

No. 675,827.

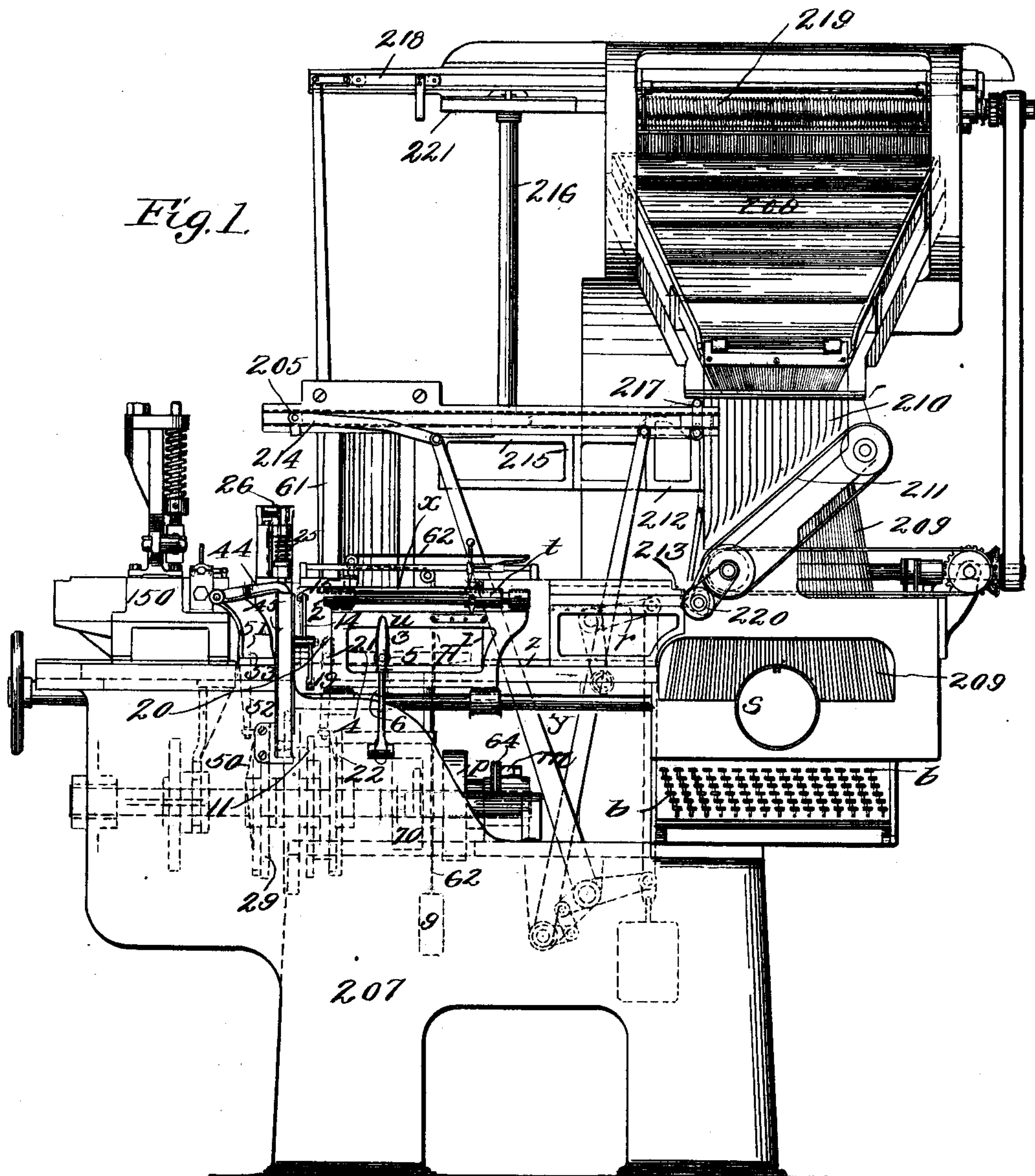
Patented June 4, 1901.

H. J. S. GILBERT-STRINGER.
TYPE CASTING AND COMPOSING APPARATUS

(Application filed Mar. 13, 1900.)

(No Model.)

10 Sheets—Sheet 1.



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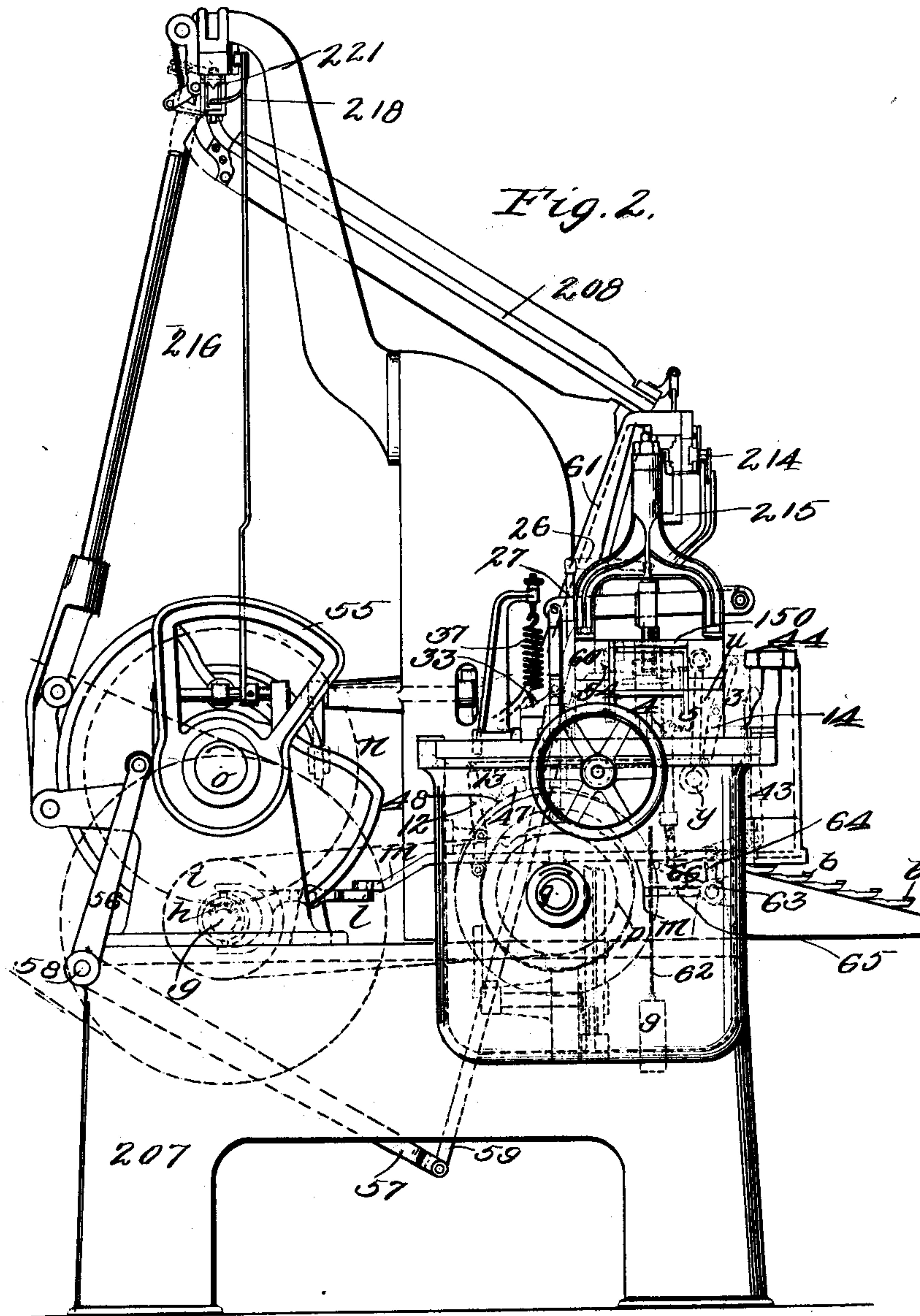
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10 Sheets—Sheet 2.

(No Model.)



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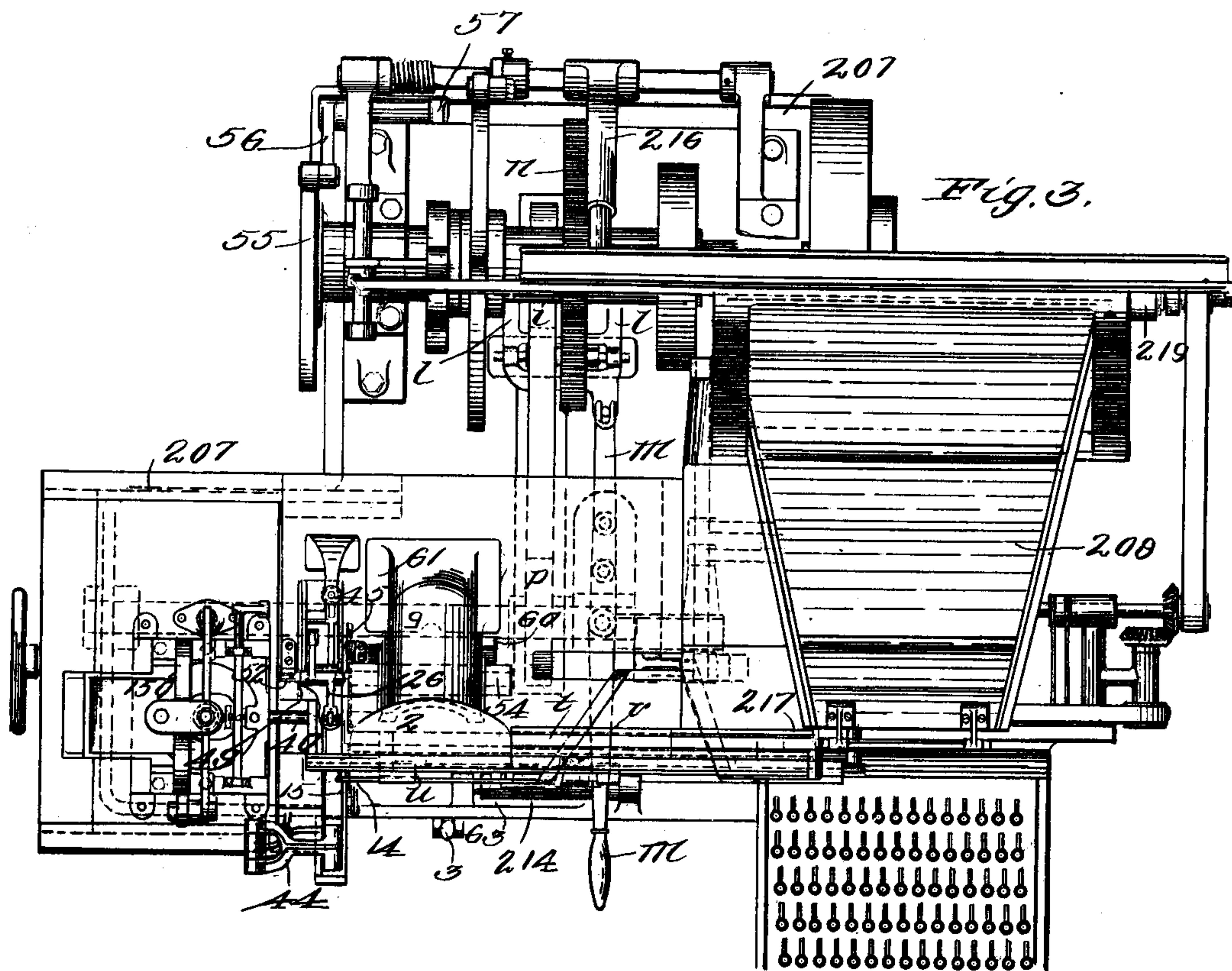
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TYPE CASTING AND COMPOSING APPARATUS.

