permit the matrix bar, blank or spacer selected from that magazine to drop in such channel. Because there are forty-five magazines, there are forty-five tail pieces 26 and forty-five grooves made in the frame, in which grooves slide the tail pieces. During its travel, each magazine passes over a channel the entering end of which is stationary and, when a space of the rack 28 is entered by the stem of the piston 57′, the magazine is held and a matrix bar, spacer or blank compound of the magazine, corresponding to the said space, is situated above the said channel. There are forty-five of these channels, one for each of the magazines. The function of these channels is to receive the matrix-bars, blanks or spacers selected from the respective magazines in order to bring the desired matrix, blank or spacer of each magazine in front of its respective nozzle of the casting apparatus to cast the character selected on said matrix.

For casting a line, the forty-five magazines are simultaneously and horizontally moved, and each one is stopped above the desired channel in such a manner that the matrix bar, or the spacer, or the blank compound to be freed therefrom is coincident with the entering end of this channel, matrix bar, or spacer, each being maintained in its compartment by means of its spring hook 30. The walls of the channels are made of flexible steel blades 33 (Figs. 16, 21, 22 and 23,) a blade forming the separating wall of two consecutive channels. These blades are fixedly secured at their upper ends to a transverse bar 67 forming part of the frame of the machine, by reason of which the entering or inlet end of each channel is stationary and the matrix bars, spacers, or blank compounds are positively caused to accurately gravitate into said channels when released. The blades 33 are narrower near their lower ends and are provided intermediate their ends with a recess 39 and an enlarged portion 38. The blades 33 are each free to slide in a groove of a sheath 34 formed of a bar which has its upper and lower ends secured respectively to the bars 35 and 36 forming parts of the frame of the machine (Figs. 21 and 23). The lower end of the blades 33 are each provided with a hook 37 for a purpose which will hereinafter appear.

Because there are forty-five magazines, there are forty-five channels, forty-six flexible blades 33, and forty-six sheaths 34. The sheaths 34 are spaced apart and each has a groove 42 in one of its faces. Between the sheaths are slidably arranged supports for the respective matrix bars, each support comprising a bar 40 provided on one side with a rib 41 which extends into the groove 42 of one of the sheaths. The bars 40 have their upper ends enlarged to form ample seats for the matrix bars. (Figs. 17, 19, and 22). Because there are forty-five magazines there are, as stated, forty-five channels, one for each magazine, forty-six flexible blades 33 to divide said channels, and forty-six sheaths 34 for the blades 33. When a matrix bar has been dropped into each of the channels formed by the blades 33, and the line is locked up, as hereinafter explained, the matrix-bars are moved toward the right as shown in Fig. 23. This with-

draws the blades 33 partly from their sheaths as shown in Fig. 23. To restore said blades 33 to their normal vertical position and bring the matrix bars under their respective compartments in the magazines a lever 124 (Fig. 30) engages the hooks 37 of said blades and draws them downwardly. Means to limit the downward movement of the supports 40 is provided, such means comprising a set of forty-five stepped stops or stairs, 44, one for each channel. (Figs. 26 and 27). These stops 44 are each movable into the lower part of one of the spaces between the sheaths 34. The forty-five stops or stairs 44 are adapted to be moved upon a support forming part of the frame of the machine (Fig. 26 and 27.) Each one is provided with a tail piece 26′ which is provided at its bottom with a rack 28′ having ten teeth 29′. During the displacement of the stairs, the teeth pass over the stem of a piston 57. When this stem has entered a space in the rack 28′, a corresponding step of the stair is stopped below the channel of descent of the compound corresponding to the stair, in order that the compound will be stopped, during its falling at a certain level, and that a certain matrix will be stopped just opposite to the nozzle 43 of the apparatus furnishing the melted alloy (see Figs. 24 and 26).