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10 Sheets—Sheet 3.



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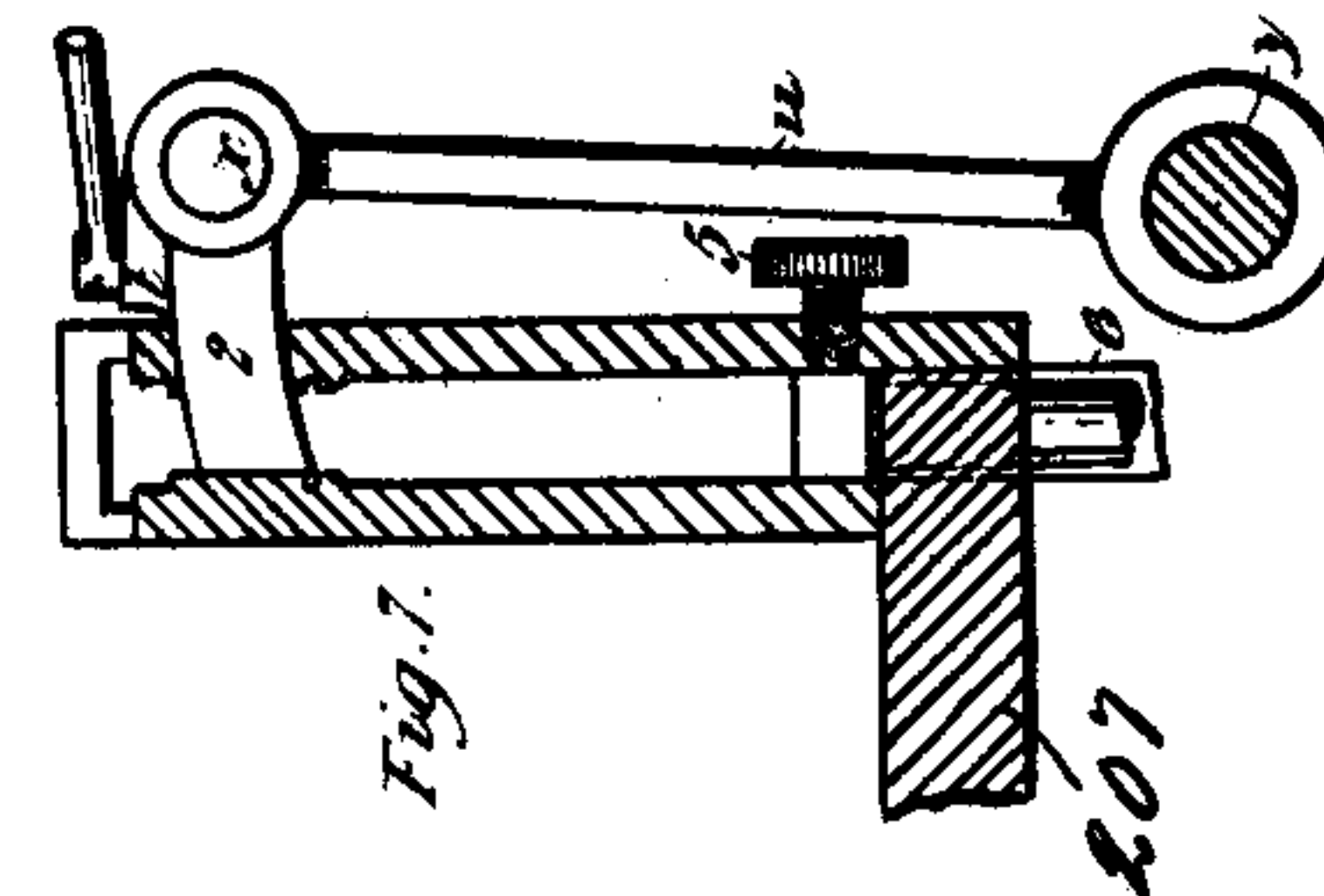
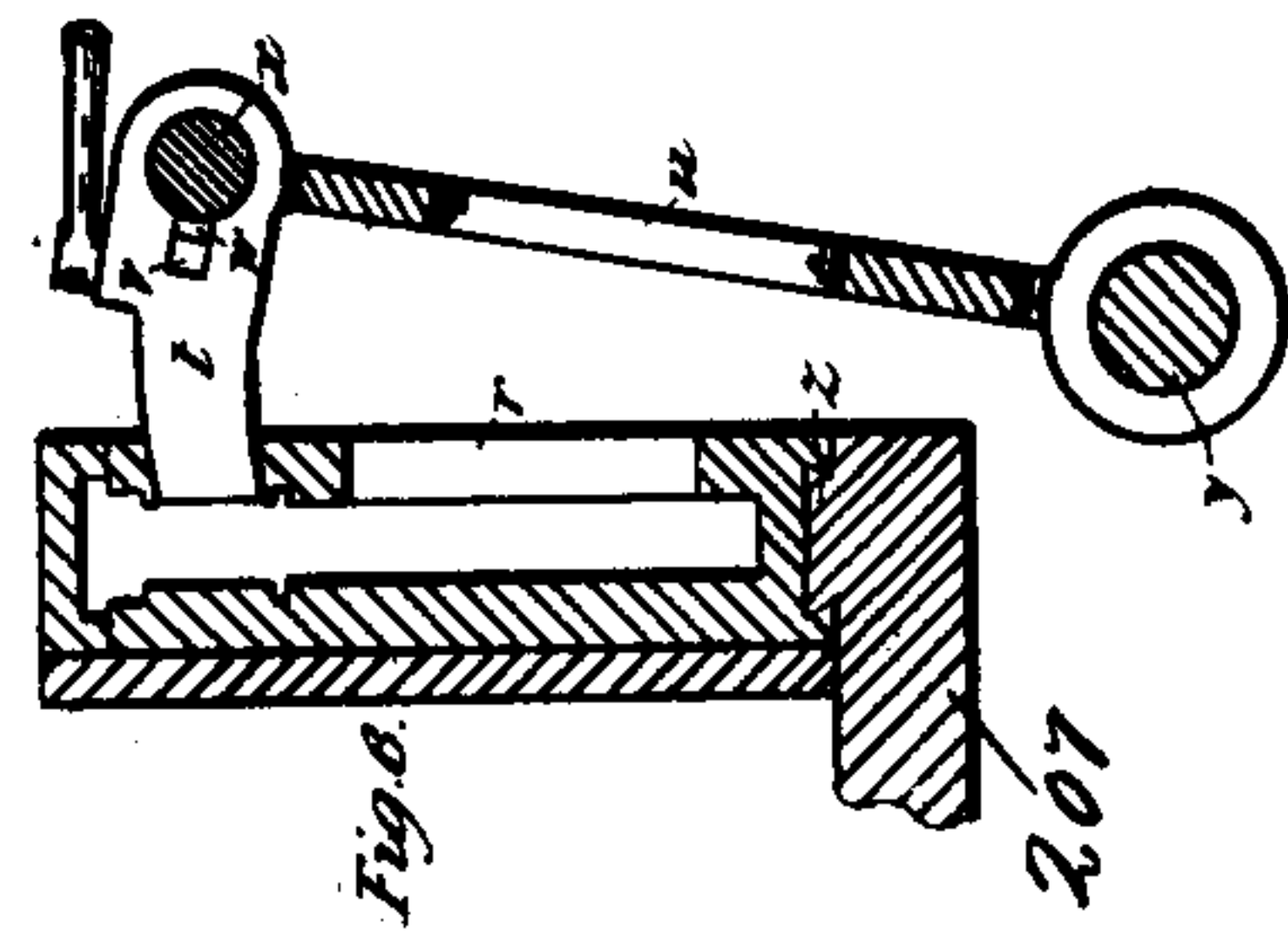
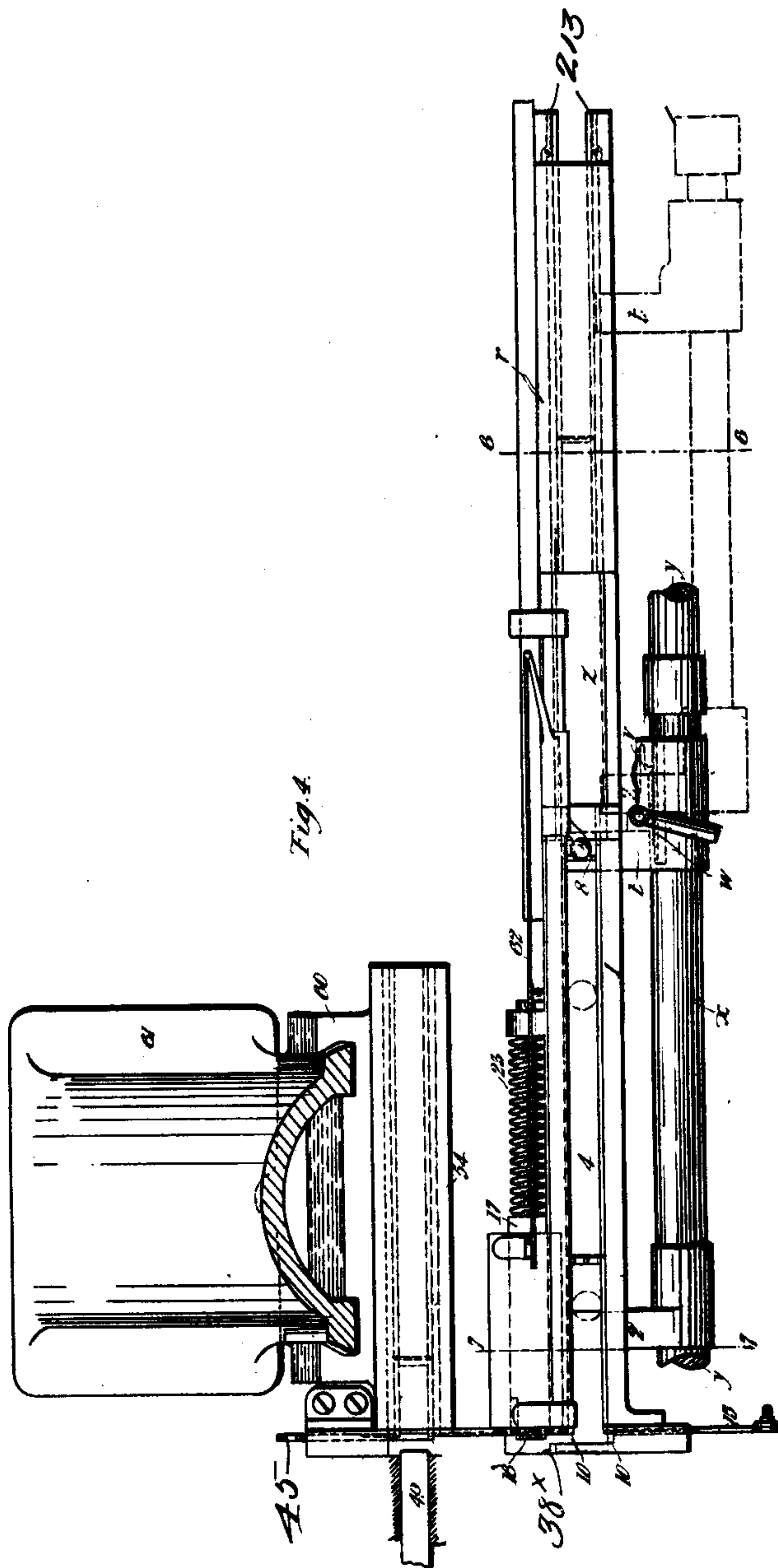
Patented June 4, 1901.

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TYPE CASTING AND COMPOSING APPARATUS.

(Application filed Mar. 13, 1900.)

(No Model.)

10 Sheets—Sheet 4.



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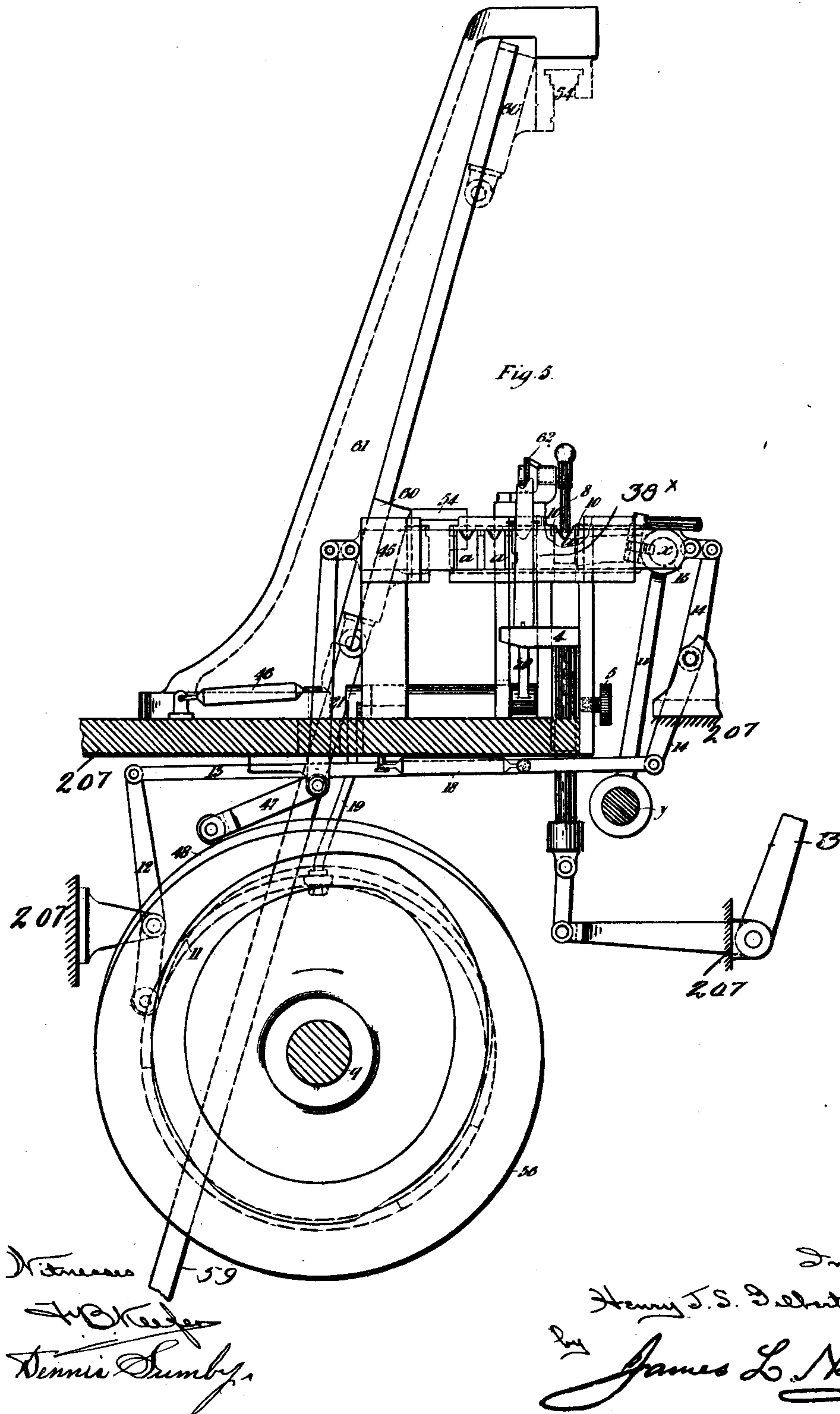
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10 Sheets—Sheet 5.



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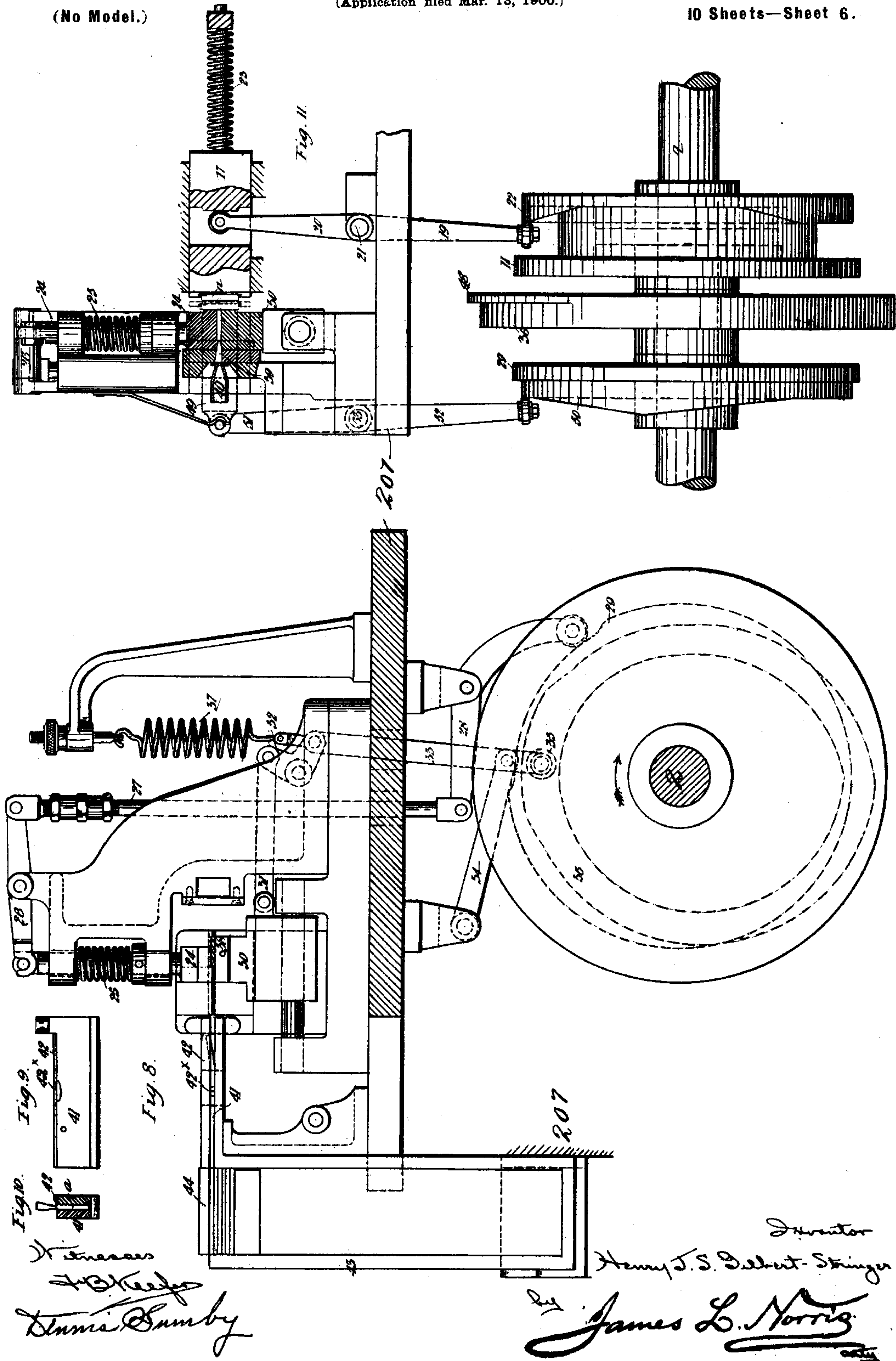
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10 Sheets—Sheet 6.