The working of the magazine and the stairs is as follows: Let us suppose, for example, that, in order to obtain the eighteenth sign (typographic character, sign, or space) of the line, we must use the fourth matrix (counted from the top of a matrix bar) of the fifth matrix bar (counted from the right side of a magazine) (Fig. 26.) The eighteenth character of the line is contained in the eighteenth magazine; so, for obtaining the result above mentioned, we must use the eighteenth magazine and the eighteenth stepped stop or stair, and arrange their motions in a suitable order. The key of the keyboard (not shown) corresponding to the desired character is accordingly pressed which through suitable mechanism (not shown) moves the appropriate magazine (Fig. 26) to the right against the tension of the spring 24 (Fig. 12). As has been hereinbefore explained, the fifth matrix bar is contained in the sixth compartment of the magazine (counted from the right side of the magazine.) At the time when the sixth space (counted from the right hand side) of the rack 28 passes over the stem of the eighteenth piston 57′, this piston is projected into said space (as will be hereinafter explained) and locks the rack. Hence the eighteenth magazine is stopped just at the time when its sixth compartment and, consequently, its fifth matrix bar, are just over the eighteenth channel. At the same time, through suitable mechanism (not shown), the stop 44 has been moved toward the right-hand side of Fig. 26 and the piston 57 which controls the movement of the stop 44 is, through suitable connections, actuated at the proper instant to bring its rod into engagement with the fourth notch of the rack 28′. This locks the stop 44 in that position and brings the fourth step of said stop into the space between the lower ends of the sheaths forming the eighteenth channel. The matrix support 40 in said channel is then permitted to drop upon such step and the hook 30 (Fig. 12) of the fifth matrix bar of the eighteenth magazine is released. This permits said matrix bar to drop. The lower end of said matrix bar will then rest upon the upper end of the support 40 which brings the fourth matrix of said bar (counting from the top) opposite the nozzle of the casting apparatus. The magazine is restored to its normal position, when the rod of the piston 57′ is withdrawn from the rack 28, by means of the spring 24; and similarly the stop 44 is restored to its normal position, when the rod of the piston 57 is withdrawn from the rack 28′, by the spring 59 (see Fig. 27).

The movements of the magazines and of the stepped stops or stairs are obtained as follows: A strip of paper having perforations corresponding to the characters, signs, or spaces which compose a line is utilized. These perforations are grouped together two by two; for a line, there are forty-five groups of two perforations, that is to say, ninety perforations. In a group, one perforation controls the movement of a magazine to bring the matrix bar, spacer, or blank compound, as it may happen, over the channel of descent, while the other perforation controls the movement of the stepped stop or stair to control the descent of this compound and to bring the selected matrix, space, or blank compound before the nozzle 43. The strip of paper 45 is unrolled from a drum 46 and passes over two rollers 47 and 49, then over a spiked drum 50, then over a roller 51 and finally is received on a drum 52. By passing over the spiked drum 50, the strip of paper is gripped by the pins and fed along. The drum 50 has fastened to its axle a ratchet wheel 53 driven in some desirable manner, a rotation of the drum 50 corresponding to the movement of one tooth of the ratchet and causes the strip of paper to advance a distance corresponding to that of two successive lines. The feed of the strips occurs each time a line of type has been cast. Between the rollers 47 and 49 the strip 45 passes over a perforated table 48, against which it bears during the interval between successive rotations of the ratchet 53, and under a hollow box 54, the bottom of which is bored with the same number of holes as the table 48, the two sets of holes being in register. This box, which is divided internally by partitions, is connected by pipes to a tank containing compressed air, these

pipes being provided with cocks driven by the machine. The holes in the table 48 are divided into two sets; the holes of one set are connected by pipes to the cylinders 56 of the pistons 57 of the stepped stops or stairs; the holes of the other set are connected by pipes to the cylinders 56′ of the pistons 57′ of the magazines. The cylinders 56 are carried by a support 58, and the cylinders 56′ by a like support 58′. Let us suppose that compressed air be directed toward one or several compartments of the box 54; if there are perforations in the strip of paper, the compressed air will go through these perforations, into the holes of the plate 48 corresponding to the perforations of the strip of paper, and, by means of the pipes mentioned, will control these or those pistons of the magazines and the stairs or stepped stops, to bring before the nozzle 43 the matrix bars corresponding to the characters desired in the printed line. When the forty-five matrix bars; spacers and blank compounds used for composing the line are assembled before the nozzle 43, their characters must be alined with respect to the nozzle in order to cause the melted alloy to properly enter the mold spaces. For obtaining such a result a transverse bar 61 is pushed into the notches 3 of the matrix bars, fifteen of the spacers, and eleven of the blank compounds, which are set in a row before the nozzle. This bar is pushed and maintained in position by means of a finger 73 driven by the machine in opposition to the return-spring 74.