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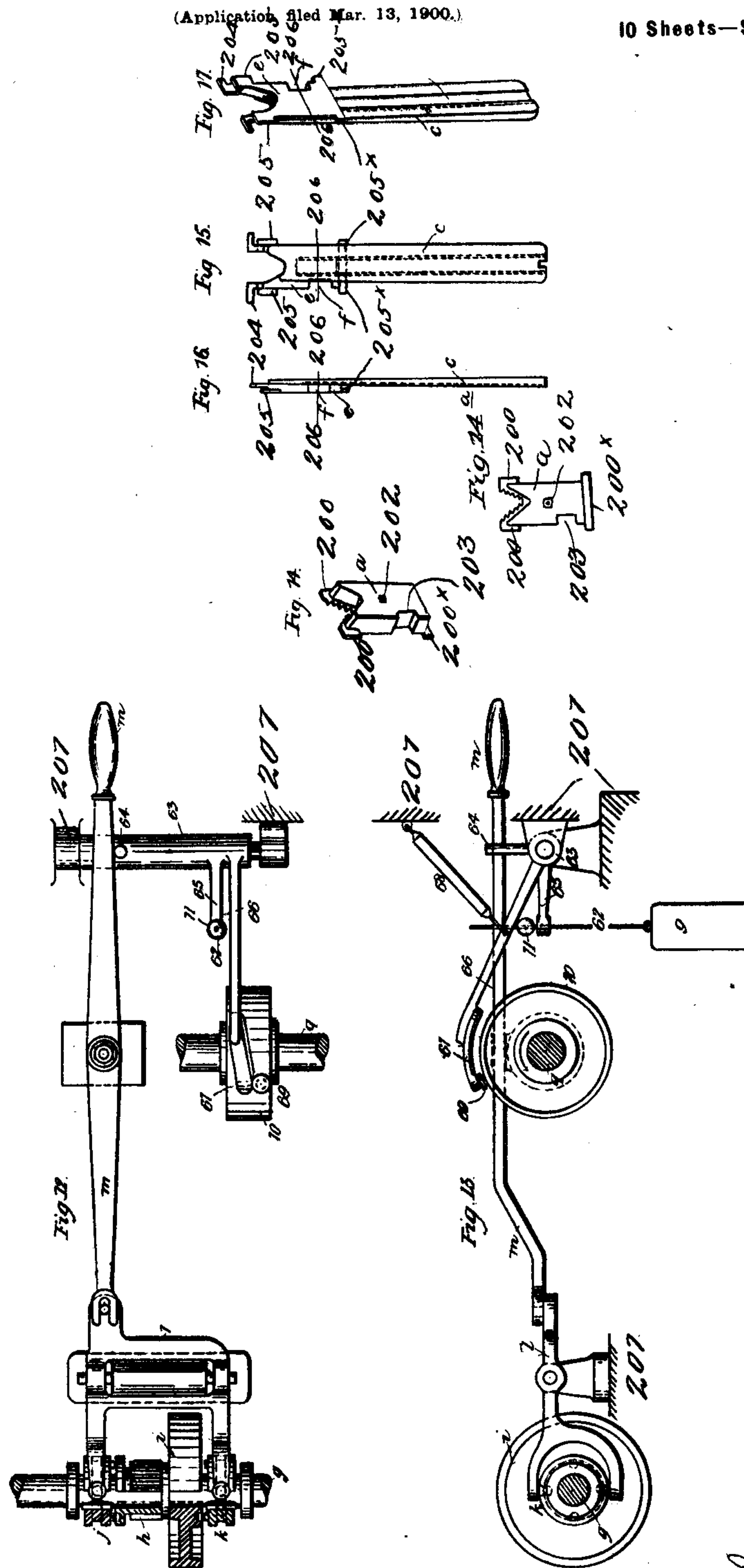
Patented June 4, 1901.

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TYPE CASTING AND COMPOSING APPARATUS.

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(No Model.)

10 Sheets—Sheet 7.



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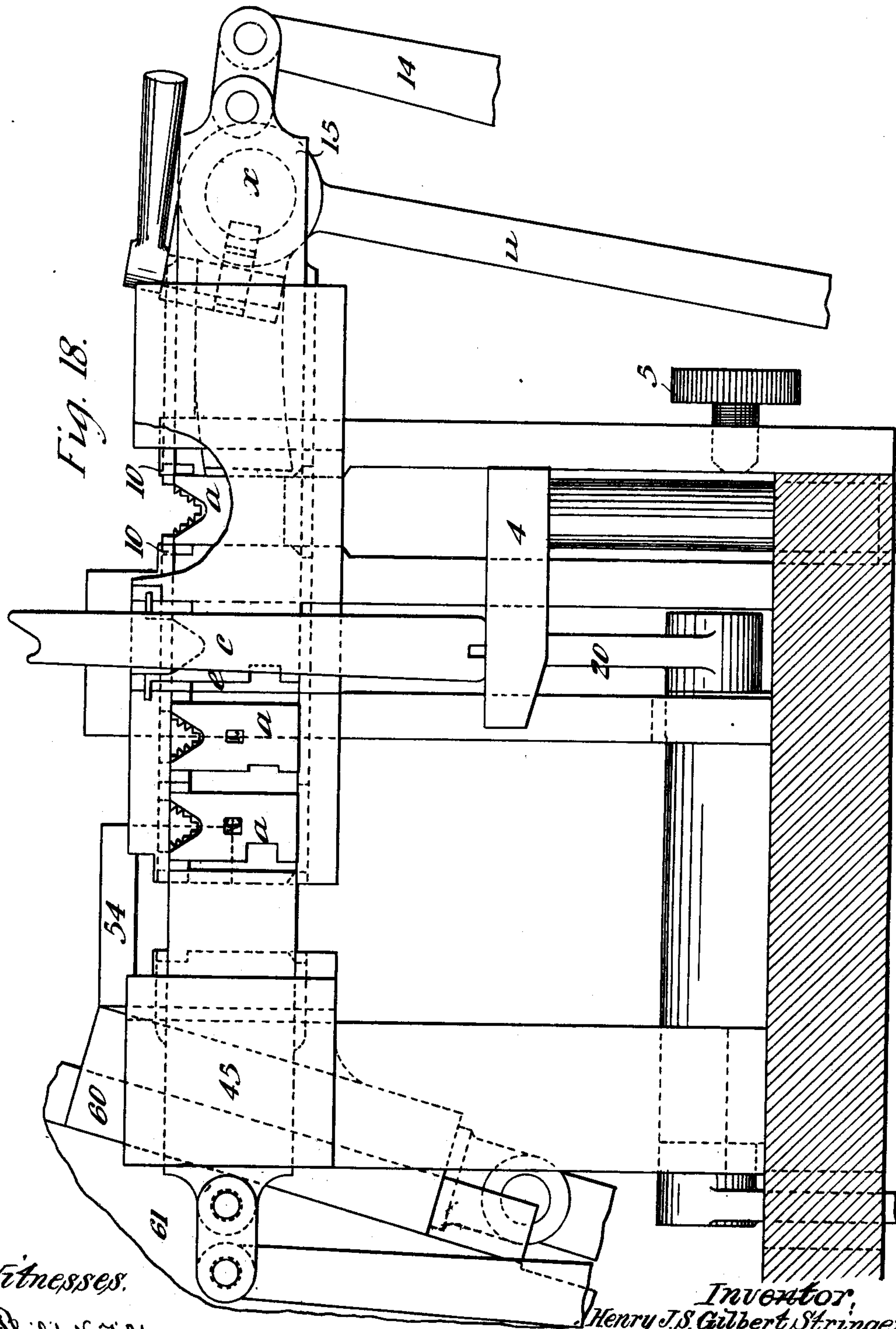
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H. J. S. GILBERT-STRINGER.
TYPE CASTING AND COMPOSING APPARATUS.

(No Model.)

(Application filed Mar. 13, 1900.)

10 Sheets—Sheet 8.



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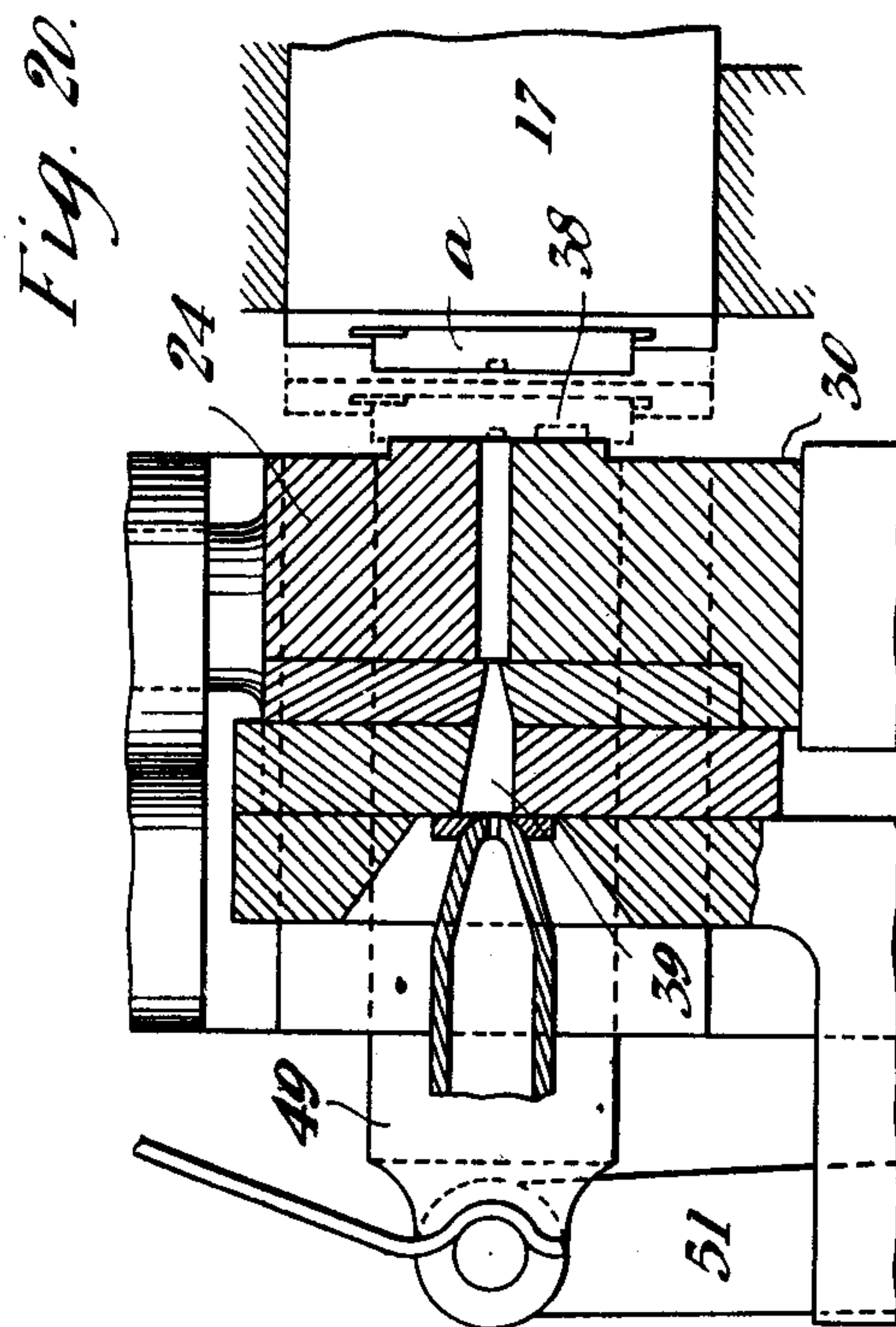
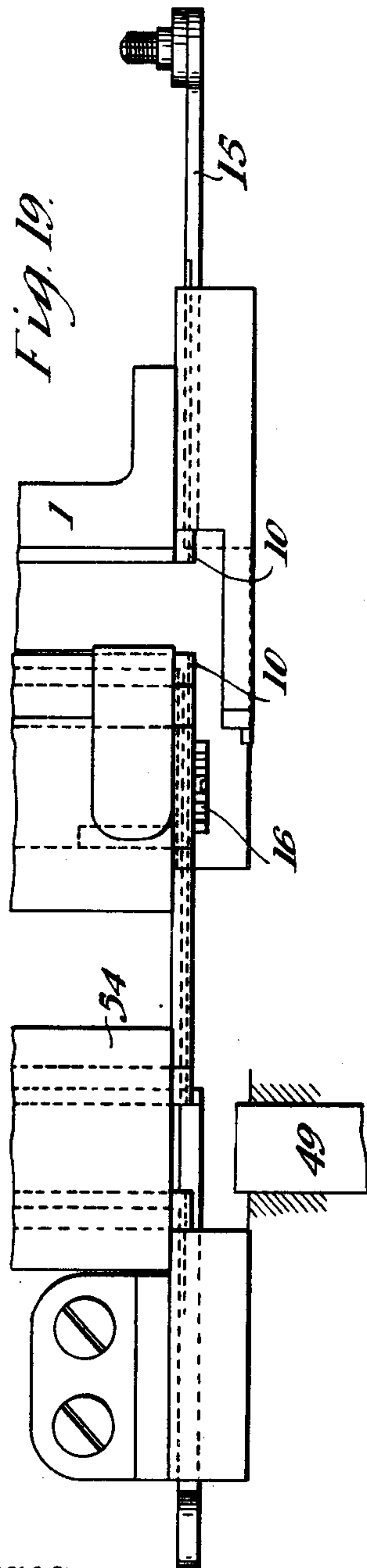
Patented June 4, 1901.

H. J. S. GILBERT-STRINGER.
TYPE CASTING AND COMPOSING APPARATUS.

(Application filed Mar. 13, 1900.)

(No Model.)

10 Sheets—Sheet 9.



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(No Model.)

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10 Sheets—Sheet 10.

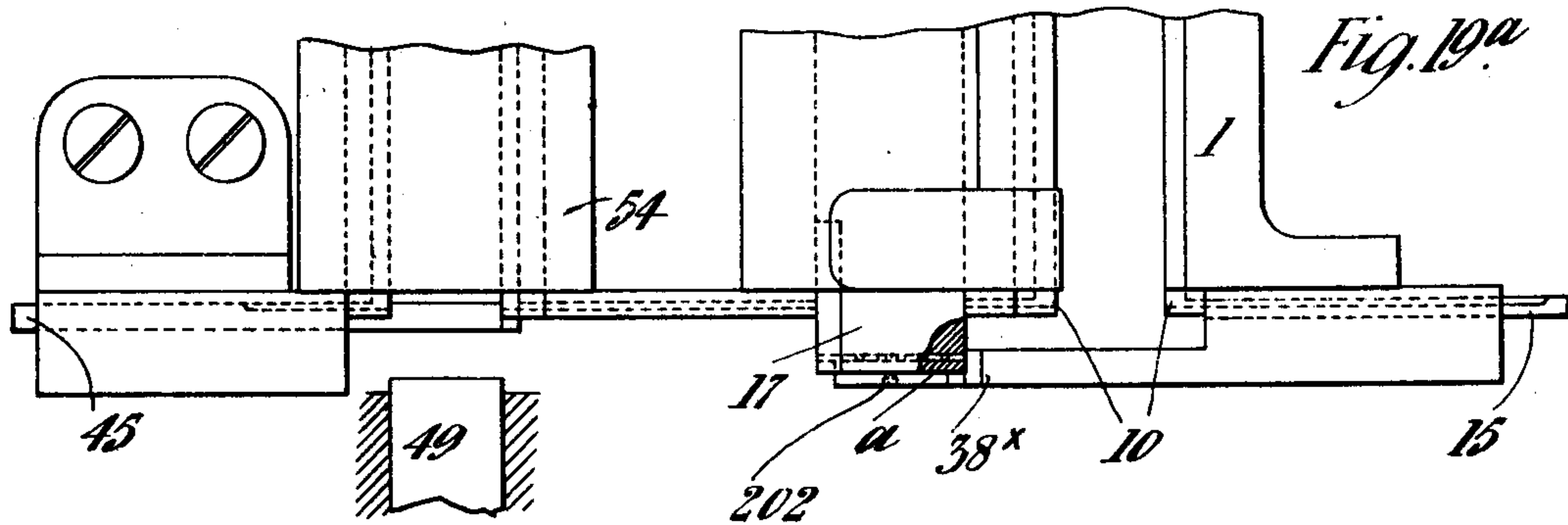
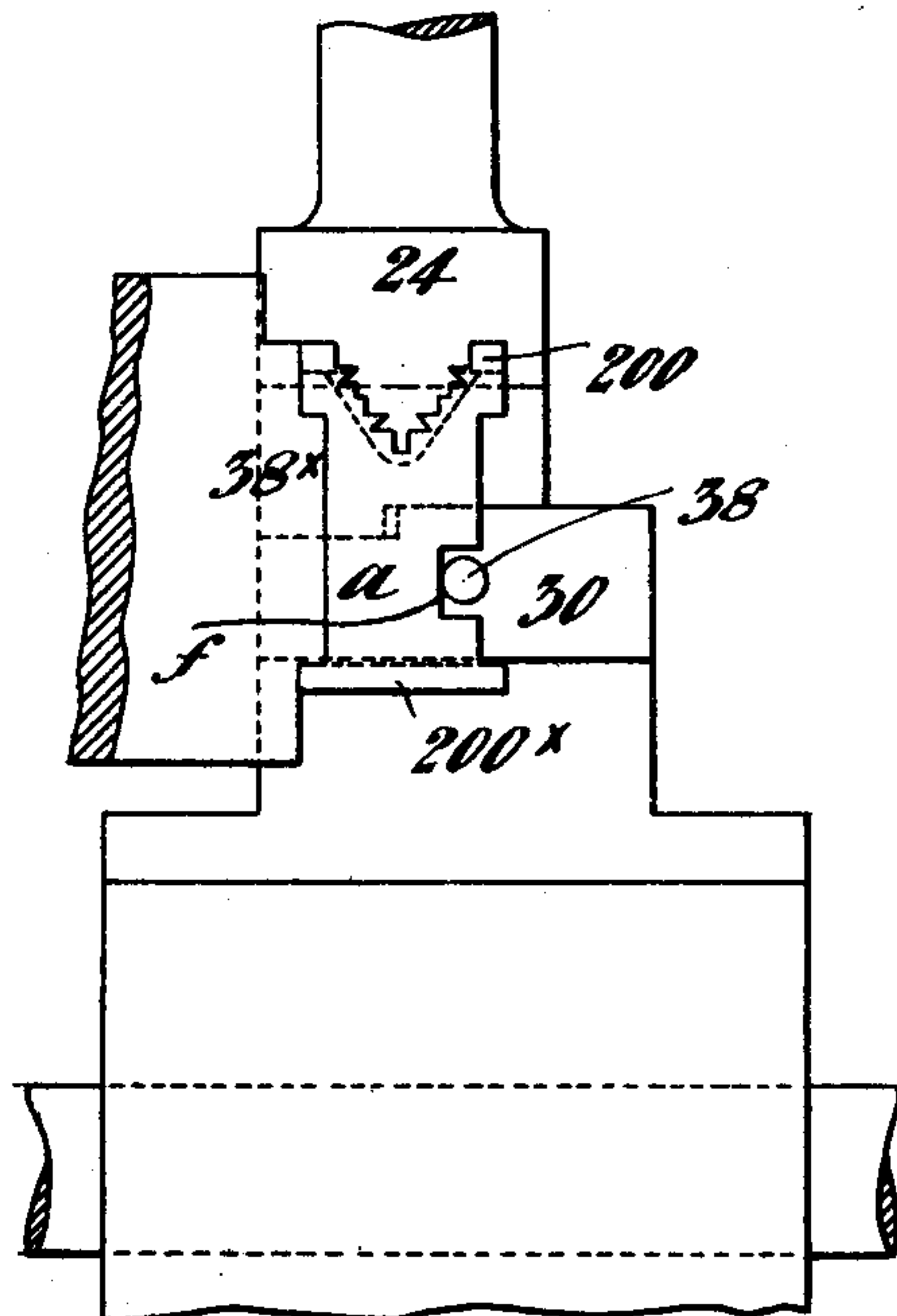