After the alining operation, the matrix bars, spacers, and blank compounds must be pressed together to justify the line; a vise is used for that purpose. The vise comprises a pair of jaws as shown in Figs. 31^a and 31^b, one of the jaws 62^a being fixed and the other 62 movable. In Figs. 23 and 25 the movable jaw 62 is illustrated in detail. A rack bar 63 extending transversely of the machine (Fig. 23) is moved by suitable means (not shown). This rack bar is provided on its outer end with a rising stud or projection through which extends a screw 64, having its inner end swiveled to the movable jaw 62, so that by turning said screw the jaw can be moved toward or away from the outer end of the rack to adjust said jaw with reference to the rack. When the inner end of the rack is moved inwardly the movable jaw is carried with it to tightly clamp the assembled matrix bars and blades 33 between said movable jaw 62 and the fixed jaw 62^a. The inward movement of the movable jaw is limited by a part of said jaw coming into contact with the bar 66 which carries the alining mechanism. (Fig. 25.) In order that the matrix bars, spacers and blank compounds (which, as stated, are at this time situated in the channels between the blades 33) may be pressed together when the vise is locked up, the bar 120 is released from the hooks 37 on the lower ends of the blades 33 and the blades are permitted to move upwardly in the sheaths and the parts of such blades, between which the matrix bars, spacers and blank compounds are situated, may be flexed as shown in Fig. 23. The plates 13 of the spacers 12 are at this time moved upwardly by reason of their lower ends having come into contact with their supports 40 and the spacers 12 are expanded, as hereinbefore explained, to justify the line and provide for the casting of the necessary spaces. Then the melting pot is oscillated, squirts the melted alloy through the nozzles 43 to cast the line of type, and finally returns to its normal position. As soon as the melted alloy has become cool, the nozzles 43 slide horizontally backward, carrying away the cast line which is shaped as shown in Figs. 14 and 15. This cast line is carried to the galley, the bar 31 which unites the finished types is broken away, and said types are brought together in a line within the galley. When the vise is released by the rack 63 the bar 120 engages the hooks 37 of the blades 33 to draw the same downwardly. This laterally moves such of the matrix bars, blank compounds and spacers as are at that time in the channels between the blades 33 to bring the same directly under their respective magazines. A comb or bar 148 (Figs. 29 and 30) is then raised by means of suitable mechanism (shown diagrammatically in the drawings as an endless chain 152) to engage the lower ends of the supports 40 and lift the latter part of the distance necessary to restore them to their normal position. A further comb 147 (Figs. 29^a, 29^b and 30) having forty-five teeth, one for each of the channels, is then actuated by suitable mechanism (shown diagrammatically in the drawings as an endless chain 151) and each one of said teeth enters one of the channels and engages the projection or head at the upper end of one of the supports and lifts it the remaining distance necessary to restore it to its normal position. The machine is ready for another operation which takes place as soon as the ratchet 53 has been turned one tooth by the machine, in order to draw the strip of paper 45 in such a position as the perforations corresponding to the following line are situated between the table 48 and the box 54.

The butts or rear ends of the types, as distinguished from the bodies of such types, are, as will be understood, connected by a bar, the cast types and bar presenting together a comb-like structure. This bar may be separated from the types or type bodies in any desirable manner, for example, by a circular cutter which is not shown as it forms no part of the present invention. The cutting of this

connecting bar from the butts of the types occurs before the types are set up in the galley.

In the setting up of a line of matrices I may use a blank compound or bar and a spacing compound or bar. The blank compounds or bars are adapted to fill out a line, while the spacing compounds or bars are expanded to justify the line.

What I claim is:

1. In a machine of the class described, a matrix device consisting of side strips, spacing members between the strips, separated from each other to provide a channel for molten material to form the shank of a type, and a matrix at the inner end of the channel.

2. In a machine of the class described, a matrix device consisting of side strips, spacing devices between the strips, separated from each other to provide channels for molten material to form the shanks of type and matrices at the inner ends of the respective channels.

3. In a machine of the class described, a matrix device consisting of side strips, spacing devices between the strips, separated from each other to provide a plurality of channels for molten material, to form the shanks of type, and matrices at the inner ends of the respective channels, the side strips being notched to register with the respective matrices.

4. In a machine of the class described, a spacing device composed of a plate folded on itself, and strips between the sides of the plate, the adjacent faces of the strips being beveled and one of the strips being fixed relatively to the other, and said strips having an adjustable channel.

5. In a machine of the class described, a movably mounted matrix containing magazine, pneumatically controlled means for arresting the motion of the magazine at a predetermined point, means for effecting the release of a matrix, and means for controlling the amount of motion of the matrix.

6. In a machine of the class described, a movably mounted matrix containing magazine, pneumatically controlled means for arresting the motion of the magazine at a predetermined point, means for effecting the release of a matrix, and pneumatically controlled means for controlling the amount of movement of the released matrix.

7. In a machine of the class described, a movably mounted magazine having a plurality of compartments, each adapted to contain a matrix device, means for operating the magazine, means for stopping the magazine at a predetermined point and for automatically releasing the matrix device, and means for controlling the amount of motion of the released matrix device.

8. In a machine of the class described, a plurality of matrix containing magazines, means for causing the movement of the magazines, means for stopping the motion of the magazines at predetermined points and for effecting the release of matrices therefrom, and means for positively holding the matrices alined.

9. In a machine of the class described, a plurality of movably mounted matrix containing magazines, means for stopping the motion of the magazines at predetermined points and for effecting the release of matrices therefrom, means for controlling the amount of movement of the released matrices, and means for holding said matrices alined.

10. In a machine of the class described, a matrix containing magazine, matrix releasing means coöperative with said magazine, a movably mounted stepped stop for controlling the motion of the matrix, and means for stopping the motion of said stop at a predetermined point.

11. In a machine of the class described, a matrix containing magazine, matrix releasing means coöperative with said magazine, a movably mounted stepped stop to control the motion of the matrix, and pneumatically operated means for arresting the motion of the stepped stop at a predetermined point.

12. In a machine of the class described, a plurality of movably mounted magazines, each provided with matrix receiving compartments, independently operative stops for arresting the motion of the magazines at predetermined points, means for effecting the release of the matrices on the arrest of the magazines to permit the motion of the released matrices toward a place of assemblage, independently operative stepped stops movably mounted and arranged to control the amount of movement of the respective matrices, and means for arresting the motion of the steps at predetermined points.

13. In a machine of the class described, a plurality of movably mounted magazines, notched matrix devices in the magazines, automatically operative means for arresting the motion of the magazines at predetermined points and for effecting the release of the matrix devices when they are stopped means for stopping the motion of the matrix devices at predetermined points, and means adapted to enter the notches of the matrix devices to hold the latter alined.

14. In a machine of the class described, a movably mounted matrix containing magazine provided with a toothed extension, and a pneumatically operated stop device arranged for operation at a predetermined point to engage said toothed extension and stop the motion of the magazine.

15. In a machine of the class described, a plurality of movably mounted matrix containing magazines, each having a toothed

extension, a plurality of blast pipes, the number of which corresponds with the number of the magazines, and pneumatically operated stop devices arranged to be acted upon by the air transferring the pipes at predetermined intervals and to engage the respective toothed extensions and stop the motion of the magazines.

In witness whereof I have hereunto set my hand this 16th day of Jan. 1902 in the presence of two subscribing witnesses.

EDMOND MARIE MAURICE RETAUX.

Witnesses:
E. GAUTHIER,
W. A. JACKSON.