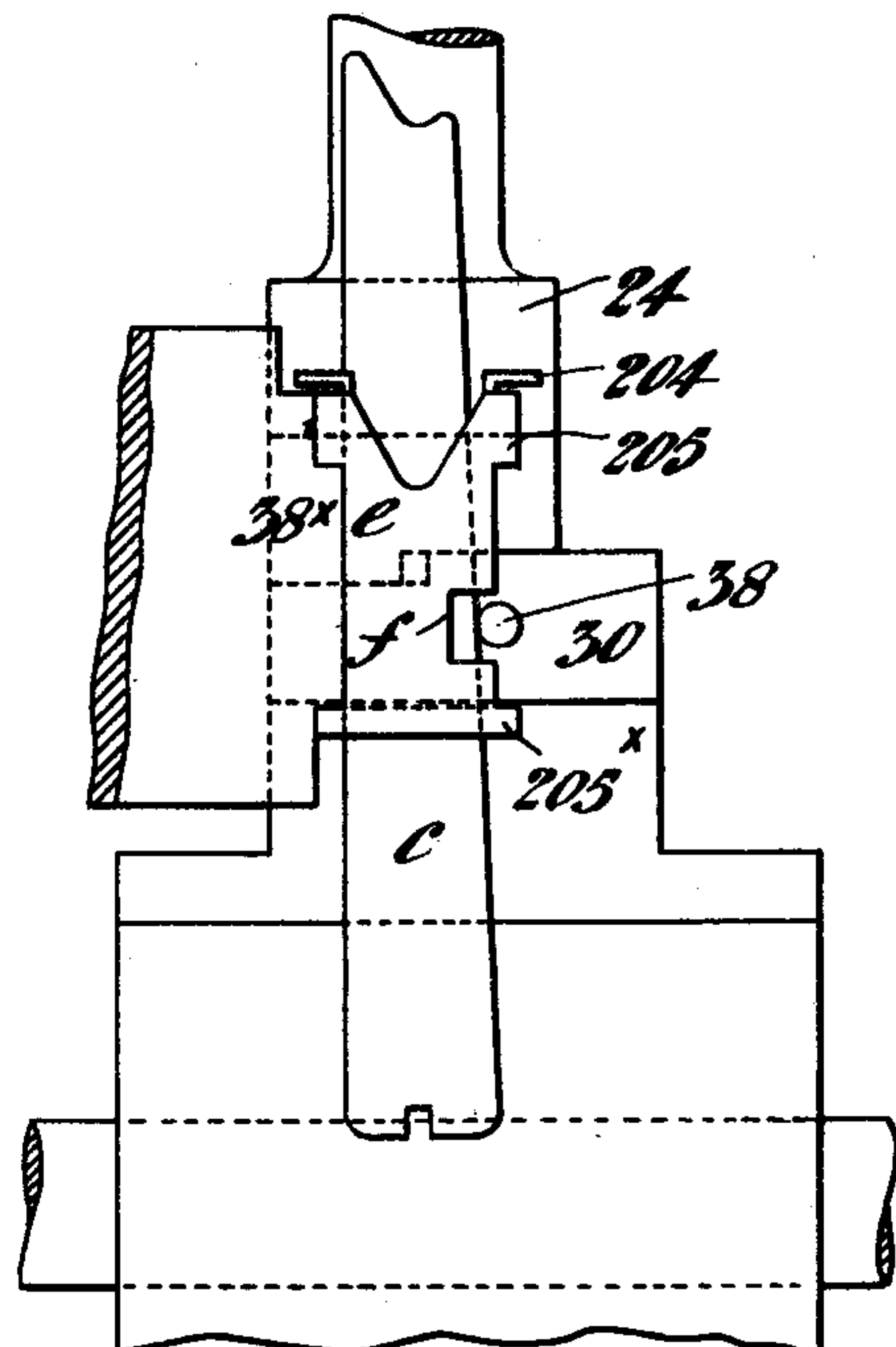
Fig. 20^a



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Fig. 20^b



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UNITED STATES PATENT OFFICE.

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TYPE CASTING AND COMPOSING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 675,827, dated June 4, 1901.

Application filed March 13, 1900. Serial No. 8,538. (No model.)

To all whom it may concern:

Be it known that I, HENRY JAMES SYDNEY GILBERT-STRINGER, a citizen of England, residing at 35 Tavistock Crescent, Westbourne
5 Park, London, England, have invented certain new and useful Improvements in Type Casting and Composing Apparatus, (for which I have applied for a patent in Great Britain, dated January 30, 1900, No. 1,903,) of which
10 the following is a specification.

In the system of composing and casting known as the "linotype" system a number of matrices selected by finger-keys are assembled to form a line, and this line being
15 arranged to form one side of a mold metal is cast against them, forming a line of characters of linotype-bar, and a number of these bars are then arranged bar upon bar to constitute a form for printing.

20 My invention relates to an apparatus to give effect to a method set forth in application Serial No. 8,539. In such method I employ matrices similar in some respects to those used in the linotype system along with special space-matrices, and these are assembled
25 in the necessary order to form a line, which I justify and then separate these matrices and cast from them separate types, which are afterward collected into a galley to constitute
30 a form for printing. The matrices are then reassembled and subsequently distributed into their respective magazines in a manner similar to that according to which linotype-matrices are distributed.

35 I believe myself to be the first to combine in an apparatus employed for the purpose of producing lines of equally-justified individual character and space types a number of independent disconnected matrices each bearing
40 a single character, space-matrices capable of justifying such line, finger-keys capable of being operated in such manner as to liberate the desired matrices from magazines in which they have been previously placed,
45 intermediate mechanism for placing the liberated matrices in line, a mechanism which coöperates with the matrices so assembled in such a manner as to justify the space-matrices between the character-matrix groups in
50 the line and advances these matrices one by one to a casting mechanism consisting of a

trix on being presented thereto closes one end thereof and operates upon a variable portion thereof, so that its walls remain open the requisite "set" width needed for the production
55 of a character or space type corresponding to the matrix so presented, a reservoir containing molten metal, a pump for injecting metal into such mold, a collecting mechanism which
60 after such type is cast causes it to be assembled and delivered line upon line in a receiving-galley in the order requisite to constitute a form for printing purposes, and a distributing mechanism which after casting collects,
65 delivers, and distributes the matrices so used into the magazines from which they originally started, and it is to be distinctly understood that my invention covers such combination in any form the equivalent of that herein de-
70 tailed.

For the purpose of producing lines of types for inclusion in a form for printing in the manner above set forth I employ apparatus which I shall describe, referring to the ac-
75 companying drawings.

Figure 1 is a front elevation of the apparatus. Fig. 2 is an elevation of the left-hand end. Fig. 3 is a plan. The other figures, drawn to enlarged scales, show details, 80
namely: Fig. 4 is a plan of the parts for assembling and justifying the line of matrices. Fig. 5 is an end elevation, partly sectional, looking from the left of the parts for moving the matrices to and from the mold. Fig. 6
85 is a transverse section on the line 6 6, and Fig. 7 is a transverse section on the line 7 7, of Fig. 4. Fig. 8 is an elevation, partly sectional, looking from the right of the parts for casting and assembling the types. Fig. 9 is
90 a plan, and Fig. 10 a transverse section, of the type-channel. Fig. 11 is an elevation, partly sectional, of the mold and the chief moving parts connected therewith. Fig. 12 is a plan, and Fig. 13 is an end view, looking
95 from the left, of the clutch for alternating the shaft movements. Fig. 14 is a perspective view of one of the character-matrices. Fig. 14^a is a front elevation of the same. Figs. 15, 16, and 17 are respectively a front
100 view, a side view, and a perspective view of one of the space-matrices. Fig. 18 is a front view, and Fig. 19 is a plan, showing, on an enlarged scale, the course taken by the mat-

rices in passing from the justifying-block after liberation from the justifying-vise along the front of the mold and thence to the channel 54. Fig. 19^a is a plan similar to Fig. 19, but showing the matrix-plunger advanced, carrying a matrix against the mold ready for casting. Fig. 20 is a section of the mold, showing in dotted lines a matrix presented to it. Fig. 20^a is an elevation of the mold with a character-matrix against it in a casting position, the matrix-plunger being removed to permit a clear view of the matrix. Fig. 20^b is a similar view with a space-matrix in the casting position.

The character-matrices, one of which, *a*, is shown in Fig. 14, are similar to those employed in the linotype system in that each consists of a flat rectangular plate of brass or like material recessed in its two vertical edges to produce the four shoulders 200 and is also notched centrally in the upper edge and provided with sustaining-teeth 201, the number and arrangement of which differ on matrices bearing different characters, so that they may be employed as a means of distinguishing between and distributing the matrices. Now my matrices differ from the above in the following novel features: First, the top and bottom of the matrix are cut back to permit of the shoulders 200 and bottom of the back part of the matrix 200^x entering and traversing a race or guide way corresponding therewith; second, the intaglio character or matrix proper, 202, is struck on its face instead of its edge; third, instead of being of the same thickness as the character-type it produces, in order to permit of a deep strike, it is made thicker than the type to be cast from it by an amount, of, say, 0.1 inch, and, fourth, matrices for different characters vary in width at the point 203, the depth of the notch determining the running or set width of the mold, and consequently the set of the type cast therein, in a manner hereinafter described.

The space-matrices, as shown in Figs. 15, 16, and 17, correspond with the space-bars of the linotype system in so far that each consists of a long wedge-blade *c*, connected by a sliding joint to a second wedge *e*, tapered in an opposite direction and provided in its upper end with extended shoulders 204. The sliding connection is of such character that the wedge *e* serves as a means of suspending its companion. My matrices differ from those of the linotype, as follows: First, they are provided with shoulders 205 205^x, corresponding to those used in the character-matrices, and are so made that they may enter and traverse the race and guide way before referred to; second, the wedge-piece *c*, in addition to the taper already mentioned, is, as shown in Fig. 15, wedge-tapered from top to bottom on its left side at the same angle in its width as it is in its thickness, and, third, the short wedge *e* has in it a notch *f* in order that the set-pin on the mold may enter and make uninter-

rupted contact with the inclined edge of wedge *c* on the casting-line 206 206, Figs. 15, 16, and 17. It is a vital element of the principle of justification that the wedge incline on the side of wedge *c* should correspond in angle with the thickening wedge-angle used in both wedge *c* and wedge *e*, because the matrix being inserted between groups of character-matrices representing words and there remaining a shortage in the line, which has to be allotted proportionately to each of the spaces to secure equable justification. This is effected by elevating all the wedges *c*, thus equally thickening each of the space-matrices until such shortage disappears, at the same time, by means of the inclined side of *c*, registering such proportionate increase in thickness at right angles thereto, so that, wedge *c* being maintained at the position to which it has been raised, when subsequently its face becomes the closing-piece of the mold for space-casting the mold set-pin, the center of which traverses horizontally on the line 206 206, meeting the inclined left edge, checks the closing of the mold, causing it to remain open such predetermined distance. For example, the wedges *c* and *e*, when at normal, (wedge *e* suspended by its shoulders 205 and sustaining wedge *c* at its lowest position) if inserted in the line would equal in thickness that of the smallest space—say 0.0312 inch—plus the thickness quoted above as being added to all matrices, or $0.0312 + 0.1 = 0.1312$ inch. At this time the width of wedge *c*, measured across the casting-line 206 206, Fig. 17, would be a constant—say 0.4185 inch plus 0.0312 inch, a total of 0.4497 inch—and if presented to the mold would prevent it closing by a distance of 0.0312 inch, the forward spring-propelled movement of the set portion of the mold being arrested by the inclined edge of wedge *c* at the point then on a level with the line 206 206. If, however, the equable justification of the line demanded that each space should be 0.0652 inch in set thickness, the wedges *c* will be raised until said wedges *c* and wedges *e* conjointly measure in thickness 0.1652 inch, and as all the wedges coincide in angle that on the side of wedges *c* will then, if measured across the front on the level of the line 206 206, be found to be 0.4837 inch. The manner in which the registration of thickness is effected and maintained after justification and removal of the matrices from the justifying-vise and during the period of separation and presentation to the mold will be described elsewhere.

The mechanism for handling the matrices and producing therefrom lines of individual justified character and space types while embracing many of the mechanical features found in linotype-machines is of course distinctive in those parts relating to justification, separation of matrices before casting, the casting mechanism, the delivery and collection of types produced, and the reassemblage of matrices into line prior to distribu-

tion. 207 is a rigid main frame, which may be of any form or construction adapted to sustain the operative parts. 208 is the magazine in which the assorted matrices are contained. *b* represents finger-keys representing the respective letters or characters and connected by rods 209 with escapement mechanism located in the mouth of the magazine to deliver the matrices one at a time therefrom. 210 represents a series of upright slots or channels through which the matrices descend. 211 is an inclined traveling belt on which the matrices are received and by which they are delivered to a horizontally-slidable assembly-block *r*. 212 is a reservoir or receptacle in which the space-matrices are contained and from which they are liberated one at a time and dropped into the assembly-block *r*. Thus far this mechanism with the substitution of assembly-block *r* for the vertically-moving assembly-block used in linotype-machines is identical in character and constitution with the mechanism designed to discharge the same purposes and set forth in United States Patent No. 436,532. It may be here noted that for facility of identification further parts included and described in such patent embraced in my mechanism to discharge identical functions will bear reference-numbers commencing with 213.

g is a shaft driven from any convenient motor and has free upon it a pinion *h* and pulley *i*, also two clutches *j* and *k*, caused to slide on feathers by a guided frame *l*, which can be moved by a hand-lever *m* so as to clutch either the pinion *h* or the pulley *i*, but not both at the same time. The pulley *h* gears with the wheel *n*, fixed upon a shaft *o*. The pulley *i* drives by a belt a pulley *p*, fixed on a shaft *q*. The shafts *o* and *q* have fixed on them cams by which the reciprocating parts of the apparatus are actuated.

r is an assembly-block provided with retaining-springs 213, sliding horizontally, and carrying on its face a scale which is set to commence its readings from right to left at a point distant from 213 the length of line desired in the composition. This scale is set off in divisions each equal to the added thickness existant in the matrices and referred to above.

s is an indicator which totals and shows the number of matrices discharged from the magazines and is returned to zero after justification of each line.

u is a hinged and sliding justifying-vise provided with a sliding jaw *t* and a spring-tooth *v*, which engages in a ratchet-rack *w*, the teeth of which are cut to the same pitch as the scale (0.1 inch) and formed on the upper bar *x*. It also carries a similar scale to assembly-block *r*, commencing at a point distant the required length of line from the fixed end of jaw 2 and reading from left to right.

1 is a justifying-block similar in its interior grooving to assembly-block *r*, and consequently the matrices when assembly-block

r is moved to join the block 1 may enter and traverse same.

4 is a justifying-bar, which by elevation raises the blades of the space-matrices, so increasing their thickness until checked by the filling of the space between the jaws of the justifying-vise *u*.

8 is a follower which when placed at the rear of the justified line of matrices after their release from the justifying-vise propels them along the justifying-block until their shoulders encounter the check-pieces 10 of the separating mechanism.

15 is a separator (see Fig. 4) which removes the matrices one by one from the end of the line and propels them through a guideway. 17 is a matrix-presentation plunger possessed of a continuation 16 of such guideway, so that the matrix may be propelled thereinto and the plunger then be advanced under spring-pressure until checked by the face of the matrix coming into contact with the mold-face.

24 and 30 are respectively the upper and lower halves of the mold, having suitable addition to provide for the casting of a runner or tang.

150 is a pump and metal reservoir provided with means for filling the mold and may be of any one of the forms ordinarily employed for type-founding.

41, Fig. 8, is a delivery-channel.

43 is a receiving-galley in which the types are received line upon line.

45 to 53, Fig. 5, constitute a reassembling mechanism by which the matrices are collected in line in a channel 54, which can be elevated to the point shown in dotted lines in Fig. 5. 214, Fig. 1, is a slide to transfer such lines along the guide 215 from channel 54 after the latter is elevated.

216 is a vertically-swinging arm provided with means for lifting the character-matrices out of the guide 215 to the distributor, leaving the space-bars behind.

217 is a device for carrying the space-bars from 215 into their receptacle or magazine 212.

218 is a slide at the top of the machine to transfer the matrices from the lifting device 216 into the distributor 219, whence they return to their respective chambers in the magazine 208.

The following description of the operation of the machine specifically details how each result is arrived at, excepting in so far as details of the known parts of the linotype-machines are concerned. The attendant depressing successively the finger-keys *b* thereby causes the matrices *a* to be discharged from the mouth of the magazine 208, whence they descend through the channels 210 to the belt 211, by which they are delivered one after another in an upright position, side by side, into the assembly-block *r*, in which they are advanced in close order by the cam 220, acting against the last matrix. From time to time the space-matrices are delivered into the

line by means of the appropriate finger-key. As each of the matrices carries an added thickness, it is necessary that some record of this should be furnished the operator, because, owing to the fact that two lines are seldom alike in number of characters, he cannot, as in the linotype process, use for all lines a justifying-vise of a predetermined and fixed length, but for a line containing sixty-four characters requires a vise with its jaws set apart the length of line desired in the composition—say three inches plus $0.1 \times 64 = 9.4$ inches. If the matrices numbered forty-two, the justified line of matrices would have an over-all measurement of 7.2 inches. This record is furnished by a dial *s*, actuated in any suitable manner by the keys *b* as the roller of a type-writer is moved along step by step. On the front of the assembly-block *r* there is a scale with divisions each 0.1 inch, reading from right to left, and which is set to commence its reading at a point distant from the latches 213, Fig. 4, the length of line it is desired each line of cast types should be. A concrete example of what will occur will be furnished by assuming the operator engaged in composing lines of three inches in length and to have liberated matrices representing the following letters and spaces, the set width of each being tabulated alongside it:

Character.	Width.	Character.	Width.
	<i>Inches.</i>		<i>Inches.</i>
Em-quad	0.1320	e	0.0695
T	0.0903	d	0.0730
h	0.0764	Space	0.0312
i	0.0417	f	0.0486
s	0.0590	o	0.0695
Space	0.0312	r	0.0590
i	0.0417	Space	0.0312
s	0.0590	b	0.0730
Space	0.0312	y	0.0764
t	0.0590	Space	0.0312
h	0.0764	y	0.0764
e	0.0695	o	0.0695
Space	0.0312	u	0.0764
e	0.0695	Period (.)	0.0417
x	0.0764	Em-quad	0.1320
a	0.0730	l	0.0590
m	0.1147	t	0.0590
p	0.0730	Space	0.0312
l	0.0417	w	0.1112
e	0.0695	i	0.0417
Space	0.0312	l	0.0417
a	0.0730	l	0.0417
s	0.0590		
k	0.0764		2.9001

From this we get a total of forty-six characters and spaces, and if they were handed direct to the casting mechanism they would produce that number of types, measuring when arranged side by side 2.9001 inches or a line short by 0.0999 inch. As each of the matrices carries an added thickness of 0.1 inch, the first of the assembled matrices would be situate from the assembly-block latches 213, including its own width, a distance of 7.5001 inches and its left edge would coincide with a point between the forty-fifth and forty-sixth divisions of the measuring-scale, showing that, as to be a complete line it should have reached the forty-sixth division, and so correspond with the dial *s*, there is a shortage, (0.0999 inch,) but not sufficient to per-

mit of further composition. The operator by thus noting the approach of the foremost matrix to the division-number on the scale which corresponds to the total shown by the indicator is apprised of the necessity to justify the line. To do this, the shifting-jaw of the justifying-vise *u* requires adjusting, so that in the present instance the two jaws *t* and 2 may be apart the required length of line (three inches) plus such additions introduced into the line ($0.1 \times 46 = 4.6$ inches) or $= 7.6$ inches. The right-hand jaw *t* can be slid along bar *x* and carries a pointer passing over a scale situated on the front of the vise, the readings of which from left to right commence at the distance of a line (three inches) from 2 and correspond with the added thicknesses, as in the last example. Consequently by moving the jaw *t* until the pointer is on the forty-sixth division of such scale the jaws are opened a distance of 7.6 inches. The jaw *t* has a spring-tooth *v*, engaging in a ratchet-rack *w*, formed on the upper bar *x* of the vise, with teeth cut to a pitch of 0.1 inch. At this time the vise *u* is in its extreme right position and is carried on its lower bar *y* as on a hinge. The operator then slides the assembly-block *r*, containing the matrices, along a dovetail guide *z* until its left end meets the justifying-block 1, which has a continuing race for the matrices corresponding with that of the assembly-block. The justifying-vise, which is in the position indicated by dotted lines in Fig. 4, is then moved on its hinged bar and made to embrace the line of matrices between its jaws *t* and 2, after which it is slid to its extreme left-hand position, its jaw 2 being stopped at the end of the slot in which it has moved, this position being shown in full lines in Fig. 4. The operator by pulling forward a hand-lever 3 raises the bar 4, thus pushing up the wedges *c* of all the space-matrices in the line, which, owing to their tapering thickness, push the character-matrices on each side of them farther apart until the line exactly fills the space between the jaws *t* and 2 of the justifying-vise. In the example quoted above it would then be found that each space-matrix in the line (there being eight) had received an increased thickness over its original 0.0312 inch of 0.012485 inch, and when presented to the mold if the blade be kept at the same height will produce a space measuring 0.043685 inch. In other words, when delivered into the line the space-matrix measured in thickness 0.1312 inch and the wedge *c* measured along the line 206 206, Fig. 17, in width was 0.4497 inch, but after justification these measurements become, respectively, 0.143685 inch and 0.462185 inch. In order to maintain the wedges *c* of the space-matrices at the height so arrived at, the bar 4 is locked in the position to which it has been raised by a setting-screw 5, bearing against a downward extension 6, and the justifying-vise is withdrawn from the justifying-block 1, leaving the matrices free therein. The operator

then moves a follower 8 to the rear of the row of matrices and pushes it down behind them. This follower, having a weight 9 attached to it by a cord 62 passing over guide-pulleys, advances the row of matrices until the foremost is stopped by its shoulders meeting check-pieces 10, Figs. 4, 5, 18, and 19, one on each side at the top and bottom of the matrix. The operator by moving the lever *m* engages the clutch *k* with the pulley *i*, which causes the shaft *q* to revolve in the direction of the arrow in Fig. 2, rotating a cam 11, Fig. 5, which by means of a lever 12, a connecting-rod 13, and another lever 14 actuates a separator or delivery-plunger 15 of rectangular section, which advances the foremost matrix laterally, its shoulders entering a guideway, which it traverses until it reaches a section 16 of such channel attached to the front of a matrix-plunger 17. The delivery-plunger 15 is then retracted by a spring 18. During this movement the blades of the space-matrices are supported on an extension 4^x of the bar 4, Figs. 5 and 18. The matrix-plunger 17 is connected, as shown in Fig. 11, through arms 19 and 20 of a rocking shaft 21 to a roller-bearing on a cam 22 and is urged by a spring 23. When the cam 22 in the course of its revolution permits, the spring 23 urges the matrix-plunger 17 forward, carrying with it the matrix firmly held in the section 16 of the guideway and placing it against the face of the mold. 38^x, Fig. 19^a, is a stop so placed as to bear against the side of the matrix opposite the notch (203 character-matrix, *f* space-matrix) and prevent any lateral movement of the matrix in that direction. The mold, Fig. 8, has a vertically-movable upper piece 24, which is urged downward by a spring 25 and is connected through lever 26, adjustable rod 27, and lever 28 to a roller bearing against a cam 29. Under this is a horizontally-movable piece 30, connected through link 31, bell-crank 32, and rod 33, guided by radius-rod 34 to a roller 35, engaged in the path of a cam 36. The rod 33 has attached to it a spring 37, and the cam-path 36 has a portion widened to allow this spring to act and push the piece 30 until a pin 38 upon it bears against the bottom of the lateral notch 203 in the edge of the character-matrix *a* or against the edge of the wedge *c* of the space-matrix, which is then facing the mold, holding it firmly against the stop 38^x, and thus determining the width of the mold. If no matrix is presented, the mold will entirely close, preventing any metal entering. The wedge *c* of each space-matrix having been pushed up until the part on the level with the lateral notch *f* is such as to give the proper justifying thickness, the width of that part of the wedge being suited to that thickness determines the position of the pin 38 when it is stopped by the wedge, and therefore the position of the lower movable part 30 of the mold is such as to give the mold the width required for the space-type. At the back of the pieces

24 and 30 are covering-pieces, so formed and fixed that a horizontal channel is formed to receive a tailpiece 39, shaped as a tang and projecting back from the lower piece 30. There is also a short vertical channel above the tang-channel in which can move a projection from the back of the piece 24. When the mold-pieces are in the position shown in Figs. 8, 11, 19^a, 20, 20^a, and 20^b, with a matrix in front of them molten metal is injected by the pump 150 through the nozzle 40 in the usual way, so as to cast a type with a prolonged tang. The lower piece 30 is then moved a little to the right, releasing the matrix, which is withdrawn by the plunger 17. The top piece 24 is then raised and the lower piece 30 is moved to the left, carrying with it the type along the tang-shaped channel, in which it is left suspended, as a cantaliver by its tang, the lower piece 30 again returning to the extreme right preparatory to closing on the succeeding matrix. As type after type is thus cast and moved along the tang-channel the foremost is pushed into a delivery-channel 41, in which the body of the type is held, while its tang projects free beyond the tang-shaped channel. Each type as it is moved along the channel 41 passes an inclined cutting-blade 42 by which the tang is cut off, and farther on its foot in passing several saw-teeth 42^x has the heel-nick cut in it. From the channel 41 the types are delivered into the galley 43, forming a line above the lines already delivered. As each line is completed the types are pressed down by a hand-lever 44 to make room for a fresh line, a movable rule being preferably interposed, so that the fresh types may slide along it. Each matrix as it is removed from the mold by the plunger 17, Figs. 18 and 19, is pushed along sidewise out of the plunger 17 through the continuing channel by the succeeding matrices, actuated by the plunger 15, until it meets a plunger 45, which is retracted by a spring 46 and moved forward by a lever 47, actuated by a cam 48. This cam is so formed that when the matrix meets the plunger 45 the plunger can retire at the same rate as the matrix advances, the plunger supporting the matrix by having its front engaged between the lateral shoulders of the matrix. The matrix is thus moved to a position in front of a plunger 49, which is actuated by a cam 50, through arms 51 52 on a rocking shaft 53. By the plunger 49 the matrices are successively advanced into a channel 54. In Fig. 18 a matrix *a* is shown emerging from the justifying-block 1. To its left is a space-matrix *e* and its wedge *c*, which has been pushed up and is held up by the justifying-bar 4 while it is presented to the mold. On the left of the space-matrix are shown two character-matrices from which types have been cast and which are being pushed toward the channel 54. While a line of type is being cast, as described, the operator can go on composing another, and as

soon as the last matrix has been cast from and withdrawn from the mold the casting-shaft is automatically thrown out of action at the completion of its revolution by the automatic mechanism shown in Figs. 12 and 13—that is to say, immediately under the lever *m* there is a sleeve 63, which can slide and turn a little and has on it a pin 64, against which the lever *m* bears. It has also an arm 65, through a hole in the end of which passes the weighted cord 62, and another arm 66, which carries at its end a curved blade 67, having an inclined edge. This arm is held by a light spring 68, so that its blade 67 is clear away from a headed pin 69, projecting from a roller 70, fixed on the shaft *q*. When in the first instance the lever *m* is moved to the left to engage the clutch *k* with the pulley *i*, which drives the shaft *q*, the lever acting on the pin 64 pushes the sleeve 63 also to the left, bringing the blade 67 over the pin 69, but still clear of it. When the last of the matrices has been removed from the justifying-block 1 by the separator 15, it allows a ball 71 on the weighted cord 62 (which has been advancing them) to meet the arm 65 and partly turn the sleeve 63, which brings the blade 67 close to the surface of the roller 70, which is revolving in the direction of the arrow. In the course of not more than one revolution the pin 69 comes against the inclined edge of the blade 67 (the head of the pin overlapping the edge of the blade) and pushes it to the right, moving the sleeve 63 and its pin 64, and so pushing the lever *m* to the right, causing disengagement of the clutch *k* from the pulley *i*, thus stopping the movement of the shaft *q* and the parts operated by it. The operator observing the machine at rest moves the lever *m* so as to engage the clutch *j* with the pinion *h*, thus causing the wheel *n* and shaft *o* to turn in the direction of the arrow. On the shaft *o* is fixed a cam 55, which operates arms 56 and 57 of a rocking shaft 58. The arm 57 is connected by a link 59 to a block 60, which is fitted to slide up along the face of a bracket 61, carrying with it the channel 54, which is fixed to the block 60, and raise the channel to the position shown in dotted lines in Fig. 5, with the matrices suspended in it. The toothed bar 221 having been lowered to a position between the walls of the guide 215, the slide 214, moving from left to right, sweeps the matrices to the right out of 54 onto the guide 215, where the character-matrices become engaged by their teeth on the bar 221. The arm 216 now swings upward, carrying on the bar 221 the character-matrices to the distributor, while the hook 217 having engaged the space-matrices (retained by their extended ears 204 in 215) moves them to the right into their magazine 212. The sweeper 218 at the same time removes the matrices from 221 into the distributor 219, by which they are in due course distributed into their respective magazines. The channel 54 returns to its lower

position to receive a fresh charge of matrices, and the shaft *o*, having completed its revolution, is thrown out of action in the same manner as is the case in linotype-machines. 70

I would have it understood that I make no separate claim for a set of magazines for character and space matrices or for means of distributing the matrices in their respective magazines or of releasing them in suitable order by finger-keys, such means having been already described and used. 75

Obviously the principles involved in producing justified lines of individual character and space types ready for inclusion in printing-forms according to my invention are susceptible of being embodied and carried out by various forms of mechanisms without departing from the spirit of my invention, and all such mechanical equivalents are therefore within the scope of my invention. 80 85

Having thus described the nature of this invention and the best means I know of carrying the same into practical effect, I claim— 90

1. In apparatus for producing justified lines of type, in combination with a set of matrix-magazines, finger-keys and means of releasing matrices in order from their magazines, a horizontally-slidable assembling-block in which the liberated matrices are received, an adjustable justifying-vise horizontally slidable and hinged at its base and a vertically-slidable bar adapted to be raised by hand for pushing up the slidable blades of the space-matrices and retaining each in such position, substantially as described. 95 100

2. In apparatus for producing justified lines of type, a space-matrix consisting of two parts, first a slidable blade tapering equally in thickness and in width from the top downward and having on one side a groove, and secondly a piece tapering in the opposite way and having an opening cut in one side with projecting rib engaged in the said groove, substantially as described. 105 110

3. In apparatus for producing lines of type a type-mold consisting of a vertically-slidable spring-pressed upper piece, its lower surface and a covering-piece thereon constituting the top and one side of the mold-cavity; a horizontally-slidable spring-urged and cam-governed lower piece, its upper surface and a covering-piece thereon constituting the bottom and the other side of the mold-cavity, the said lower piece having a mold-adjusting pin and a backwardly-projecting tang, also back pieces provided with an opening for a metal-injecting nozzle and with a channel for the tang, substantially as described. 115 120 125

4. In apparatus for producing justified lines of type, the combination with a mold, and matrices, of means for moving successive matrices up to and away from the mold, means for assembling a number of matrices in a distributing-block, and means for raising and lowering said block, substantially as described. 130

5. In apparatus for producing justified lines

of type, the combination with mechanism for
assembling character - matrices and space-
matrices in line of mechanism for producing
from each of such matrices a character-type
5 or space-type corresponding therewith in
character and set so that these types assem-
bled form a justified line of a predetermined
length, substantially as described.

In testimony whereof I have hereunto set
my hand in presence of two subscribing wit- 10
nesses.

HENRY JAMES SYDNEY GILBERT-STRINGER.

Witnesses:

GEO. J. B. FRANKLIN,
W. J. NORWOOD.